Cape Fear River Partnership
Fall 2023 Session

October 30, 2023; 9 am – 12 pm
Microsoft Teams

Agenda

9:00 am Introductions – All

9:15 am Cape Fear River Lock and Dams 2 and 3: Update on Fish Passage Design – Moffatt & Nichol and Luther Aadland

- Model Results
- Alternatives Analysis
- 408 Authorization Process

10:00 am Discussion on Lock and Dams 2 and 3 Fish Passage – All

- Develop Focus Group
- Alternative Concepts
- Future Funding Opportunities

11:00 am *Microcystis aeruginosa* blooms in an unlikely riverine ecosystem: A waste treatment lagoon source? – Madi Polera, NC State University

11:30 am Brief Partner Updates – All

Meeting summary will be posted to www.capefearriverpartnership.com

Cape Fear River Partnership Meeting Summary

Fall 2023 Session

October 30, 2023; 9AM-12PM

Virtual | Microsoft Teams

Meeting Attendees:

Bill Holman, The Conservation Fund	Maria Dunn, NCWRC	Ian Rossiter, NOAA
Dana Matics, USACE Operations	Ellen Waldrop, SCDNR	James Kapetsky, Retired GIS Specialist
Dana Sargent, Cape Fear River Watch	Heather Evans, NCWRC	Jason Green, Fayetteville PWC
Nora Deamer, DWR-Basin Planning Branch	Frank Yelverton, Retired USACE	Jill Deaney, CFPUA
Anne Deaton, NCDMF	Fritz Rohde, NOAA Fisheries	Brena Jones, NCWRC
Donna Myers, American Rivers	Deanna Hardesty, USGS	Julie DeMeester, TNC
Corey Dunn, USGS NC Cooperative Fish & Wildlife Research Unit, NCSU	Kimberly Harding, NCDMF	Krista McCraken, NOAA
Loretta Lutackas, NCSU	Howard Schnabolk, NOAA	Krysden Burden, Brunswick County Public Utilities
Todd Mathes, NCDMF	Luther Aadland, Fish Passage Design Expert	Madi Polera, NCSU
Dylan McDonnell, NHC Planning & Land Use	Jason Mays	Jeremy McCargo, NCWRC
Kyle Rachels, NCWRC	Jeff Morris, Moffatt & Nichol	Peter Raabe, American Rivers
Cindy Simpson, NCWRC	Judith Ratcliffe, NC Natural Heritage Program	Benjamin Ricks, NCWRC
Tony Young, USACE	Chris Stewart, NC DEQ	Fred Tarver, NCDWR
Samantha Morrison, Moffatt & Nichol	Chris Wood, NCWRC	Dawn York, Moffatt & Nichol/Cape Fear River Partnership Coordinator
Emily Hughes, USACE Regulatory	Bill Post, SCDNR	Mark Pirrello, Moffatt & Nichol
Fred Scharf, UNCW	Mike Wicker, USFWS	Brian Rostholder, City of Wilmington Stormwater Services

Dawn York, Cape Fear River Partnership Coordinator, welcomed the group and asked for new attendees to introduce themselves. The following represents a summary of presentation and discussion points. Slides are provided and a link to the recording is provided at the end of the meeting summary.

Cape Fear River Lock and Dams 2 and 3: Update on Fish Passage Design – Moffatt & Nichol and Luther Aadland

Moffatt & Nichol provided an update on *Lock and Dams 2 and 3 Fish Passage Design – Mark Pirrello*

- The intent of the project is to develop a comprehensive watershed-based strategy to improve the resilience of anadromous fish populations through the construction of natural rock rapids fishways at both Lock and Dams 2 and 3.
- Additionally, the intent of the project is to provide free flowing access to historic spawning grounds, without compromising congressionally authorized purposes of navigation or affecting water supply users with intakes upstream of each of the dams.
- Bladen County is the lead governmental entity.
- There are several goals of the project, including:
    - Develop nature-like fishways at Lock and Dam 2 and 3 similar to the structure completed at Lock and Dam 1.
    - Incorporate modifications to the design to minimize structural improvements to the lock structure.
    - Stabilize the scoured riverbed downstream of the dams as required.
    - Incorporate the latest federal fish passage design guidelines.
- The key is to take lessons learned and modify and evolve nature-like fishways and minimize structural conditions to the dams and maintain stability of the system.
- One issue through the process was Lock and Dam 2, there was a large scour hole. Thanks to the efforts of the USACE, there is a project that is working to stabilize the scour hole.

Overview of Scope

- Data Collection and Field Investigations
- Biological Monitoring – Monitoring of biological work conducted in between. Two years of monitoring occurring.
- Stakeholder Input Session and Outreach/Education – Provide and get input from stakeholders and educate the public on the system. The goal is to keep everyone informed about how we progress.
- Alternatives Analysis – Focusing on natural fishways and ensure we encompassed analysis and expanded on what the USACE did at Lock and Dam 1. Think of considerations within authorization and getting a better comprehensive understanding of the thought process.
- Preliminary Design and Recommendation of Preferred Alternative – Really getting into evaluations that are complex systems and considering velocity and how target species maneuver through fishways.
- Advanced Hydraulic Modeling
- Dam Removal Assessment – Dam removal was considered. Focused on what that would mean to water levels and impacts to water supply as key considerations.
- Environmental Assessment and Permit Application
- USACE Section 408 Review
- Final Design and Preparation of Construction Documents

Status of Tasks

- The basis of design is completed.
- The hydrologic and hydraulic studies are completed.
- Preliminary engineering is completed.
- Alternatives have been developed, including:
    - Upstream and Downstream
    - Bypass
    - Interior Locking
    - Dam Removal
    - No Action
- The 408 Permit Package is under development and being sent to USACE for consideration.

Concurrent Efforts by Partners

- Section 216 Disposition Study is on hold.
- Lock and Dam 1 Fish Passage Modification and Improvement was completed in November 2021.
- Working with DWR and all other partners come into play for this work.

Alternatives Evaluated

- We looked at downstream and upstream options.
- The focus early on was looking at having fish and size to attract and increase passing efficiency of various species. Keep width and length of target slopes. Have various pathways and weirs and pulls built into the system. We are looking at land features too.
- Dam lowering was considered in context of putting smaller rock arch ramp without compromising the system's integrity.

Downstream Alternative @ CFLD2

- More cost-effective down range
- Lock and Dam 3 is more cost-effective because of the size of the dam. Not having to do as much of fill and construction.

Fishway Planning/Design Lock and Dams 2 and 3 – Jeff Crump

- We are looking to pursue the downstream option.
- There are four hydraulic modeling design flows for different species.
- FLOW3D CFD Modeling – Not used as frequently as 1 or 2D. FLOW3D is very computationally intensive.
- Each alternative takes a whole day to compute.
- We do not know what velocities are down further in the water column.
- This was the modeling approach we needed to do.
- Pool Design Criteria – Rock arch weir ramp, fish can swim between rocks and rest then make journey to the next one.
- Leaving dam in place and placing rock fill.
- We are not making any improvement or changes to locking structures.
- One change we are looking at now is the weir crest, it is not flat, likely because of different conditions, thus we are looking at designs to better incorporate that.

- Weir details – Boulders with offsetting gaps.
- The primary focus is to evaluate velocity fills and adjust put boulders along edges.

Technical Rational in Fish Passage – Luther Aadland

Fish passage effectiveness and considerations

- Dam Removal would be the best for fish passage.
    - Most complete restoration
    - Eliminates dam function
    - Sediment accumulation may require significant restoration
- Full-width Rock Arch Rapids
    - Slope dependent (flatter is better)
    - Natural river width
    - No attraction issues
    - Practical limits for dam height
    - Allow room for large-bodied fish
    - Potential spawning habitat for rheophilic spawners
- Partial-width By-pass Fishway
    - Slope dependent (flatter is better)
    - Size dependent (bigger is better)
    - Attraction critical (entrance near dam best)
    - High dams require long fishway/land
    - Small fishways can be bottleneck for large numbers of fish and large-bodied fish
    - Habitat is size-dependent

Centerline Slope

- Slopes over 3% should be avoided and result in:
    - High shear stress
    - Pools that are short for fish passage and energy dissipation
    - Excessive head-loss over weirs
    - Lower initial cost may be lost in long-term stability and maintenance
    - Site hydrology and geology affect slope efficacy
- As slopes go down, we improve fishway.
- A 3% limit is proposed for Lock and Dams 2 and 3. The current design is 3.25%.
- The velocity gets lower as slopes go flatter.
- Some earlier rock ramps were random boulders with high velocity.
- Smaller body fish benefit from narrower gaps because the velocity is lower.
- The St. Louis River Rock Arch Rapids have were designed with a 3% slope and built to provide sturgeon spawning habitat.
- The Drayton Fishway Red River of the North has a 3% slope.

USACE Section 408 Program – Jeff Morris

- No dam removal would be allowed under 408 Program
- The process USACE uses takes 120 days

- Currently working with USACE for pre-application meeting
- When there were modifications to Lock and Dam 1, there were significant concerns from USACE. If you continue to decrease, then it starts to really alter system and USACE would have concern with the process.

Discussion – All

Dawn York – Asked to create focus group for Lock and Dams to discuss progress, funding opportunities workshops, and community outreach.

Peter Raabe – In the alternatives, did you do an analysis of whether any options would comply with the ESA need for recovery? Will Bladen County make the alternatives analysis publicly available? It would be great to be able to really look through that. Especially since the County seems to have a preferred option already.

Luther Aadland – Three observations of sturgeon. Assumption is they did pass fishway during lower flows. There is an issue of spawning behavior of Atlantic that is confounding. Historically, fish move to first rapids, then spawn in those rapids. At low population levels, we would expend more energy to get upstream. The tendency to spawn in the first rapid is a problem for Atlantic sturgeon. There are density-depending factors involved.

Julie DeMeester – Tagged over 100 fish. Results are still coming in. Shad had a better year. Striped bass slightly improved. The data is preliminary. Not even 80% efficiency for fish passage. We were able to get a lot of fish over Lock and Dams 2 and 3 with pulses. We are one-year post slope study and ideally need multiple years of studies. It was a dry year. The consensus is, yes, the slope at Lock and Dam 1 improved passage but we need more research to know what is working or not.

Mike Wicker – The crest lower at Lock and Dam 2 is concerning. If it does not affect use, then it might not be considered substantial.

Dawn York – Is there a brief update on the gate?

Dana Matics – Damage to minor gates at Lock and Dam 3. Work at Lock and Dams 1 and 2 involves mechanical parts being sent back and forth to shop. Work is ongoing. Lock and Dam 3 does work, and when parts get back for Lock and Dam 2 then it will work. Lock and Dam 3 is operational now, while the other dams are anticipated to be operational by the first of the year.

Jeremy McCargo – What commitment does the Corps have to operating the Locks? Can you email with a proposed schedule? Is normal process we have used the appropriate one? Sending letter and asking for schedule? What is the best way to comment on how locks are operating to make sure fish are making it upstream?

Dana Matics – Yes, saw your email. The process to send letter or email is fine. We used to do weekly maintenance lockage, but not anymore.

Dawn York – Shared correspondence from USACE. Asked for additional clarification on 216 Study. We need to explain why 216 Study is on hold and how it will impact ongoing work from Bladen County. Everything presented today has been provided to USACE. We have received no feedback to date.

Julie DeMeester – When you looked at de-lowering, did you take that option of the table because of deauthorization?

Mark Pirrello – We looked at it overall and cutting it in half or more would lead to considerations with deauthorization. When we started this, we expanded our scope because we thought it was necessary, but we are getting constrained. As much as we can support, we will within the frame of scope.

Dawn York – No documents have been formally submitted to USACE. All documents would be willing to be distributed to the public. Not a public document yet. Expect submission to Bladen County.

Julie DeMeester – TNC is trying to put together a package for NOAA habitat grant. The intent is not to address Lock and Dams directly.

Dawn York – Are we aware of any plan surveys for minor gates?

Dana Matics – No, there are no plans.

Anne Deaton – Do you have enough information now to move froward? Do you know the best design?

Mark Pirrello – Before getting into high level assessment, looking at water surface elevation change without getting into dam stability. The key is to look at it more from a global view with USACE. Having additional preliminary analysis and then setting up meeting with USACE. We have helpful suggestions.

Mike Wicker – Did you look at reduced crest elevation? Response: Yes, we did.

Frank Yelverton – What is the slope of the proposed ramps?

Jeff Crump – The current design for both is 3.25%.

Peter Raabe – Are there any confirmed examples of Atlantic Sturgeon using rock ramps?

Luther Aadland – I think the only rock ramp where Atlantic sturgeon is present is at Lock and Dam 1. The three observations of sturgeon upstream including the individual caught were all caught during five to six months of flow well below inundation.

Peter Raabe – It seem like 2-3 sturgeon may not be sustainable population though?

Luther Aadland – Agreed. I do think that we need to think in terms of meta populations for Atlantic sturgeon since any segment of the Cape Fear does not contain a sustainable population but a river with potential critical spawning habitat that can sustain the anadromous population.

Microcystis Aeruginosa Blooms in an Unlikely Riverine Ecosystem: A Waste Treatment Lagoon Source – Madi Polera, NCSU (mpolera2@ncsu.edu)

Anomalous Microcystis Blooms

- Almost always associated with proximal lacustrine source or slow-moving lentic conditions.
- High temperature, low flow, high nutrients, low N:P
- Confined to river reach below Lock and Dam 3 and above Lock and Dam 1.
- River blooms have been reported in other regions due to lack of proper stream source.

Investigation

- Sampling locations – There are 13 major access points from Lock and Dam 1 upstream to confluence of rivers and to Jordan Lake.
- Retrieved public data from agencies.
- Looked at historical patterns and flows and discharges.
- Targeted filed sampling in 2015-2016
- Remote sensing imagery 2016-2019
- Occurrence throughout River Basin

Results: Phytoplankton biomass through time

- Biomass significantly higher during bloom events
- High chl *a* during non-blooms
- No relationship with turbidity

Results: Allochthonous anthropogenic source

- No significant changes over time at wastewater treatment plants (two in Fayetteville, one in Elizabethtown)
- Negligible nutrient input from two other major industrial point source dischargers.
- Nutrient concentrations and loadings to the river provide nutrients necessary to promote microalgal growth.

Interpretation

- Does *M. aeruginosa* occur throughout the Cape Fear River basin? Yes.
- Did low flow conditions support bloom formation? Necessary but not sufficient.
- Did high temperatures favor bloom formation? Necessary but not sufficient.
- Could variation in river turbidity have promoted bloom formation? No.
- Would unusual nutrient loading patterns have driven bloom formation? No.
- Could *M. aeruginosa* blooms have been seeded from Jordan Lake? No.
- Could there have been an allochthonous anthropogenic source? Unable to rule out.

Discussion – All

Dawn York – When is publication expected?

Madi Polera – Any day now.

Nora Deamer – Cape Fear Basin Plan is about to come out any day. Wondering what we can put in the Basin Plan. Too much nitrogen and phosphorus in the system already. Are there other sources in watershed that could be contributing as well?

Madi Polera – It has been a long time since we had a bloom.

Brief Partner Updates

Anne Deaton – Save the Date for Friday, November 3 for in-person summit. See link for details: COA – Elizabeth City | Campus Locations | College of The Albemarle

Corey Dunn – We do a lot of research support for NC and southeast (USGS Research Scientist, Research Fish Biologist, North Carolina Coop Unit)

Heather Evans – Still processing samples. Will have data in several months.

Howard Schnabolk – Reviewing grants. Transformational grant open for couple more weeks. Underserved communities grant open until December. Reach out to discuss grant opportunities.

Brena Jones – Discussed update on FWS brood stock. 1000 juveniles are being released out at sites this Friday, November 3.

Julie DeMeester – TNC's two-year effort for full-basin SWAT modeling was officially published. Now working on restoration scenarios. Landscape Pollution Source Dynamics Highlight Priority Locations for Basin-Scale Interventions to Protect Water Quality Under Hydroclimatic Variability - Schaffer-Smith - 2023 - Earth's Future - Wiley Online Library We have listed positions for immediate need. Looking for someone located near restoration sites. Sustainable Rivers Program analyzing data mode. Nuese River got added to the Sustainable Rivers Program this year. We are going to start the background research part for that.

Krysden Burden (krysden.burden@brunswickcountync.gov) – Cape Fear Public Utility Authority and Brunswick County Utility are meeting on November 16. Please reach out to Krysden if you would like to be involved or participate in upcoming meeting. Source Water Protection Plan (nc.gov).

Jeremy McCargo – Submitted multistate Section 6 grant to NOAA Fisheries for more sturgeon work on the Cape Fear. Project just started this past July and is three-year project.

Peter Raabe – American Rivers started project with private partners in deep river. There are two projects currently happening and some other suspect projects.

Judith Ratcliffe – Hiring three staff to fill positions for those who left and there are two new positions.

Chris Stewart – We are continuing to tag striped bass in the river.

Fred Tarver – Carolina Canoe Club is trying to organize an initiative to protect falls.

Meeting Recording: Cape Fear River Partnership- Fall 2023 Session-20231030_090157-Meeting Recording.mp4

End of Meeting Summary