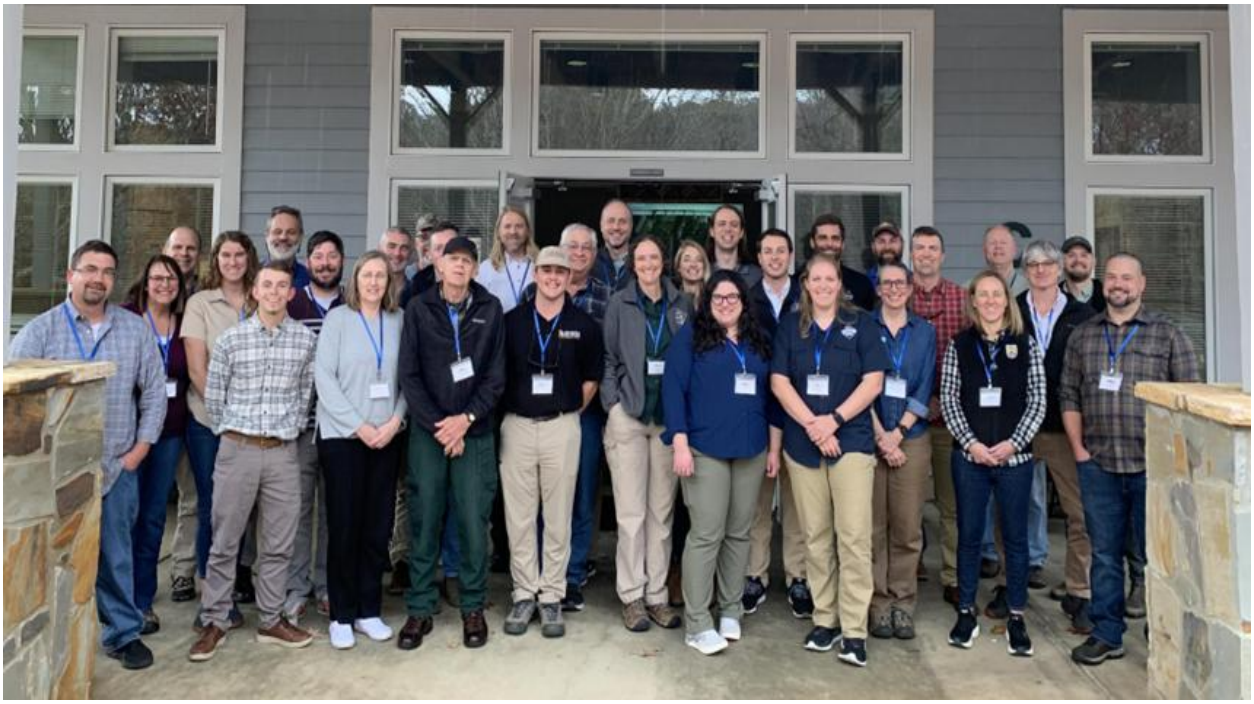
Annual Report of the 2024 Robust Redhorse Conservation Committee Meeting

30th Annual Meeting

December 17 - 19, 2024

Charlie Elliott Wildlife Center, Mansfield, GA



The RRCC is a multi-state collective of multiple stakeholders comprised of state and federal natural agencies, academia, utility companies and conservation groups that have collaboratively worked together over 30 years to conserve Robust Redhorse (*Moxostoma robustum*) with the goal of preventing the species from becoming federally-listed. At the time of the 2024 meeting, Robust Redhorse was still not federally-listed but state-listed only in Georgia and North Carolina. Also, at the time of the meeting, the public awaits hearing the published results of the USFWS' Species Status Assessment and proposed federal listing decision for Robust Redhorse which is anticipated to occur possibly some-time during Q1 or Q2 of the USFWS' 2025 fiscal year.

The 2024 annual meeting of the Robust Redhorse Conservation Committee (RRCC) was held at the Charlie Elliott Wildlife Center, Madison, GA during December 17-19, 2024 (meeting agenda in Attachment I). The meeting was well attended (attendance list in Appendix A). Consistent with meetings of the past, the agenda focused on status updates from each of the RRCC Technical Working Groups (TWG). The agenda was augmented by RRCC members invited to present additional subject-matter-related information (agenda provided in Attachment I).

Summary:

- the meeting was opened by current RRCC Chair, Tony Dodd. The group welcome and round-table introductions were followed by notes on site safety, housekeeping, meeting sign-in and eventual check-out needs. Paula Marcinek (TNC) recorded meeting notes.

- principal investigators representing Technical Working Groups (TWGs) for the three ESU (Ecologically Significant Units) for Robust Redhorse plus TWGs for RRCC's information technology team (IT TWG) and the genetics monitoring and research team (Genetics TWG) presented status reports for the most recent field year of monitoring and research. The scope of work for 2024 field year stemmed from the current phase of the 2022-2025 CSWG (Competitive State Wildlife Grant) and where appropriate was included in analysis relevant to historical trend information. TWG presentations (listed below and attached electronically to later be added to the RRCC website publications list).

  List of TWG and special presentations and presenters are shown below. Copies of presentations are planned to be provided in the list of RRCC publications on the re-engineered RRCC website (sometime in 2025). Notes associated taken during presentation discussions are provided in Appendix B.

  <u>List of 2024 TWG/ESU Presentations</u>

  - Yadkin - PeeDee TWG Update
    - Brena Jones, NCWRC. Robust Redhorse in the Pee Dee River
    - Ryan Heise, Duke Energy. Yadkin Pee Dee Hydroelectric Project

  - Santee Update
    - Steve Meyer, SCDNR. Robust Redhorse monitoring in the Santee River System
    - Ryan Heise, Duke Energy. Robust Redhorse collections in the Wateree River

  - GA Savannah Update
    - Jackson Davis, Georgia Southern University. Savannah River Update.

  - Altamaha TWG Update
    - Percy Knight, GADNR. Conservation of Robust Redhorse, Update 2024.

  - IT TWG Update
    - Devin Rambo, GADNR. Overview of RRCC web management needs and Robust Redhorse Data Management

  - Genetics TWG Update
    - Daniel Farrae, SCDNR. Presentation on134 genetics samples at SCDNR archived from Pee Dee, Santee and GA locations; Pee Dee and Santee results and GA data archival (updated genetic metrics).

TWG/ESU Presentations (Continued)

- RRCC Group – Species listing update and Pathways Discussion (Eric Bauer guided extended discussion with group members about listing implications and path forward)

Special Presentations

- Paula Marcinek, The Nature Conservancy. Overview on threats and conservation measures for Robust Redhorse.

- Patrick O'Rouke, Georgia Power Company. The Lloyd Shoals FERC license and planned tailrace habitat enhancement plan.

- Eric Bauer, U S Fish and Wildlife Service. An ESA Tool - Conservation Benefit Agreement

- RRCC Members Group Discussion. C-SWG remaining scope and research needs (2025).

- Business Update
  - The RRCC treasury had $4,966.23 as of 12/16/24 (~$3,300 outlay pending for meeting expenses). As of 3/19/2025, the Treasury balance was $2,794.28.
  - MOU Membership: Roll call (in-person) acknowledged current signatory and EXCOM representatives. Some change in representation (Points of Contact [POC]) has occurred since the most recent signing in 2020. Mr. Christie of the South Carolina Aquarium' was not able to attend this meeting in person and is assumed to be South Carolina Aquarium's Point of Contact (POC) as signatory representative in light of recent communication from T. Dodd. The current version of RRCC's establishment Memorandum of Understanding among members is a 10-year agreement not due to be re-signed until 2030.

    RRCC MOU Signatory Member Representatives

    - GADNR – Bryant Bowen (former POC: P. Marcinek)
    - NCWRC – Brena Jones
    - SCDNR – Ross Self
    - GPC – Patrick O'Rouke (former POC: T. Dodd)
    - Dominion Energy – Caleb Gaston (former POC: M. Quattlebaum)
    - Duke Energy – Ryan Heise
    - Georgia Wildlife Federation – Mike Worley
    - USGS – Corey Dunn (former POC: C. Jennings)
    - USDA – Keith Whalen (former POC: J. Rickard)
    - South Carolina Aquarium – Barrett Christie (former POC: D. Wilkins)
    - USFWS – Eric Bauer (former POC: C. Straight)

RRCC Executive Committee Members (EXCOM)

Chair – Tony Dodd (GPC)	USFWS (1) – Eric Bauer
Vice Chair – Todd Ewing (SARP)	USGS (1) – Corey Dunn
GADNR (1) – Bryant Bowen	Utility Company Representatives (2) Caleb Gaston; Ryan Heise
SCDNR (1) – Ross Self	Academician Representative (1) – Bud Freeman
NCWRC (1) – Brena Jones	

- Members as COOPERATORS include:

  The Southeastern Aquatic Resources Partnership (SARP) represented by Todd Ewing and newly joined this year is The Nature Conservancy (TNC) represented by Paula Marcinek and Talia Levine

- Recognitions
  - Todd Ewing was recognized for his service as Past RRCC Chair with award plaque.
  - Recognition and appreciation was expressed for RRCC's 2024 meeting sponsors which included:

    o GAWRD
    o Dominion Energy
    o Duke Energy
    o Georgia Power
    o TNC

  - Meeting Support – WRD, Bryant Bowen including preparation of the Low Country Boil and Jim Page and Chad Sexton, WRD Fisheries, for keeping the shrimp frozen in good condition through the recent hurricane Helene power outage!

- New Business

  Items included final mention of anticipating arrival of the pending Robust Redhorse federal listing decision this winter or spring (2025). The Chair urged members to be thinking ahead about representing their unique stakeholder voices in the 60-day public comment period that will follow an official listing announcement. The Chair indicated he may call for an EXCOM mtg early in 2025 to hear more or more recent viewpoints/positions from members as they contemplate the potential listing. Also, it would be good to hear member thoughts on the idea of a CBA agreement – a hypothetical umbrella type agreement for RRCC to consider as described in Eric's CBA presentation on possible pathways forward following a listing decision. The Chair and IT TWG will move forward in 2025 with the RRCC website rebuild in a more modern, secure platform under UGA's IT management group Chuck Bergeron. In the next EXCOM meeting, to be held possibly in early 2025, the Chair will poll members to select a venue for the next annual RRCC meeting (NC folks had already left during the later part of the 2024 mtg when this discussion came up so no venue choice was tendered).

APPENDIX A

Attendee Sign-In Sheet

2024 Robust Redhorse Conservation Committee Meeting

December 18 - 19, 2024
Charlie Elliott Wildlife Center, Mansfield, GA

Attendance Sign-In Sheet

Name	Affiliation	Email
Robbie Payne	GWF	Rpayne@tallcrow.com
Caleb Gaston	Dominion	Caleb.Gaston@dominionenergy.com
Will Bowes	Dominion	william.w.bowes@dominionenergy.com
Ian Paige	USFWS	jameson_paige@fws.gov
Steve Meyer	SCDNR	MeyerS@dnr.sc.gov
Ryan Heise	Duke Energy	ryan.heise@duke-energy.com
Devin Rambo	GA DNR	devin.rambo@dnr.ga.gov
CATHY MARION	USFWS	cathy_marion@fws.gov
Corey Dunn	U.S.G.S/NCSU	Corey_Dunn@NCSU.edu
Daniel Farrae	SCDNR	farrae d@dnr.sc.gov
Tanya Darden	SCDNR	dardent@dnr.sc.gov
Steve Vives	Georgia Southern U	svives@georgiasouthern.edu
Todd Ewing	SARP	todd@southeastaquatics.net
Patrick O'Rourke	GA Power	pmorourke@southernco.com
J. Kuthuwhain	US Forest Serv.	sam.s.whitten@usda.gov
Talia Levine	TNC	talia.levine@tnc.org
Emilia Omerbery	NCWRC	emilia.Omerberg@ncwildlife.org
Brena Jones	NCWRC	brena.jones@ncwildlife.org
Rychael ~~Hoke~~ Hoch	NCWRC	Rachael.hoch@ncwildlife.org
Percival Knight	GADNR	percival.knight@dnr.ga.gov
Jackson Davis	Georgia Southern	jd33154@georgiasouthern.edu
~~Rachael Hoch~~		
Jimmy Evans	GADNR (retired)	jwest.rhe@gmail.com
Rich Harrington	SC DNR	HarringtonR@dnr.sc.gov
Alexus Carter	SCDNR	carterA@dnr.sc.gov
LEO ROSE	SCDNR	ROSEL@DNR.SC.GOV
Ross Self (CAVE)	SCDNR	SelfR@DNR.SC.GOV
Bryant Bowen	GA DNR	bryant.bowen@dnr.ga.gov
Eric Bauer	USFWS	eric_bauer@fws.gov

APPENDIX B

Discussion Notes

Notes from 2024 Special Presentations/Discussions

18 Dec 2024

Eric Bauer, Status Update on Species Listing Decision

- The SSA was finished on Sept 23, 2024 and still in FWS vetting process. No updates, but it's moving through decision process
- Eric anticipates it may be announced in Q1 or Q2 of next year (2025) as it's with decision makers now; still must go to federal register, etc…as soon as he hears that it will go to federal register, the SSA will be published, the decision will be published, and the process opened for public comment at that time
- The SSA is living document that can be updated frequently
- Concerns voiced about the species becoming listed, needs for permit protections, etc., there are mechanisms through Conservation Benefit Agreements (CBAs) that help facilitate
- Q: if listing occurs, would it be by specific ESU?
  A: Eric said FWS will look at full species range, but if listed it's possible to list by Distinct Population Segments (DPSs)
- Q: what is the process of updating SSA?
  A: Eric amends and sends to website
- Q: do updates to SSA trigger any other formal process?
  A: no, if species is listed, then it's subject to the 5-year review. Every 5 years the listing is reviewed against criteria and looked at again. If it were to be listed, there is a process for developing recovery plan.

Listing Pathways Discussion (still Eric leading)

- Whatever the decision becomes will go to federal register to list as threatened or endangered or not to list
  - If listed as threatened >> 4D rule (talked about specific activities that are exempt from take prohibitions)
- Decision will come out and then public comment period will begin after, whether listed or not
- After initial proposal, the listing Decision becomes due to be finalized a year later
- To have most impact during comment period, Tony said should we have new data (2025 sampling year) by then to add to or substantiate comments? Eric said new data will be welcomed; before the final listing, experts may change their mind on their previous thinking based on review of new data (completion of the 2025 cswg data collections).
- At present, the Final SSA has not been reviewed. Final draft is available for review when goes to the Federal Register
- The process is continually changing, in this case, the SSA comes out at the same time as the proposed listing decision
- The announcement will go out to state partners and experts yet to be identified and they will go through commenting system, but anyone can comment on the SSA
- SSA will not address possibility of critical habitat, but a proposed listing could include critical habitat

- Proposing robust redhorse for listing was not litigated but was petitioned and it fell into weird category because it was found to be warranted a while back but precluded by FWS at the time because there were higher priorities; back then there was a tiered system and the species status did not belong in the highest tier; when that changed robust redhorse fell through the cracks, and the species status review is now on the national work plan and FWS is trying to adhere to the process deadline as closely as possible
- Tony question: In C-SWIG document authored by group – and understood to be inclusive of FWS grant review - stated that results of the CSWG will be used to inform SSA; that implies that the full 3 years of work will inform the decision. Tony asked if there's consideration from FWS about that to push the potential listing schedule out further to accommodate the timing?
- CBA can accomplish recovery actions, it's process goes through the Federal Register

19 Dec 2024

<u>Presentation: Conservation Benefit Agreements (CBA) (Eric Bauer, FWS)</u>

- Before CBAs there were Safe Harbor Agreements (threatened and endangered) and Candidate Conservation Agreements [with Assurances] but CBA went into effect May of this year)
- CBA covers listed, candidate, and other species
- Net conservation benefits
    - Should address threats
- Anyone can except the feds
- Eric thinks it may be possible to have a blanket CBA for the range of the Robust Redhorse whether listed or not
- Recovery Plan will be written (if species listed)
- Recovery criteria should address species needs and 3Rs (resiliency, redundancy, representation)

<u>Group Discussion (2022-2025 C-SWG remaining scope and research needs)</u>

<u>Oconee Population research needs</u>

- Electrofishing run in lower Oconee last year (nothing found) but not aggressively sampled with electrofishing since 2014; Tony said there is a paucity (years) of robust redhorse data for the Oconee and would like the federal listing decision to be made based on data rather than lack of data
- Jimmy Evans - source of all brood fish in the past was from the Oconee, so it's important we know status of parental population; he doesn't think it's extirpated but questions need to be answered so he thinks need big effort next year to sample Sinclair Dam downstream to try to answer
- Paula says habitat assessments for spawning gravels done in 2017 and 2018 on Oconee and there was no appropriate habitat

- Tony says fluvial geomorphological assessment of riverbed (Oconee) - that he and Paula have been talking about Oconee and Ocmulgee for this assessment for years - will be doing some of this NOAA Award & FERC for Ocmulgee but leaves Oconee, limited capacity because only one crew sampling for state
- Jimmy agrees that DNR efforts should be Ocmulgee, Broad, Ogeechee, but Oconee would need to be contracted out, would be major effort, and no funding currently
- Habitat is in question, but Tony says it's a big river, but 55 miles of river where historically seen RRH distributed, if gravel is in thalwegs or other areas we can't access; robust redhorse will taking advantage (using) of that
- Paula says mobility is something to consider too, Ocmulgee has consistent habitat (can't reach it all and what can reach is inconsistent) but Oconee has historically different land use, hammered with sediment and historic dredging from army corps worse in Oconee than Ocmulgee, focusing effort where most needed, she says where is funding going to come for that contract and is that the priority?
- Jimmy said the last Oconee survey was contracted out and collected a couple of robust redhorse; is there enough habitat remaining to support the population at some lower level?
- Percy samples in lower Commissioner Creek, went up to trestle bridge, they thought they saw some spawning gravel that could be utilized, Tony says may be an indication that there's more to look at, Tony started with Oconee because among the 3 ESUs seems to be lacking most info
- Paula says GDNR Fisheries is ramping up sampling efforts in Oconee in prep for Sinclair relicensing
- Bryant says Oconee fish may not be running up as far as they used to be
- Tony asked Tanya about feasibility of eDNA in Oconee, her questions are accessibility and funding, money is not in CSWG to do that, tool that could be used but not going to give population estimate, recognize limitation of that, can have benefits and then go in and do targeted work
- Jamie asked if get positive eDNA hit, how far up is that fish? SCDNR says that may be more of hydrology question, know limits of degradation, must consider flow around time of sampling, and prior, depth, etc., but it would be unknown
    - In Ogeechee they saw declining signal going downstream
- Tanya said CSWGs don't have capacity to do this type of work so we would need alternate funding source
- Jamie asked how important it is to know if fish are extant, do we need to answer that or do we need to know how many fish there are
- Sensitivity analysis, look at condition tables and SSA, systematically go into that and move numbers around and that can guide what's offers the most bang for buck, so if assumption about status in Ogeechee, can simulate that by changing values in the conditions table to see impact on overall indexes
- Do we have access to that table? Eric may have it from last year. Corey Dunn says there's way of doing the experiment that could save lots of money)
    - Paula suggests starting to have this discussion at the TWG meetings, Eric says he can show up at those meetings

    - Eric says big thing in those tables is recruitment and that was based on expert input (experts most familiar with those systems and what they thought), for population estimates, FWS had to use most recent estimates (like Pee Dee where had recent recaps)
- Jimmy says any fish you collect in Oconee regardless of size would have to be a recruit since hasn't been stocked in 20 years, Eric says the Broad River is in that category too; small fish caught indicates wild recruitment, but still a question of how much is going on especially with gravel bars covered in sediment

<u>Pee Dee next research needs/gap inside or outside of CSWG scope</u>

- This next year would be 10th stocked year class. Brena says she thinks it's time to take step back and monitor to see how they're doing and to give fish some peace and quiet
- Two of big research questions talked about last year: have a lot of species and impacts happening, but don't have a lot of quantification of dynamics and level of impact is in that particular system, Casey and Tiffany Penland looked at toxicology profiles in that river system at different levels of food web; partners tried to include more contaminant work in CSWG but it was really expensive; the task needs a dedicated graduate program; the population bottleneck is from 0-6 mo. window for fish; digging into tox questions more to evaluate impacts; huge funding need would take a lot of dedicated research
    - Eric asked about EPA funding, Paula said she's approached them
    - Paula said frozen eggs (asked Percy to stick some in a jar when he encounters eggs in the field), so don't have to sacrifice fish
    - Someone asked about looking in lower portion of river - Brena said will be looking into that in the spring (2025), and SCDNR will be doing striper searches so will be there looking out for robust redhorse as well; Paula noted the radio transmitter receivers out there and Brena said she could do some more acoustic tagging; what is it that robust redhorse like down river (in SC canals?) and are there other places like that they can check out?
    - Eric said he found money for larval plankton tows; and part of money was to look at lower back river habitat in Savannah
    - Brena said radio telemetry was done on adults (2 subpopulations, one group in NC happy there and one travel all the way down to coast), juvenile acoustic study, at least one used that habitat
    - Is that a potential place to look for eDNA where could look for shoals to sample below? Brena says yes
    - Jimmy asked if they've have sampled oxbows (eDNA) in lower Altamaha and Paula said yes but big, expansive system so needle in haystack
    - Emelia asked if there is protocol for tox/egg collection?
    - Corey- spawning, juvenile fish are in the lower river systems, but there are hundreds of kms of river where we don't know what's happening; several techniques used on sturgeon; need to understand how long egg and plankton stages are; use flow models, and that will give an idea of where free living juveniles would settle out; this step may help narrow search distance; Tony said a lot has been done with mostly negative info (not there), but still lots of work to be done

    - Brena said juveniles are being found with adults in same places, so maybe before they weren't there to be caught and now they are?
    - Pairing life history studies with flow model? Maybe use Cecil's data for this, but still effort of going out there to get data to truth models
    - Tanya said the eDNA search can be hard because don't know where in water column they're spending time

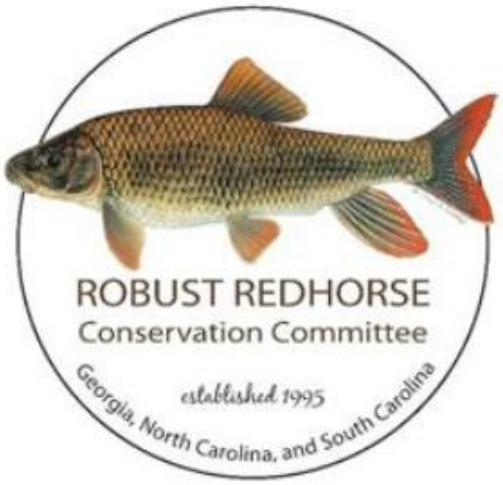
Santee System

- Some bias in looking at spawning habitat during spawning season to catch spawning adults, but Steve said based on Brena's observations about finding juveniles with adults maybe they should be seeing them there? But also based on where smaller fish have been observed maybe they should be looking in different places; SCDNR doesn't put in too much effort though; far from home and sampling for other sport fish.
- CSWG work slated for this year in Santee: they plan to update life history tables, update age key, and will be working with Brena to make an age-length key based on data

Paula said use CSWIG otoliths; Marty Hammel's student will work up otoliths for free (doing *Moxostoma* as research project) - so just have to get otoliths from Bud's office to student; if there's any sourced from robust redhorse mortalities or if any specimens pop up in a museum, send them over); and they have in CSWG for radio carbon dating subset.

ATTACHMENT I

2024 RRCC Meeting Agenda



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WELCOME!

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AGENDA

Tuesday, December 17th

6:00 – 9:30 PM	Welcome Reception **(Shephard Room)**

Wednesday, December 18th

7:30 – 8:30 AM	**Breakfast (Dining Hall)**
8:30 AM	**(Shephard Room)** Welcome and Introductions (Tony Dodd, GPC) PeeDee Update (Brena Jones, NCWRC; Ryan Heise, Duke Energy) Santee Update (Steve Meyer, SCDNR; Ryan Heise, Duke Energy)
10:30 AM	**Break** GA Savannah Update (Jackson Davis, GSU) Altamaha Update (Bryant Bowen, GADNR) IT TWG Update (Devin Rambo, GADNR)
12:00 - 1:00 PM	**Lunch (Dining Hall)**

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AGENDA (CONT.)

Wednesday, December 18th

1:00 – 4:30 PM	Group Photo Genetics TWG Update (Daniel Farrae, SCDNR) Proposed listing update (Eric Bauer, USFWS) Listing Pathways Discussion Break Robust Redhorse – Impacts and Conservation (Paula Marcinek, TNC) Lloyd Shoals FERC Tailrace Habitat Enhancement Plan (Patrick O'Rouke, GPC)
5:30 PM	Pre-dinner social
6:30-9:00 PM	Low-Country Boil Dinner (**Shephard Room**)

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Thursday, December 19th

8:00 – 9:00 AM	**Breakfast (Dining Hall)**
9:00 AM	ESA Tool - Conservation Benefit Agreement (CBA) (Eric Bauer, FWS)
9:40 AM	**Check-out and room key collection**
10:10 AM	Any carry-over from CBA presentation (Group) C-SWG remaining scope and research needs (Group Discussion)
	Business Meeting (Tony Dodd, GPC) - Finance - Membership - Annual Report - Recognitions - New Business - Actions
	Adjourn
As occurs	**Lunch (Shephard Room) - Eat in or To-Go**

2024 RRCC Business Meeting

- Finance
  - $4,966.23 as of 12/16/24 (~$3,300 outlay pending for meeting and website)

- Membership:
  - MOU SIGNATORIES (up to 2 Reps each; MOU 10-year agreement signed in 2020)
    - GADNR – Bryant Bowen
    - NCWRC – Brena Jones
    - SCDNR – Ross Self
    - GPC – Patrick O'Rouke
    - Duke Energy – Ryan Heise
    - Dominion Energy – Caleb Gaston
    - Georgia Wildlife Federation – Mike Worley
    - USGS – Corey Dunn
    - USDA – Keith Whalen
    - South Carolina Aquarium – Barrett Christie
    - USFWS – Eric Bauer

2024 RRCC Business Meeting

- Annual Report
- Recognition
  - **2024 Sponsors** (Many Thanks!!)
    - GAWRD
    - Dominion Energy
    - Duke Energy
    - Georgia Power
    - TNC
  - Meeting Support
  - Accolade
- New Business
- Actions
- Adjourn

ATTACHMENT II

2024 RRCC Meeting Presentations and Abstracts

Conservation Benefit Agreements and Recovery Plans. USFWS Region 4 Ecological Services, Athens, GA.

No substantive updates have been provided since the last update. We are clearly experiencing delays relative to the September 2024 deadline. The package is still making its way through our decision process. I will ensure that the RRCC is updated as soon as we have an expected date of publishing of the decision and draft SSA for public comment. Public comment period will be open for 60 days but you can communicate with me after that date. At the time of the decision publishing the SSA will also go out for peer review, these peer reviewers have not to my knowledge been identified yet but will likely include members from the RRCC. Comments on the decision and the SSA will all be addressed.

USFWS has updated their regulations on Safe Harbor Agreements and Candidate Conservation Agreements with Assurances; these agreements have been combined into a single document called a Conservation Benefit Agreement (CBA). CBAs can now cover federally listed, candidate, or other state listed species or species of conservation concern. These CBAs can be signed/held by non-Federal or private partners and may include Section 10 Enhancement of Recovery Permits for conducting conservation actions with listed species. In exchange for conservation actions that provide a net conservation benefit to species covered by an agreement on non-federal lands, participating property owners receive formal assurances from the FWS that if they fulfill the conditions of the CBA, the FWS will not require any additional or different management activities by the participants without their consent. Part of a CBA is measuring the baseline condition of the habitat or population, if the property owner chooses to end, or let the CBA expire, the Service's Biological Opinion would exempt take anticipated from returning to the baseline condition. USFWS Recovery Plans (RP) have specific regulatory requirements (Recovery Strategy, Recovery Criteria, Recovery Action, Time and Costs Estimates) with a draft RP due 1.5 yrs and final RP due 2.5 yrs from listing, both of which are subject to public comment periods. RPs can be developed by Recovery Teams that can include outside experts appointed by the Regional Director, the Recovery Team is exempt from the Federal Advisory Committee Act (FACA). A Recovery Plan is a guidance document required by the Endangered Species Act that describes the envisioned recovered state for a listed species (when it should no longer meet the Act's definitions of a threatened or endangered species). The Recovery Strategy is the strategic vision of what the recovered state of the species looks like. Recovery Criteria are objective, measurable descriptions of the species' conditions (in terms of the 3Rs) and threat abatement that the species no longer fits definition of threatened or endangered. Recovery Actions are site-specific management actions that together will result in the Recovery Strategy condition ("recovered") for the species. Recovery actions are broad enough that they don't need to be updated, the sub-actions or activities that define the specifics are included in the Recovery Implementation Strategy which is not subject to public comment periods and are easily updateable in real-time. Time and Cost Estimates are required by the act but are estimates and are most easily summed up once the Recovery Actions and Recovery Implementation Strategy are developed.

Bowen, B.R., D. Rambo, P. Knight and D. Weiler. 2024. Conservation of Robust Redhorse Update 2024. GDNR. Social Circle, GA.

In 2024, the Georgia Department of Natural Resources worked with RRCC partners to meet the Robust Redhorse CSWG project objectives. As outlined in Project 1 (Task 1.1), GADNR conducted population monitoring surveys of the Altamaha ESU. A total of 49.5 hours of electrofishing effort were recorded in 2024. 29 hours were allocated to sampling the Ocmulgee River, 14 hours to the Broad River, and 6.5 hours to the Oconee River. Four Robust Redhorse were collected from the Ocmulgee River just below the Juliette spillway between April 17th and May 1st, 2024. Six individuals were collected from the Broad River between April 24th and May 7th, 2024; two of the six were captured at the highway 29 bridge on the Hudson River, a tributary to the Broad River. The remaining four were collected on the mainstem Broad River, below the Hudson River confluence and above the highway 281 bridge. At this time, water temperatures in these two systems were between 19 and 24°C. The first Oconee sampling trip took place on May 2nd, 2024. Two more trips were made to the Oconee in mid-June. No Robust Redhorse were collected during sampling efforts on the Oconee River. In accordance with the genetic monitoring protocol (Task 1.3), 25 fin clips were collected from new Robust Redhorse captures from both the Altamaha and Savannah ESUs. GADNR also collected 45 fin clips from *Carpiodes* spp.. These, along with 18 Robust Redhorse fin clips from 2023, were delivered to SCDNR for genetic analysis. As part of the life history study described in Project 2, GADNR is directed to work with RRCC partners to conduct acoustic tracking of the Savannah River population. In the spring of 2024, GADNR worked with Georgia Southern University to deploy the remaining 15 V16 acoustic tags. The detection data from these tags, available through October 15, 2024, were provided by SCDNR. Using this data, GADNR developed a graphic illustrating migration patterns, occupancy, and site fidelity of the Savannah River population. Moving forward, this graphic will be made available to the RRCC to provide a better understanding of the behavior of this population. In 2025, GADNR will continue sampling efforts of the Altamaha ESU, prioritizing thorough sampling of previous capture locations. GADNR will continue operating in accordance with the RRCC and under the directive of the Robust Redhorse CSWG.

Davis, J., J. Roberts and S. Vives. 2024. Savannah River Update. Georgia Southern University, Statesboro, GA.

Over the past 10 years, GSU and other biologists have focused on better understanding the demographics of the spawning RRH population in the Savannah River. Visual stream-side surveys of spawning habitats have generally indicated 1) peak spawner abundance between mid April and mid May, 2) greater numbers of fish and redds at the lower than the upper gravel bar, and 3) annual maximum observed counts at the lower bar ranging from 6 to 204 individuals per year, when estimable. Repeated attempts at visual surveys using UAV videography have proven difficult because of a combination of high flows, high turbidity, and water glare, though UAV videography collected in 2024 still shows promise for the technique, when conditions are right. In a new initiative for 2024, we buried two temperature/dissolved oxygen loggers in the lower gravel bar and attached a third to a pylon in the thalweg upstream. These loggers were operated from mid May to mid August

to determine whether conditions in the spawning gravel remain acceptable through the summer. Water-column DO remained above 7PPM throughout the summer, whereas DO at the two buried loggers frequently fell below 4PPM, particularly after mid-June. We completed a two-year mark-recapture study to estimate the entire adult population size (not just the spawning population) between the estuary and New Savannah Bluff Lock and Dam. Along this ~270 km segment, we established 11, 3.2-km-long sites where we used multi-visit boat electrofishing sampling to estimate detection probably (p) and true population size (N) from the raw catch data. We also sampled another 35 km of the river with one pass, so altogether, we boat electrofished ~26% of the river between NSBLD and I-95. We observed 181 RRH (total CPUE = 0.68 fish/km), of which 124 were collected and PIT-tagged (tagged CPUE = 0.47 fish/km). Only 2 fish tagged by us (along with 3 fish tagged by SCDNR in previous years) were recaptured, suggesting that true N is relatively large. However, low recapture prevented us from using a mark-recapture model to estimate p and N, so instead we used N-mixture models. These N-mixture results, combined with previous findings in the literature, indicated a p of 0.0572 (confidence limits ~ 0.002 to 0.141). We used this p and various assumptions about our uncertainty around p to estimate N for each reach, then extrapolated to the entire segment. Depending on assumptions, river-wide N ranged from ~7,000 fish to ~16,000 fish, with confidence limits ranging from ~4000 to 45,000 fish. Thus, uncertainty was high, but regardless the approach, N was estimated to be relatively high, in the thousands of adults. Finally, in 2024 we again assisted the GADNR with the implantation of Vemco 10-year acoustic tags in 15 RRH. Combined with 11 fish tagged in 2018 and 9 fish tagged in 2023, this makes 35 acoustically-tagged adults. Our analysis is still in progress, and is complicated by attrition of SC's acoustic receivers over the years following floods, but preliminary results indicate that 1) nearly all fish were detected throughout the study period, suggesting low tag loss or mortality, 2) fish commonly migrated both to the lower and upper gravel bars, the latter being surprising, 3) at least some fish appeared to return to the same non-spawning habitats (between rkm's 150 and 250) year after year, and 4) flood flows corresponding to Hurricane Helene coincided with an apparent downstream "mass exodus" of many tagged RRH, who were last detected near rkm 65. Further analysis of these data and continued tracking of these fish in coming years should shed more light on patterns and timing of habitat use, whether it is changing, and how synchronous it is across individuals.

Farrae, D.J. 2024. Genetics TWG update for the Robust Redhorse Conservation Committee. SCDNR Marine Resources Institute. Charleston, SC

The Genetics TWG will provide an update on all tissue collections that have passed through or are being stored at SCDNR Population Genetics lab and the efforts to track down other samples. We will provide an update on the eDNA collections from the Tillery Reach, Pee Dee River, NC and the Little River, Oconee River tributary, GA that were collected and processed during 2024. The Genetics TWG will provide a brief update on genetic analysis of Robust Redhorse collected in GA, SC, and NC, though a more thorough discussion of these results will be provided by the respective TWGs.

Heise, R.J. 2024. Robust Redhorse collections in the Wateree River. Duke Energy Corporation. Huntersville, NC

This sampling has occurred annually in the immediate tailrace area since Robust Redhorse stocking was initiated 2005. To determine if Robust Redhorse are present in the nearby shoal habitats when not present in the tailrace area, additional electrofishing located farther downstream of the Wateree Dam was initiated in spring 2023. No Robust Redhorse were collected in the tailrace area during 2024 sampling. The total number of individuals captured from the tailrace since the first individuals were captured in 2006 remains at 85 fish. In the shoal habitats, four sampling events occurred from March 27 to April 17, 2024 and a second electrofishing boat (SCDNR) was present on two of these occasions. The total electrofishing effort (Duke Energy and SCDNR) was 8.3 hrs. A total of five Robust Redhorse were captured, and two individuals had been previously captured (a PIT-tag was detected). All individuals were large adult females with a mean weight of 6,026 g and a mean length of 680 mm TL. One recaptured fish was first tagged in 2023, but a record of the other recapture could not be located. Since shoal habitat sampling began in 2023, we have collected 16 Robust Redhorse located in an area 3 rkm to 4 rkm downstream from Wateree Dam. That area is likely used for spawning based on observations and captures in 2023 and the continued occupancy of this area in 2024.

Heise, R.J. 2024. Yadkin Pee-Dee Hydroelectric Project No. 2206. Duke Energy Corporation, Huntersville, NC.

Fisheries components of this project include spring surveys targeting American shad, opportunistic fish collections and spring season fish collections between Highway 74 and Blewett Falls Dam on the Pee Dee River. Weekly electrofishing was conducted for American shad during March 1st through May 31st. Water quality measurements accompany the American surveys. Spring collections for robust redhorse have occurred at 9 locations since 2016. The number of captured robust redhorse ranged from 0 to 5 among the 9 sample locations. Robust redhorse captures have increased from as few as one to two from 2016 from 2018 to 24 in each of the 2023 and 2024 surveys. The 2024 spring collection yielded 11 females (474 to 742 mm TL), 6 males (530 to 691 mm TL), 7 with undetermined gender and 1 recapture. Four Carolina redhorse were captured among 4 for the 9 locations and were comprised of 1 female (541 mm TL) and 3 with undetermined gender (467 to 531 mm TL). The smallest specimen of robust redhorse collected to date, on 1 May 2024, was approximately 134 mm TL. The crew visually noticed an increase in smaller sucker species during late spring while sampling under low flow conditions. Two wild robust redhorse were collected in 2024 and both were estimated to be four years old.

Jones, B. 2024. Yadkin Pee Dee TWG update - Robust Redhorse in the Pee Dee River. NCWRC. Creedmoor, NC.

Robust Redhorse Monitoring - We completed another sampling effort on the Pee Dee River (Richmond and Anson counties) thanks to all our cooperators in the Yadkin-Pee Dee Technical Working Group. Three spawning shoals were sampled over three total days: Big Island (upstream of Hwy 74), Hitchcock Creek, and Jones Creek shoals. The goals of our spring electrofishing

surveys are to monitor the population abundance, recruitment of both wild and stocked fish, and to collect brood fish for the hatchery program.

In 2024, total electrofishing effort (pedal time) in the Blewett reach was 24.6 hours. We had 62 Robust Redhorse (*Moxostoma robustum*) captures during targeted sampling this spring, representing 59 unique individuals, with a catch rate of 2.5 fish per hour (Figure 1). Twenty-one were previously untagged and 30 were among year recaptures, yielding a recapture rate of 51% (Figure 2). Four wild fish were collected, three of which were untagged, young fish approximately three to four years old based on size. The fourth was a ten-year-old first captured in 2019. Total length of all captures ranged from 133 to 742 mm TL, with continued successful recruitment documented from multiple year-classes of captively reared fish. Twenty-four additional captures of twenty-two individuals were made outside the targeting sampling window by Duke Energy biologists near Blewett Falls dam, including eleven previously untagged fish, one of which was another wild fish, ~4 years old. This brought the total number of Robust Redhorse captured in NC in 2022 to 81 fish.

In addition, fifteen individuals were captured in a set of manmade canals and lakes near the confluence of the Waccamaw River. SCDNR staff were exploring new potential habitats in search of Striped Bass and discovered an aggregation of Robust Redhorse instead. These were the first captures of adults in these kinds of blackwater habitats. Seven animals were caught in early March of 2024, ranging from two to five years of age. Genetic analysis showed that these were all stocked individuals. One was captured in May of 2024 and another seven were captured on a return visit in late September of 2024, ranging from two to three years old. Genetic analysis of this batch is ongoing.

One additional individual was captured in a commercial gill net in SC and reported to SCDNR. It was scanned for a PIT tag and no tag was detected. It was released alive but had severe body and skin damage from being trapped in the net for an extended period.

During spring sampling, we again saw relatively large aggregations of individuals spawning on the gravel bars at Big Island, the most upstream spawning shoal near Blewett Falls Dam. This indicates that stocked individuals continue to successfully join the spawning population as they mature.

Eggs from four females and eight males were crossed for captive propagation this year. These animals were all captively propagated adults, with the exception of one wild-spawned male. The resulting fry were grown out in ponds at NCWRC's McKinney Lake Fish Hatchery and SCDNR's Dennis Wildlife Center for population augmentation stocking.

Genetic analysis of fin clip material revealed 93% of the fish collected during targeted sampling in 2024 were stocked individuals. These were products of the eight different year-classes and represented individuals stocked at ages six months, eighteen months, and five+ years. This year was the first capture of animals from the 2021 (n=1), 2022 (n=4), and 2023 (n=1) year-classes, which are one to three years old but not yet sexually mature. All four of the 2022 fish were down in the SC blackwater canals on the Coastal Plain in March. The 2023 fish was collected at the beginning of May up near Blewett Falls dam in the Piedmont.

In partnership with Duke Energy, water quality monitoring loggers were placed in the three spawning shoals over the spring and early summer (April 9 to June 13) of 2024 to measure changes in temperature and dissolved oxygen on gravel bars. All three were located in side channels around islands. The loggers were weighted so they lay on or in the gravel beds to try to capture values that Robust Redhorse eggs would be exposed to. In Big Island and Hitchcock Creek shoals, dissolved oxygen levels stayed above the North Carolina instantaneous state standard of 4.0 mg/L for the majority of the time window measured. However, at Jones Creek shoal, dissolved oxygen was well below that value, often at zero, for most of the month of May and into June before it finally recovered. This procedure will be replicated in 2025 to provide additional data and to examine whether there are consistent patterns between years.

Robust Redhorse Augmentation - In November of 2023, 796 Phase II (18 months old) Robust Redhorse raised at the NC McKinney Lake hatchery were fitted with PIT tags and stocked into the Pee Dee River at Hwy 74, just upstream of the Hitchcock Creek shoal, along with 8,765 Phase I (6 months old) fish and one Phase III fish from the 2015 year-class. Another 538 Phase I fish were held back at McKinney Lake for grow-out to Phase II, to be stocked in the fall/winter of 2024.

Marcinek, P. and T. Levine. 2024. Freshwater Impacts and Conservation in Georgia with Implications for Robust Redhorse. The Nature Conservancy in Georgia.

The Robust Redhorse (*Moxostoma robustum*) faces a myriad of anthropogenic threats such as sedimentation, impassable aquatic barriers, habitat destruction, and pollution that impair critical habitat and life history processes. Successful protection and management of large river, highly migratory species like Robust Redhorse requires comprehensive conservation strategies that address these, and other, threats through a whole systems approach including sediment abatement, barrier removal, land protection, and policy change. For the Altamaha Evolutionarily Significant Unit (ESU) of Robust Redhorse, the Ocmulgee River, Georgia, holds a significant amount of spawning habitat that is unavailable to the Altamaha population due to the Juliette Dam. Non-operational for power production since 2014, Juliette Dam prevents the potamodromous Robust Redhorse from accessing historic spawning habitat (approximately 7 miles of mainstream shoal) vital to sustaining the Altamaha ESU. Currently The Nature Conservancy (TNC), the University of Georgia, resource agencies, and other partners are working under funding from the NOAA Restoration Center to conduct phase one feasibility studies and community engagement concurrently to involve both upstream and downstream stakeholders in meaningful and informed discussions about the future of the dam. Funding will allow partners to address critical priorities for conservation of Robust Redhorse in the Ocmulgee River while also benefitting the river community by providing opportunity for development of recreational spaces, improved public safety, and increased climate readiness. This project and others supported by TNC advance several of the research and recovery actions set forth in 2023 by the Robust Redhorse Conservation Committee.

Meyers, S. 2024. Robust Redhorse monitoring in the Santee River Basin. Region 4 SCDNR. Charleston, SC.

Robust Redhorse sampling efforts on the Broad River occurred on April 25th and 26th, 2024. In total 13 adult Robust Redhorse were captured, 11 females and two males. Sizes ranged from 630 – 742

mm in total length. Seven females and two males were captured in the shoals below Parr Dam during 7,189 seconds of pedal time. Of these nine fish, two were recaptures from previous years. One recapture was caught in the same location on May 16th, 2015, and the other record is unknown at this time. Genetic analysis determined hatchery year classes of 2004, 2008, and 2009 for three fish, and the placement of a coded wire tag determined hatchery year class of either 2004 or 2009 for one fish. Five fish were classified as unmatched, meaning they could not be matched using genetic analysis to hatchery brood and were too large (>550mm) to be sure they were wild spawn. Four female Robust Redhorse were captured between Shelton Ferry Landing and the train trestle 1.3 km upstream during 1,791 seconds of pedal time. One of these fish was captured on May 8th, 2023, in the same location. Genetic analysis assigned all four as unmatched. Low river height conditions on April 26th, 2024, prevented sampling from occurring at the Neal Shoals site where Robust Redhorse have been captured in years past. Instead, April 26th sampling focused on the site near the confluence of the Sandy and Broad Rivers, where zero Robust Redhorse were captured during 1,024 seconds of sampling.

O'Rouke, P. 2024. Oral presentation only on Georgia Power Company's Lloyd Shoals Tailrace Project. Georgia Power Company. Atlanta, GA.

Georgia Power Company, licensee for the Lloyd Shoals Hydroelectric Project (FERC No. 2336- 094) (Project), and the National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), and Georgia Department of Natural Resources Wildlife Resources Division (WRD) are collaborating to better understand the types of aquatic habitat and connectivity of aquatic habitat in the spillway tailrace of the Project. The Tailrace Habitat Plan (THP) will provide useful information regarding the Project's tailrace habitat and allows flexibility for the implementation of management actions for potential habitat enhancement (e.g., spawning habitat). Habitat needs of the state-protected Robust Redhorse *(Moxostoma robustum*) and other certain targeted migratory and resident species of management interest known to the basin will serve as the basis to assess existing tailrace habitat suitability. Literature-based habitat-use information will be developed for target species then combined and analyzed in conjunction with *in- situ* habitat and stream-bed physical measurements and hydraulic modeling to result in mapped features that can identify areas suitable for target species spawning and potential habitat enhancement in Lloyd Shoals tailrace (Ocmulgee River).

Rambo, D. 2024. IT TWG update (data and web management). GDNR. Social Circle, GA.

Increased concern of data management and responsibility for robust redhorse information for several river basins and jurisdictions led the Committee to create the Information Technology TWG in 2003. Since then, the RRCC has encountered opportunities to technologically improve data management. One relatively recent innovation is the use of the ArcGIS Survey123 application enabling field data collection with nearly real time cloud compatible data management. Although, a draft electronic field data sheet has been used previously by GADNR, the current plan is to use the digital field data collection sheet during the 2025 sampling season. Currently, the tool is designed for in-house use only. Functional and security features of RRCC's website have become outdated and in need of modernization. RRCC is moving forward with a renewal of the website utilizing UGA's IT web management group services which can very affordably add the RRCC website into their relatively large-scale web management program in 2025. The modernized service will provide maintenance services and offer training to the RRCC IT TWG for a self-serve maintenance and content updates