

Dominion Energy, Diadromous Fish Restoration Technical Advisory Committee (DFRTAC)
American Shad and Eel Working Groups
12 October 2021

Virtual Conference Call Scheduled from 0900-1500
FINAL MEETING MINUTES

Present (Conference Call Attendees):

Dominion Energy – Peter Sturke, Corey Chamberlain, Olivia Ambuehl, Ben Rice, Taylor Allen, Paul Vidonic, John Swenarton

NMFS - Twyla Cheatwood, Fritz Rohde, Kevin Mack

USFWS - John Ellis

NCWRC – Jeremy McCargo, Katy Potoka, David Belkoski, Kirk Rundle

NCDMF – Todd Mathes, Holly White

VDWR – Scott Smith

Alumnus – Bob Graham, Wilson Laney (NCSU)

AKRF – Justin Krebs, Carlos Lozano, Chris Manhard

Welcome and Introductions

Peter Sturke convened the meeting at 9:38 a.m. He apologized for the late start. Four of the Dominion staff are at the Roanoke Rapids Power Station in the conference room: Corey, Ben Rice, Olivia Ambuehl and Pete. Pete noted that the house is full, with everyone who indicated they would be here, present.

We discussed the photo of a Blue-spotted Sunfish that Pete had on his screen (spots were white instead of blue, on some participants screens).

Pete noted that there is a hand-raising option on this meeting application, or we can just interrupt him. He noted that we have a pretty good agenda for today. He briefly reviewed it. He mentioned a couple of goals, one of them to be talking about American Shad passage. He noted that they annually update FERC about the license requirement of American Shad upstream passage. He noted that he will leave periods of silence so we can consider things, since we are meeting virtually. Dr. Matt Balazik is out on the James River today, so he will not be with us. Pete indicated that he hopes we can get through that portion of the agenda by noon. He reviewed a few other potential participants.

Pete decided to do introductions per request from Fritz, since we had some new participants. Everyone did so. David Belkoski is with NCWRC. Carlos is with AKRF.

Peter thanked everyone for the audio check. He asked Wilson if he was taking notes. Wilson indicated he was but noted that he was supposed to be on another call at 1:00 p.m. Peter noted that it is good that we will have minutes of the call.

Peter asked if there was anything else prior to beginning. There was no input from anyone.

- **American Shad**

Peter indicated that he would begin with American Shad and hear from others regarding that species as well. Then we will have a discussion regarding upstream passage in 2022, and what may lie ahead.

- **Dominion Bypass Anadromous Sampling, 2022 flows, and timeline**

Peter gave his presentation and reviewed the Bypass Sampling Stations methods for ichthyoplankton collection, and adult electrofishing. He noted that we had met in May, and showed us an updated flow graph, which shows the river and bypass flows. He noted that Dominion was in flood control in February, and the flows dropped down in March. The red line is the temperature at the Halifax gage. He noted that we can reference back to that graph if we need to do so. He showed us the Bypass Electrofishing Results for 2021. The peak American Shad catch was 85 per hour, during the first week in April. Striped Bass was right about the same time.

Wilson asked about the Hickory Shad numbers. Pete noted that there are not any at the base of the dam.

Pete showed us the 2010-2021 graph with the Bypass flows, and CPUE superimposed. The peak was reached in 2020 for American Shad. River Herring also increased. The increased flows in the Bypass were initiated in 2021.

Someone asked if the drop in American Shad this year was relate to the 2015 observed drop. Pete noted that perhaps it was part of a cyclic pattern, with a decrease around every four years or so.

10:00 a.m. Peter noted that Jeremy had sent out their genetic analysis report yesterday.

Holly noted that anecdotally, in the absence of any data for 2020, the commercial landings for 2020 were pretty good. They think there was a good number of fish that moved through in 2020, so that lends support to the peak observed in the Dominion graph.

It was noted that Dominion did not have the data ready for this meeting regarding male/female American Shad ratio.

Katy noted that in 2017 and 2018, pretty small numbers were stocked, 200 and 300 thousand respectfully, so that might be partially responsible for the observed drop, since the hatchery contribution is high, as Pete noted.

Todd asked if we had length data for the fish.

Peter indicated that they do. He would have to pull the data from those Tom sends him.

Todd indicated that he would discuss that later.

Peter remembered that the males were significantly shorter than the females. Pete noted that would be a good discussion point for the winter meeting as well. **(Action Item)**.

Todd noted that it is interesting that we are seeing lower numbers of Striped Bass, but perhaps larger fish.

Peter noted that Tom Gunter (ABMS) took fin clips for the Striped Bass this season as well.

Jeremy noted that they have results for the 2020 Striped Bass clips, from Tom Gunter. They just sent off the 2021 clips as well. Jeremy noted that he can review those with us.

Jeremy noted that Tom provided 34 Striped Bass clips in 2020, and 53 percent (18 out of 34 clips) were of hatchery origin. In 2019, it was about 88 percent. There is definitely some influence of fish stocked in Roanoke Rapids Lake and Lake Gaston, moving into the Bypass Reach. Jeremy noted that they did go back and test some archived clips from 2016 as well. In total, about 63 percent (15 out of 24 clips) of the 2016 fish were stocked. It appears that some of the stocked fish hang around the upper river and bypass reach and don't move downstream. They did take more clips in 2021. The high flow events into the Bypass appear to move fish down into the lower river. In most years they can only tell if the fish were stocked in an upstream reservoir because the fingerlings from the same broodfish tank are often stocked in both reservoirs. The fish from the Bypass Reach were from both reservoirs, so the fish are making it out, after being stocked as fingerlings. Kirk Rundle added during the minutes review that VDWR stocked 31,600 Striped Bass fingerlings into Roanoke Rapids Lake on 11 July 2017. These fish did not have any genetic markings and may have had a small impact on the overall estimates regarding the percent contribution of Roanoke Rapids Lake Striped Bass to those collected in the Bypass reach since the 2017 stocking. He followed and said that no other fish have been (since ~2010) or will be stocked into the lakes without genetic markers.

Roanoke River Bypass Reach field samples contribution summary for 2016 collections.

Designation	Number of Individuals	Contribution	Stocking Location
Wild	9	37.5%	-
2011 Cultured (age 5)	1	4.2%	Roanoke Rapids Lake
2012 Cultured (age 4)	2	8.3%	Roanoke Rapids Lake & Lake Gaston
2013 Cultured (age 3)	6	25.0%	Roanoke Rapids Lake or Lake Gaston
2014 Cultured (age 2)	6	25.0%	Roanoke Rapids Lake & Lake Gaston
Total	24	100%	

Roanoke River Bypass Reach field samples contribution summary for 2020 collections.

Designation	Number of Individuals	Contribution	Stocking Location
Wild	16	47.1	-
2015 Cultured (age 5)	1	2.9	Roanoke Rapids L.
2016 Cultured (age 4)	6	17.6	Roanoke Rapids L. or L. Gaston
2017 Cultured (age 3)	11	32.4	Roanoke Rapids L. or L. Gaston
Total	34	100	

Todd wondered if the observations were more reflective of Striped Bass moving out of Gaston, rather than any increase in fish from the anadromous stock moving into the Bypass Reach.

Jeremy noted that number is definitely being influenced by fish coming out of the lake.

Todd agreed that makes sense.

Jeremy noted about half the number from 2020 was from fish stocked in the lake.

Pete noted that he was always impressed by the genetics. It definitely seems that the proportion is about half. Peter noted that it would be good to have clips from the fish in the tailrace.

David noted that they had discussed taking some fin clips from fish taken in the fall, to see how many of the fish from each group are hanging around. He asked Kirk if the plan is still to get some fin clips from fish in the fall.

Pete noted that Dominion will definitely provide access for fishing off the dam, if that is needed. Jeremy noted that they were working with some local anglers to get fish from the tailrace.

Pete noted that they see fish from the dam all the time. It was noted that retired Dominion staff would be pleased to assist in the angling.

Kirk noted if it can be demonstrated that those fish are a high proportion of reservoir fish, the local anglers would like to see a season opened on them.

Pete noted that they will provide access if needed. He noted that there were some Striped Bass stranded below the South Bypass Eelway a few years ago, but they were not able to be caught on hook and line.

Pete noted that some of the Striped Bass tagged in the lower Albemarle Sound, showed up on their acoustic receivers in the tailrace of Roanoke Rapids Dam.

Todd noted that those came from either the Neuse, or the Tar-Pamlico, so a whole different ball game.

Pete showed us the graphic for the maximum, and average, CPUE for American Shad in the Bypass Reach, which he indicated was Wilsons's idea. The trends are the same.

Pete showed us the 2021 ichthyoplankton sampling. The cells highlighted show the catches. They got Striped Bass eggs, Hickory Shad eggs, River Herring eggs. They did not catch any American Shad larvae this year. They got one damaged larva, which they could not definitively identify. Carlos asked if they had seen some Walleye in their shocking as well. Pete confirmed that there were indeed Percidae eggs in the samples so likely Walleye.

Bob Graham had his hand raised, but I missed the question.

Wilson asked if it was possible for River Herring eggs showing up in the Bypass Reach to be originating in the reservoirs.

Kirk felt that it was possible, but more likely that the eggs observed were coming from anadromous fish. He noted that there are healthy populations of both Alewives and Bluebacks in the reservoirs.

Carlos noted that if the lake populations are spawning, they likely make a run into some tributary, so the eggs likely would not make it downstream.

Wilson agreed that is a good point, noting that any eggs produced would likely have hatched and undergone larval development by the time they make it downstream.

Bob noted that there is a lot of vegetation in the reservoirs which could serve as spawning habitat for River Herring. Also, the water levels fluctuate in Roanoke Rapids, so that complicates things relative to fish movement.

Pete agreed and noted that the water in Deep Creek on Roanoke Rapids can move in either direction, depending on generation.

Kirk noted that if they make abbreviated spawning runs into coves, the eggs are also semi-adhesive. He did not think that the eggs were moving downstream into the Bypass Reach in large numbers, but it would be possible.

Holly asked if the Bypass adult sampling was occurring concurrent with the ichthyoplankton sampling.

Pete indicated that they are usually done on the same day, or subsequent day. He noted there are some paired sampling days. Other days they have to also work up American Eels.

Holly asked if they only had one netter.

Peter indicated that they do have only one person netting, in the Zodiac.

Holly noted that the timing of peak catch rates was interesting.

Pete noted it is interesting to note that the eggs and adults peaked on the same day.

Holly noted that it could be a factor of the time as well.

Pete noted that all four of the River Herring samples which were high, were all on the same day. Something obviously was occurring.

Pete showed us the graphs for the five-year intervals. The American Shad count in 2021 was the highest they have had but was small in comparison to the other anadromous species.

Pete showed the CPUE for ichthyoplankton, for 2010 through 2021. He noted that they may have missed the window when the American Shad were there, since they were unable to sample during the peak flow windows.

- **NCWRC American Shad Update**

10:29 a.m. Peter asked Jeremy to review the NCWRC update for American Shad. They had decided on no 2022 stocking.

Jeremy noted that they presented the 2021 sampling results at the last meeting. Katy and Chris had completed the American Shad sampling. They decided to continue refraining from stocking in 2022.

Pete projected the NCWRC report on the genetic analysis. Dr. Heather Evans now works as a conservation geneticist for the NCWRC. They were unable able to analyze the 2019 American Shad fin clips until recently. The 2020 American Shad fin clips came from the Neuse. There were none collected from the Roanoke due to Covid restrictions. The hatchery contribution for 2019 was 64 percent, which is slightly less but still really high. We have been above 60 percent for the last three years of sampling. All of the cohorts on the spawning grounds for those years could have been stocked fish. The 2014 cohort begins to show up in the 2019 sample. Heather also ran some of the analysis for Effective Population Size. This is of concern, because it showed only 386 fish. That makes a lot of sense, if you think about the high contribution of stocked fish. We would expect it to be relatively low, and that raised concerns for inbreeding and loss of genetic diversity. We have seen population numbers vary from year to year, but there have been no increases since NCWRC began to take brood fish from the river. That is why they recommend NO stocking in 2022. They will observe the population as the stocked cohorts begin to decline. We can then discuss stocking again. There is little genetic difference in the Neuse, Roanoke and Albemarle Sound populations. All the fish tested are basically the same,

given the genetic marker suite they are using. They tested fish from the Meherrin and Nottaway, in the hope that they could detect a difference, but they could not with the suite of markers they are using. They haven't tested Tar River fish for a while, but the larger publication that looked at fish coastwide also found no difference among NC fish.

Jeremy was asked if fin clips had been analyzed from the commercial catch, to see the hatchery contribution.

Jeremy noted that they had tested fish from the commercial catches, as well as the fish that Holly had tagged. The consensus was that most of the fish in the commercial catch are coming from the Chowan. Jeremy noted that they think that the Roanoke River stock is not contributing much to the commercial catch. Also, the Roanoke population appears to be much smaller than the Chowan.

Pete noted that the Mattaponi and Pamunkey rivers in VA seemed to be eerily similar to the Roanoke/Chowan situation. All the shad were running up one river and the Striped Bass up the other.

Scott Smith didn't recall.

Jeremy gave us the numbers for the Chowan fish. Very few of them were hatchery fish.

Wilson asked if it was possible to derive an effective population size for only the wild fish, versus the hatchery fish.

Jeremy thought that given that the wild fish were combined with the hatchery fish, you would think that the wild fish might overwhelm the stocked fish. He noted that the analysis from the Neuse shows a much higher effective population size.

Wilson agreed with Jeremy's suppositions. He suggested that Jeremy pass along the question about the wild versus stocked fish, to Dr. Evans. Jeremy indicated that he would do so.

Question to Heather: Would it be prudent and possible to remove the hatchery-origin American Shad before calculating effective population size for Roanoke American Shad? Essentially only use the wild fish to calculate the N_e ?

Response: "It's possible, but I don't think it will give you an accurate picture of your effective population size because the hatchery fish aren't spawning in isolation from your "wild" population. I put wild in quotes because we are only identifying fish spawned AT the hatchery as hatchery fish, even though most of those fish by now have hatchery contribution. For example, a male fish from a 2017 hatchery spawn could breed with a female fish from a 2018 hatchery spawn in the wild and obviously that offspring will have strong hatchery contribution but will not be classified as a hatchery offspring. So, 1) even "wild" fish can have significant

hatchery contribution and 2) removing the known hatchery fish will only mask the contribution those fish are making to the spawning runs and will artificially inflate your effective population sizes.”

Peter found the paper on the Virginia rivers and will provide that to everyone (**Action Item – completed 28 October 2021**).

Holly gave a brief update on the NCDMF plan for American Shad. She explained how that plan enables fishing when sustainability is ensured. They didn't have any data for 2020, other than landings which were about double. For 2021, the landings dropped back down. The Juvenile Abundance Index (JAI) in 2020 for American Shad was 1(one). Right now, it is at 3.5, which is better than last year. As far as River Herring, in their juvenile monitoring, they saw an increase in Alewife, one of the highest recently, which was influenced by a high catch in June. The Blueback JAI was still around 1, so very low. The target is 60. The gill net survey, suspended due to Covid, will be resuming in November, so there will be more data available again. They are moving to a 12-hour set due to the Biological Opinion (BO) and incidental take provisions. That was all Holly had.

10:50 a.m. Pete noted it is good to see that many Alewives recruiting.

Holly noted that spring was cooler this year, so perhaps that helped to explain the increase.

Peter asked if the incidental take was for Atlantic Sturgeon.

Yes, it is. Holly noted that the other part of the state includes sea turtles as well, but they don't have those in Albemarle Sound. They got the BO and were ready to roll with the reduced soak time, so hopefully that won't unduly impact the data stream.

Pete noted that the VA/NC Alosa Task Force hasn't met recently. The Tidal Freshwater Intake Mitigation Guidance document is still under development. Many of the DFRTAC members are also on that group.

Pete shared the table that he shows us each year, with the license requirements and showing the Bypass Reach adaptive flow schedule. He noted that in May, we had discussed what level to keep the flows.

- **Shad Passage FERC Decision**

The license discussion is the last thing we need to do. Pete noted that it makes sense to him to delay once again, given the status of the population. He felt it appropriate to delay any upstream transport.

Wilson noted that he supports further delay. He noted that a lot of good work is being done but noted that we don't even yet understand the biology of these populations. He agreed that the effective population size is very low, so he has no problem with a further delay.

Fritz noted that his former, late colleague, Prescott Brownell had pushed hard for moving fish upstream. He noted that he, Wilson, John, and Bob were all veterans from the early years. He agreed that we should delay American Shad trap and transport. He thought it was pretty stupid from the beginning.

John Ellis and Jeremy McCargo concurred.

Peter agreed with Wilson that we need to learn more. He noted that the Bypass Reach work is helping the entire ecosystem. He asked if anyone else objected to the delay.

Fritz noted that he would like to have some sort of brainstorming session to try to figure out what is going on in the Roanoke. Did we do that?

Peter noted that we had not done that. It is on the list of things to do. He suggested that perhaps we can have a discussion during our winter meeting. He noted that the Bypass Reach flows have been increased every four or five years. The last increase will be 2024 [added for clarification – The 1000 cfs flow is the last study flow unless the DFRTAC decides to test a higher flow but that can't occur until year 30 according to Article FL1 Section 4.7]. So, we will have to make a decision then (2024). Having a good brainstorming session would perhaps help us to decide what data we need to analyze, and what analysis to run. **(Action Item)**

Wilson made two points. The first is that he needs to follow up on Holly's information about additional haul seine fisheries for America Shad on the Roanoke. He needs to visit NC Archives and History to look for additional information. Wilson noted also that we had talked about repeating Julie Harris' experiment, at some future date, when environmental conditions might be closer to what we considered "normal."

Kevin Mack asked about the resident fish, versus migratory fish, studies, and whether they have any bearing.

Peter noted that the resident fish survey is a different license requirement that is once every 5 years. He suggested that we may wish to have a session on the Bypass Reach itself. He noted that we could also consider the results of the freshwater mussel survey in the Bypass Reach as well.

11:05 a.m. Peter suggested we take a five-minute break, until 11:10 a.m.

11:11 a.m. Peter reconvened the meeting. He hoped that everyone was tuned back in.

- **Atlantic Sturgeon**

- **Updates from Balazik**

Peter gave us the Atlantic Sturgeon update from Dr. Matt Balazik. He caught four males on September 23, three of which received transmitters. They were caught upstream of Halifax, in a deeper hole. They captured a post-spawned female just above Plymouth on October 1. Peter noted that it is pretty exciting stuff. Peter indicated that Matt is keeping his boat at Weldon.

Wilson noted that Jeremy is coordinating the NMFS Section 6 Atlantic Sturgeon for the whole state. There have been some interesting observations from the Tar-Pamlico, and Cape Fear Rivers.

Jeremy noted that he is working with Dr. Chris Hager, to try to get some work going in the Neuse and Tar-Pamlico rivers.

Todd noted that they have seen a good number of juvenile Atlantic Sturgeon in both the Neuse, and Pamlico rivers this year, fish under 500 mm which are presumably young-of-year (YOY). They did see one large fish that escaped. They did have some observations of Atlantic Sturgeon mortalities as well.

Fritz noted that a consulting firm out of Wilmington, CZR, did 24-hour sets near Domtar on the Roanoke River, and they did cause two mortalities, one of them a post-spawned female. That was not good news. The sets were part of a study that is being done for Domtar, looking for metals in bottom fish, particularly catfish.

Peter noted that they got the wrong bottom fish.

Jeremy noted that Domtar has been doing that study for years. He noted that NCWRC and NCDMF permit those collections, and just overlooked the potential for sturgeon interactions in the lower river. They had three more mortalities out in the Sound, around Mackay's Point.

Peter noted at least it was a post-spawning mortality, so perhaps her progeny are out there.

- **American Eel**

Peter noted that there is a new paper to be published in December, about American Eel reintroduction on the Susquehanna. Also, there is a Bay Journal article in the October 2021 issue. The article noted that there seems to be a correlation between American Eel and Eastern Elliptio freshwater mussels, since the eels are a host. Peter noted that Dr. Sheila Eyler has indicated that they have an 85 percent outmigration target for eels at each dam. They are still trying to work on getting them out of the projects.

- **Roanoke Rapids Downstream**

- **Eel Population and Movement study Update – AKRF**

11:22 a.m. Peter asked AKRF to give their American Eel update.

Justin Krebs gave the update. They caught a lot of eels this year and all of them were released alive. He gave an update on Year 2 passage. They just wrapped up their 24th month of trapping. Receivers and the trap survey were ramped up during that time. In January of 2020 they really reached the standard sample regime they have used for the last two years.

He reviewed the goal and objectives of the study. They do monthly trapping for determining the spatial patterns of habitat use, and the habitats they are using. They are also collecting data to generate a population estimate, as well as eel size structure in the lake. The second aspect is acoustic tagging and tracking. Justin reviewed the details. They have ten receivers deployed and also receive data from agency receivers downstream, which extend to Oregon Inlet. They did some electrofishing for eels in Johnson Pond and tagged 13 eels there in 2019. They also tagged some of the eels captured in traps from Roanoke Rapids Reservoir. This enabled them to keep their numbers of tagged eels up. They have acoustic tagged a total of 50 American Eels. Sampling using traps is stratified random design. They have divided the study area into seven zones, which Justin described and for which he showed us a map. There are four habitat strata, nearshore-natural, nearshore-structured, offshore-shallow, and offshore-deep.

During Year 2, they had deployed over 500 traps. They collected 114 eels (276 total to date). Justin showed us a map depicting where the eels were captured and where all of the traps were set. Pete indicated that they had captured up to seven eels in one trap at once.

Justin showed us the CPUE by habitat (number caught per 24 hours) zone and stratum. He noted that they are developing a habitat map and trying to make sense of the data to determine the habitats they are using most frequently. He noted that there is a cluster of catches off the mouth of Deep Creek, which may be due to a bathymetric feature. The offshore strata produced more eels than the nearshore strata. The trends are consistent across both years. Lake East has no shallow habitat, so there was none to sample. Justin noted that Johnson Pond didn't produce very many eels by trapping.

Pete provided some information about the bathymetry as influenced by river flow and possibly the historic river channel. That area is deeper.

Justin noted that makes sense. There is another area where Justin also thought that something might be going on with the bathymetry. Peter agreed.

Justin asked if they had been taking notes about SAV on the traps.

Peter indicated that they had not been taking notes on SAV presence on the traps, but they did notice that it was thick at times.

Justin provided a graphic summarizing the monthly eel trap survey. They experienced higher eel catches in spring/summer (May through October). They had 49 traps with multiple eels; thirty-three percent of the traps had eels.

The highest catches were at water temperatures at/above 15 C. Catches increase once that threshold is passed. In both years, when the water got too warm, the catches dropped off.

Justin noted that they have length-frequency now for 281 eels captured. There is a clear bimodal size distribution. Sizes ranged from 210 to 697 mm. A majority were over 420 mm. Based on the gender information collected in prior years, the smaller eels could be males, and the larger ones females.

Bob Graham asked why they wouldn't think that the smaller fish are just younger eels.

Justin indicated that he agreed the smaller eels are younger, and probably do have some females. He noted that based on the prior data, the males maxed out around 350-400 mm, so that would mean most of the larger ones are female.

Bob noted it would be interesting to know if those data had more larger eels. Justin noted that they could also look at the literature.

Peter noted that a less dense population, sometimes shows more females, the further upstream you go.

Justin noted that there is information about size ranges for males and females.

Kevin Mack indicated that his understanding is that there are more females than males, the higher you go in a given watershed. Kevin indicated that he would bet that the fish 660 and larger are all females.

Justin noted that collecting gender data wasn't part of the study objectives. They can only hypothesize based on the size distribution they have.

Peter noted that the primary goal is to look at eel survival. Given that they haven't seen any over 700 mm, these data seem to trend with other SE populations. They don't get as large as the ones in the St. Lawrence, or the NE in general, so that gives them a higher probability of survival.

It was noted that 700 mm is very large for an eel in the South East US.

Peter noted that we had talked about gender and the status of silvering, at the beginning, but we decided to not sacrifice any adults to collect that information and rather focus on the populations chance for survival.

Justin noted that the trap survey was also useful for mark-recapture. Every eel captured in the traps received a PIT tag and was released. They have recorded the number of recaptures and developed a population estimate. The estimate is limited to yellow, or silvering eels, over 300

mm total length, which is the smallest size vulnerable to the trap. They excluded months when the temperature was less than 15 C, since the eels don't move much during those periods. They have 33 days of trapping data from October 2019 through September 2021. They have 11 fish recaptured from 255 marked fish, which is coming up on five to eight percent, which is reasonable. The size of the tagged population has improved. Based on those numbers, the population is around 2,880 eels, with a 95 percent confidence interval of 2,014-5,051, which is lower than the previous estimate and with a much tighter confidence interval.

Justin moved on to the acoustic telemetry tagging and tracking. Justin reviewed the eels that they had trapped and tagged. They put some more tags out this year, to replace those which had out-migrated, or died. They still have the receivers in place, as well as the six receivers downstream. The third year of outmigration is expected to begin soon. There are still 25 acoustic-tagged eels at large. Water temperatures are still pretty warm. Flows also play a role in outmigration.

Pete indicated that receiver download will take place today or tomorrow. He noted that all of the hurricanes which have come this year have missed the Roanoke system.

Justin noted that it will be very interesting to see the detection data this week. He guessed that most of them are staying put.

Peter noted that the eel named "Fritz" is stuck in the triangle of receivers in the eastern part of Roanoke Rapids Lake. It will be interesting to see if it goes.

Justin summarized their observations for Years 1 and 2. They have collected 276 eels to date, 127 in 2020, and 114 in 2021. Traps will go out next week and that will be the last trapping event for 2021. Justin noted that they will resume trapping in the spring of 2022, focusing on the May-October period of next year. Eels are most abundant in the offshore habitats of the lake, in both shallow and deep strata, and in general are most abundant in the Central Zone of the lake, and most abundant from May-September. There have been few eels in Deep Creek and Johnson Pond. Eels were most abundant in shallow SAV during the 2020 winter, which may reflect seasonal habitat use and as Bob Graham noted, may be due to solar insolation.

Justin reviewed their plans for 2022. They plan to wrap up the trap survey in October 2021 and resume in spring 2022. They will conduct trapping in May-October 2022 and focus on mark-recapture to preserve ongoing eel population estimate. They will potentially acoustic-tag another 10 eels during summer 2022 depending on outmigration numbers this season and the number of remaining acoustic-tagged eels. They will maintain the Lake-East receivers and continue downloads through fall/winter 2022 outmigration. They are submitting two manuscripts to peer-reviewed journals to publish results of: 1) population estimate and habitat associations for eels in Roanoke Rapids Lake; and 2) environmental cues for eel outmigration. Both of these studies are to be presented at AFS in Baltimore this year. Justin provided additional details on all of these plans. Justin noted that some of the acoustic receivers will be

pulled, for example the ones in Johnson Pond, since they are no longer detecting acoustic-tagged eels there.

Peter noted that when the receivers were downloaded in August, they did move some of them downstream, and upgraded the receivers. The 6 receivers in the Bypass, Tailrace, and lower river are now the TX models, which can be relocated if they move and are “lost.”

Justin noted that they haven’t yet decided what to do with the Lake-West receiver.

Peter noted it is pretty secure, and on a buoy, and he thought it was in a good location to serve as a “gate” for upstream movements.

Justin noted that none of the acoustic tagged eels thus far have been detected moving upriver toward Gaston.

Pete noted that after the first year, when all were released in Johnson Pond, those receivers haven’t had any detections.

Justin noted that the few that are being captured in the Gaston Zone just don’t have acoustic tags. He noted the two manuscripts that they are planning to submit.

12:03 p.m. Their abstracts have been accepted for the Annual AFS meeting and they are currently working on the slide decks.

Peter thanked Justin for the presentation. Peter noted continuing the work in 2022 wasn’t part of the original plan, but it was easier and more valuable to maintain the data set and generate the population estimates. That is why they were targeting doing it again next year. He noted that they will see what proportion of acoustic tagged eels leave this year and can decide whether to keep that going as well. He asked for any questions on the downstream study. He noted that we are at noon. He noted that downstream passage, and size distribution, and where the eels were in the lake, and the size at departure, all were questions, and it has been really good to have these data.

Fritz asked if anyone besides him was concerned about the apparent low survival rate of the eels that we have moved into the lake.

Peter noted that the model is assuming a closed population, but it really isn’t. He noted that the juveniles can move upstream as well. There can potentially be outmigrants of those eels over 300 mm. Peter noted that the population estimate that Justin reported is really showing that around 3,000 adult eels can move out of the lake every year.

Bob Graham noted that the eels are only recruiting to the traps if they are over 300 mm.

Justin noted that there are a lot moving upstream and also eels in a lot of areas they can't sample.

Wilson noted that he wasn't at all concerned about the estimate, given the qualifiers. The estimated is only for the larger size fractions. Wilson suggested that Justin and his co-authors may want to take the total number that have been moved upstream, and discount that by predation, outmigration, and upstream migration, etc., and what sort of number they generate.

Peter noted some of the other factors that might be at play, such as density-dependence. This is addressed in the paper that he is providing to us. He noted that they have been releasing eels at two sites, and that may come into play as well. Peter noted that flows, and temperatures, may enter into outmigration as well, and they will try to develop a predictive model.

Peter noted that Justin had planned to leave at noon, so he didn't want to keep him any longer. He noted that Justin's presentation was great. Peter noted that the median of the population estimate might be influenced, if they catch a lot of non-tagged recaptures in October.

Justin noted that Chris had done some estimates, using no recaptures, and using a low number of recaptures. They did that as a sensitivity analysis, and it didn't affect either the confidence intervals, or the actual population estimates, a whole lot.

- **Turbine Replacement Discussion**

Peter moved to the fish-friendly turbine presentation. He asked if everyone wants to power through the remainder of the agenda.

Wilson noted that he would like to finish. So did Bob. Fritz did as well, as an old man. Twyla suggested that you don't have to be old in order to power through.

Peter noted that we have Wilson for another 43 minutes, so they would try to finish.

Peter moved to the turbine-friendly update. We couldn't see that slide as yet.

He noted that the study they did yielded two fish-friendly turbines that would work at Roanoke Rapids. The GE or Voith minimum/reduced gap runner, and the Alden Fish-Friendly Turbine. The Capital Project Team now has taken the lead and is developing a SOW and a conceptual design project moving forward in 2022.

Corey noted that this is under the current budget. They would select one turbine and EPC contractor for installation in 2024.

They also want to develop a new updated eel survival estimate based on new information from the AKRF study, including updated eel passage based on the 30 percent turbine design. They want to build in time for the fishway engineers to have a review.

Peter asked who in USFWS would be reviewing the design.

John Ellis and Wilson were not sure but can find out. Peter asked about Brett Towler, and we weren't sure if he was still with USFWS, or had moved to USGS, to the Conte Lab.

Peter noted that they want to start the conversation and see what the agencies feel about the path forward, about using a fish-friendly turbine as a primary means of passing American Eels. They want to stay away from any operational restrictions. They may need to be running more at night. He asked Ben to comment.

Ben noted that environmentally, they want to pass the eels downstream, but they also have to be concerned about other things, such as moving flows between the tailrace and Bypass Reach. They want to avoid that as well as nighttime shutdowns, if possible. Moving flows around would be problematic. They want to try to stay in compliance with the license. The hydros are going to be called upon more at night, given the advent of solar power.

John Ellis asked about the flow concerns.

Corey explained that when they move flows, they have to deal with the step-down requirements in the license.

Peter noted that the plan right now is to replace Unit 1; and if feasible and warranted, they would like to replace all four of them. Current survival estimated was around 74 percent. If they prioritize running Unit 1, at night, they want to see what that does to the survival. They are banking on the turbine performing the way they want it to. It also should have less cavitation, which would be another benefit of new equipment.

Ben noted that moving on to Units 2-4 would hopefully eliminate any need for nightly shutdowns. That would help him to keep these in the budget where they are.

Peter noted that the Alden runner has been tested on eels, in a lab setting, but the minimum gap runner has not been tested on eels. So, there are some questions for both the biological and engineering aspects. They want the agencies to take the trip with them.

Fritz noted that NMFS had asked Dominion to talk to Bjorn and asked if he was able to do so.

Peter had talked to Bjorn, and he felt that the fish-friendly turbine was a good option. Peter noted that they will have to look at the load demand at night and if they need only one turbine at night, and assuming that survival is better than the current turbines, they would be moving in the right direction. If they can replace the other turbines as well, that would yield a good solution for eels. If they have to pass more water for flood control, that is what they have to do.

Fritz noted as we refine the outmigration timing that will also help things.

Peter agreed. He noted that the current best case for survival is during periods of high flow. Hopefully with the new turbine(s) it would only get better. They want to tell FERC what they are hoping to do. They need to know how the agencies feel about this plan. He noted that they don't have any guarantee this will work.

Fritz noted that Roanoke Rapids has effectively been the "guinea pig" for American Eel work.

Dominion indicated that they were glad they could do the work.

Fritz noted that the Alden turbine seems to be the best option right now, because the other one has only been tested on salmon smolts.

It was noted that the only reason they are looking at the other one is that it is a Kaplan-type, which can be operated at lower levels.

Fritz noted that was good.

Peter noted that we (the DFRTAC) are the professionals who will be helping with the decision.

It was noted that at the end of the study, they might have a minimum gap in Unit 1, and Alden in Units 2-4.

Peter noted that if the first one winds up being a minimum gap, and the others Alden, which might be a good experiment. Peter noted that the eels eventually want to get out of Gaston as well, so they want safe passage at both projects.

Fritz noted that they still may have to have some sort of adaptive measure, as a last-case scenario, if the turbines don't work as anticipated.

Ben noted that Roanoke Rapids can release water through the tainter gates, if the turbines aren't available due to outage, etc. He also noted that while this would not be an abnormal operation for the station, this method for passing eels should not be relied on or considered a viable operational restriction.

Fritz noted that they were shut down recently anyway, so that is not unusual.

That was confirmed to be the case.

Olivia asked about any additional stress due to starts and stops of the units related to nighttime shutdowns.

It was stated that turbines are really heavy equipment and built to handle heavy loads. There are lots of torque stressors due to stopping and starting so they are designed to handle this.

Corey noted that there is a cost-provision built into the license, for the downstream passage. Replacing turbines would definitely compare to the strobe light costs. Given the turbines are likely around 15 million each, definitely more than flashing lights, but they want something that will work for both operations, and the eels.

Peter brought up a table from the Alden (2018) report.

Fritz noted that he didn't see turbine replacement as an alternative.

Peter noted that this was the first report, and Alden came up with the fish-friendly turbine later.

Ben noted if they determined that fish-friendly turbines were not effective, they won't move them forward, but they will have to do something to pass eels as per the license requirement.

12:44 p.m. Peter explained and provided another table for us that showed the costs for the various options. It isn't a regulatory requirement right now, to obtain 95 percent survival, but they are targeting that for the time being. Without nighttime shutdowns, they are likely approaching 80-90 percent survival, but using the current size range of eels captured in Roanoke Rapids Lake, that value is likely higher. Peter noted that they can refine the numbers with the data we have now.

Peter noted that John Ellis had to leave the call.

Fritz asked what is needed from the group.

Peter noted that they need to know that the group believes a fish-friendly turbine is an acceptable method for increasing American Eel survival. They want to know that nighttime shutdowns can be eliminated as an option.

Ben noted that if they do this the eels will benefit, and so will other projects around the country. These aren't the only dams out there that are 70 years old.

Fritz noted that USFWS has left the call, but if the NMFS and USFWS fishway engineers come to agreement, we would like to review the biological aspects.

Wilson noted that what Fritz said sounded good to him. He thought John Ellis would likely be comfortable with it but noted that Wilson could not speak for USFWS any longer.

Bob Graham suggested that Dominion prepare a formal plan. He noted that it sounds like the agencies are not yet ready to buy off on fish-friendly turbines, at the moment.

Fritz concurred and noted that NMFS hopes that the fish-friendly turbines will work, but we need to have some “buts” or “off-ramps” in there as well.

There was some discussion about timing of any report or final decision.

Bob noted that he wasn’t thinking about so far out.

Peter suggested when the new survival numbers are out, that might be a good time for a decision.

Ben noted that nighttime shutdowns are problematic for Dominion, and there will be other competing authorities that will weigh in, if such shutdowns are in the mix. Nightly shutdowns would be a big problem for Dominion and not something they want to do. He liked the idea of submitting a plan. Nighttime shutdowns are not practical, they just don’t work for the station.

Bob Graham noted that has never been laid out very well.

Peter suggested that could go hand-in-hand for the turbines, and perhaps if the survival numbers are as expected, then perhaps they could move away from the nightly shutdowns and put that alternative to bed.

Peter noted that they have the information they need. They will work on putting the nightly shutdowns to bed, for the station and then pass that along to the fishway engineers. It was stated that they want to put a plan in front of the agencies, pretty quickly. It was suggested that they should talk to the two fishway engineers (NMFS and USFWS) first, before they even work on the plan. **(Action Item)**

Fritz stated that talking to the fishway engineers first was good, and he also liked the idea of Bob’s “off-ramps.” He understands that Dominion really doesn’t want nighttime shutdowns, but he would like to see some other options in the plan as well, in case the turbines don’t work.

Dominion noted that they would plan to produce a “nice pretty plan” that includes the operational constraints.

Peter noted that June of 2022 might be a good target date to put a bow on all of this, including a decision point for the agencies.

Fritz noted that provides about an eight-month window.

Peter noted that gives some time as well for the company. It was noted that fabrication would take about a year and a half.

Scott Smith indicated that he was good with the plan approach as outlined.

1:00 p.m. Todd Mathes indicated that he was good with that path forward. Kirk and Jeremy also agreed.

Peter noted that they would get something out. He indicated that they would plan to talk to Bjorn. He asked if anything else comes to mind, they would document it in the minutes. They will get a plan to everyone for review.

Jeremy noted that he wanted to announce to the group today, that Chad Thomas is retiring from NCWRC as of October 31. He will be moving to the NC Marine and Estuary Foundation after his career with the NCWRC. Jeremy indicated that he would provide Chad's personal e-mail address so we can send messages to him.

- **Roanoke Rapids Upstream Numbers**

Peter gave the Roanoke Rapids trap update for the year. We haven't had a fall jump in numbers as yet. It is pretty warm still in the Bypass Reach. They did have 14 mortalities this year, probably due to a lack of DO in the bucket during transport upstream. The South Bypass Eelway and Skimmer Gate Update are scheduled for fall 2022. The catch to date has been 10,193, with 9,543 in the N Eelway, and 528 in the S Eelway, and 122 in the Tailrace. Peter noted that was the update on the Skimmer Gate.

Peter showed a different graph with the flow, temperature, and catch all overlaid. No fall peak has arrived as yet. Peter showed us 2020 as a comparison. There was a big fall peak that year. They will continue to monitor in 2021.

Peter showed us the new South Gaston trap. They filled rip-rap interstitial spaces with concrete to prevent American Eel from avoiding the trap entrance. Those are the last pieces of the puzzle, and the trap has caught a lot of eels (1,967 plus around 300 more yesterday). It is on pace for a record year. They are still implanting Coded Wire Tags (CWTs) in every eel going into Gaston [added for clarification: CWT tagging up to 500 per week as planned in the distribution and effectiveness study plans]. They are measuring a subsample. Average TL is 172.9, with one up to 362 mm. They have captured two CWT recaptures. Peter has not pulled those tags yet. There have been no mortalities at Gaston.

Peter provided a table of the months to show the numbers by month. Purple cells are new records.

Bob asked for clarification on the highlighted cells.

1:12 p.m. Peter shared a hypothesis for why they have been seeing more this fall in the S Gaston trap.

- **Gaston Upstream**
 - **Construction**
 - **Distribution and Effectiveness**

Peter updated us on the N Gaston Trap construction. He showed multiple photographs. It is tentatively scheduled to be operational by the end of October 2021.

Peter asked for any questions on the N Gaston Trap.

With respect to the Gaston Upstream Eel Passage studies, they are going to put all of that together in a package for FERC. They will include the effectiveness studies, and distribution studies. The distribution studies found no eels in April sampling, but they did see one in July. Fall sampling is scheduled for October/November.

Peter noted that he hasn't received any reports of eels captured by anglers around the lake.

Upcoming events

- **FERC filings (October and December)**
- **Fall Gaston Eel Distribution Sampling**
- **November Gaston Site visit**

Peter reviewed the upcoming meetings, which include AFS in Baltimore in November. Chris Manhard and Justin Krebs will be presenting separately. Field work is coming along for the Fall Gaston Eel Distribution Survey, the FERC letter end of October, shad and eel updates, and so forth.

The last slide indicated that we would have an eelway tour for Wednesday, November 17, or Thursday, November 18. Agencies will be invited, and the tour could be outside. There is an open-air picnic shelter.

The winter DFRTAC meeting will be in February.

Peter indicated that he would send out an invite for the November tour dates.

Jeremy indicated that those dates would work for him.

Peter noted that he was aware that travel for the NMFS folks was more difficult.

Twyla indicated she would pass that request up the chain.

Peter noted that they would like to get Bjorn down for that trip.

Twyla noted that any request that includes overnight stays is not likely to be approved.

Peter noted that they are also under more scrutiny when they do overnight travel.

Wilson noted that he would remind John Ellis that USFWS needs to determine who in USFWS would be doing the fishway engineering review.

