Sustainable Rivers Program

USACE photos

Chattahoochee River Water Quality Workshop

Jan 2023

US Army Corps of Engineers
Mobile District
Lake Sidney Lanier – Buford Dam Project
Planning Division
Engineering Division

Georgia Department of Natural Resources
Wildlife Resources Division

Sustainable Rivers Program

Chattahoochee River Water Quality Workshop

Introduction:

The Sustainable Rivers Program (SRP) historically examines opportunities to benefit river ecology while maintaining the federal mandates of the United States Army Corps of Engineers (USACE) facilities through identifying environmental flows (e-flows) or flows that benefit native species and ecological systems. SRP has also begun exploring other environmental actions that will produce ecological benefits to river ecology. The SRP focuses on benefitting native species and ecological systems.

It is important to have the following discussion early in this report. With the construction of the Lake Sidney Lanier – Buford Dam Project in the 1950's, the Chattahoochee River below Buford Dam became a cold-water river (annual average temperature = 11.0 °C) owing to the deep, hypolimnetic release from Buford Dam. The state of Georgia, with federal assistance, soon after constructed a trout hatchery approximately 2 miles downstream of Buford Dam for the purpose of stocking Brown, Brook, and Rainbow trout in the river and as remediation for the loss of native, warmwater species and the fisheries that were established prior to the dam's construction. While Brook trout are native to Georgia and the upper ACF basin, Brown trout and Rainbow trout are not. Since that time, the Lanier Tailwater has been managed as a cold-water system that supports the trout fishery and it is designated as a secondary trout stream.

It is acknowledged that the removal of Buford Dam to return the river to its natural warm water condition will not occur. Therefore, the Lanier Tailwater will continue to be managed for its current cold-water state to include non-native trout species as an alternative to the native, warmwater species and fishery displaced by the cold-water environment. While this effort does not specifically focus on trout, they can be an indicator of overall water quality and ecosystem health.

Description:

The Lake Sidney Lanier – Buford Dam Project *(Figure 1)* is in the Apalachicola-Chattahoochee-Flint (ACF) River Basin *(Figure 2)* which encompasses a 19,600 mi^2 watershed among Georgia, Alabama, and Florida. The headwaters of the Chattahoochee River begin as a convergence of small spring-fed tributaries in the Chattahoochee National Forest in northeast Georgia and flows southwesterly for approximately 42 miles to the Project. Lake Sidney Lanier is a 38,000-acre multi-purpose reservoir operated by the USACE. The Lake Lanier watershed has a total drainage area of 1,040 mi^2. The Lake is impounded by Buford Dam and is the first of a series of reservoir projects on the Chattahoochee River. The Chattahoochee River resumes flow from Buford Dam continuing a southwesterly flow for approximately 35 miles until reaching Morgan Falls Dam, which is operated by Georgia Power. From Morgan Falls Dam, the Chattahoochee River continues through a series of active hydropower infrastructure, and inactive hydropower facilities and historic milldams until its convergence with the Flint River at Lake Seminole in the far southwest corner of Georgia. Upon discharging out of Woodruff Dam at Lake Seminole, it becomes the Apalachicola River and travels from the panhandle of Florida to the Apalachicola Bay in the Gulf of Mexico.

Figure 1: Lake Sidney Lanier – Buford Dam Project (USACE photo)

Project Operations:

Buford Dam is operated in conjunction with the other Projects in the ACF System to maintain system balance while providing for the authorized purposes of hydropower, flood risk management, navigation, water supply, water quality, fish and wildlife conservation, and recreation. Lake Sidney Lanier contains approximately 64% of the storage capacity for the ACF system; therefore, Buford Dam operations can have significant influence over the entire system.

Generally, on a weekly basis, entire system needs are analyzed and determinations are made for how much water needs to be released from each project on the ACF system to meet authorized purposes, legal requirements, and to maintain system balance. This determination is then verified on a daily and, if needed, hourly basis. Consideration is given so that the volume of water to be released from Buford Dam supports as many of the project and system purposes as possible. With the Buford Hydropower plant being a peaking plant, this determined volume of water is communicated to the Southeastern Power Administration (SEPA) daily. SEPA then develops a daily schedule for the release of water based on how much power is needed and at what times. Schedules can change depending on downstream needs or hydropower plant failures. Water released does not only produce power, but it also provides for municipal and industrial (M&I) water supply and water quality benefits downstream in the Metropolitan Atlanta Area.

Scope:

This effort focuses on the Lanier Tailwater *(Figure 3)* within the Chattahoochee River. The Lanier Tailwater is an approximately 35-mile reach of the Chattahoochee River from Buford Dam to Morgan Falls Dam. It is in a highly urbanized area with significant population. It is also within the National Park Service Chattahoochee River National Recreation Area (CRNRA) which receives over 3M visits annually.

CRNRA provides 11 recreation area units within the Lanier Tailwater for public access, environmental education, and recreational activity. Local jurisdictions provide multiple additional access points. Non-motorized water sports (tubing, canoeing, kayaking, paddle boarding, fishing, swimming, wading, sunbathing, etc.) are the primary recreational activities on the river, however motorized vessels do navigate the river. There are several CRNRA authorized rental businesses and fishing guide services that provide recreational opportunities on the river. According to the National Park Service, the CRNRA generates over $235M in economic benefits to the local economy.

The Lanier Tailwater is designated as a secondary trout stream by the Georgia Department of Natural Resources (GDNR) and supports a unique cold-water fishery for wild Brown and Rainbow trout. The GDNRs' Wildlife Resources Division supports trout fishing opportunities in the Lanier Tailwater through annual stockings of up to 180,000 catchable Rainbow trout. Additionally, these trout are cultured at Buford Trout Hatchery, which sources its water directly from the Lanier Tailwater and annually contributes over 400,000 catchable (10") trout to the statewide trout stocking program. Brown trout are now naturally reproducing in the Lanier Tailwater. According to the GDNR, the economic impact from trout fishing in the State of Georgia is approximately $172M.

The Chattahoochee River is the primary source of water for municipal and industrial (M&I) purposes for the Metropolitan Atlanta area with multiple water intakes and effluent discharges located within, and just downstream, of the Lanier Tailwater. The states of Alabama, Georgia, and Florida have had disagreements, including multiple lawsuits, over the water from Lake Lanier, flowing through the Chattahoochee River, for several decades. The USACE approved and published the updated Water Control Manual in 2017.

The Lanier Tailwater suffers from poor water quality *(see Appendix B)* in late summer and fall because of Lake Lanier's seasonal stratification process *(Figure 4).* It also approaches, and sometimes exceeds, temperature standards in the summer months. Sedimentation, bank scouring, dissolved metals, and bacteria also contribute to the overall water quality and ecosystem health. The importance of the health of the Lanier Tailwater cannot be overstated considering its importance to all stakeholders and its impact to drinking water supply, industrial use, recreational opportunity, economic impact, and ecological and aesthetic value in a highly urbanized environment. With such importance, the Lanier Tailwater is high profile with significant stakeholder interest.

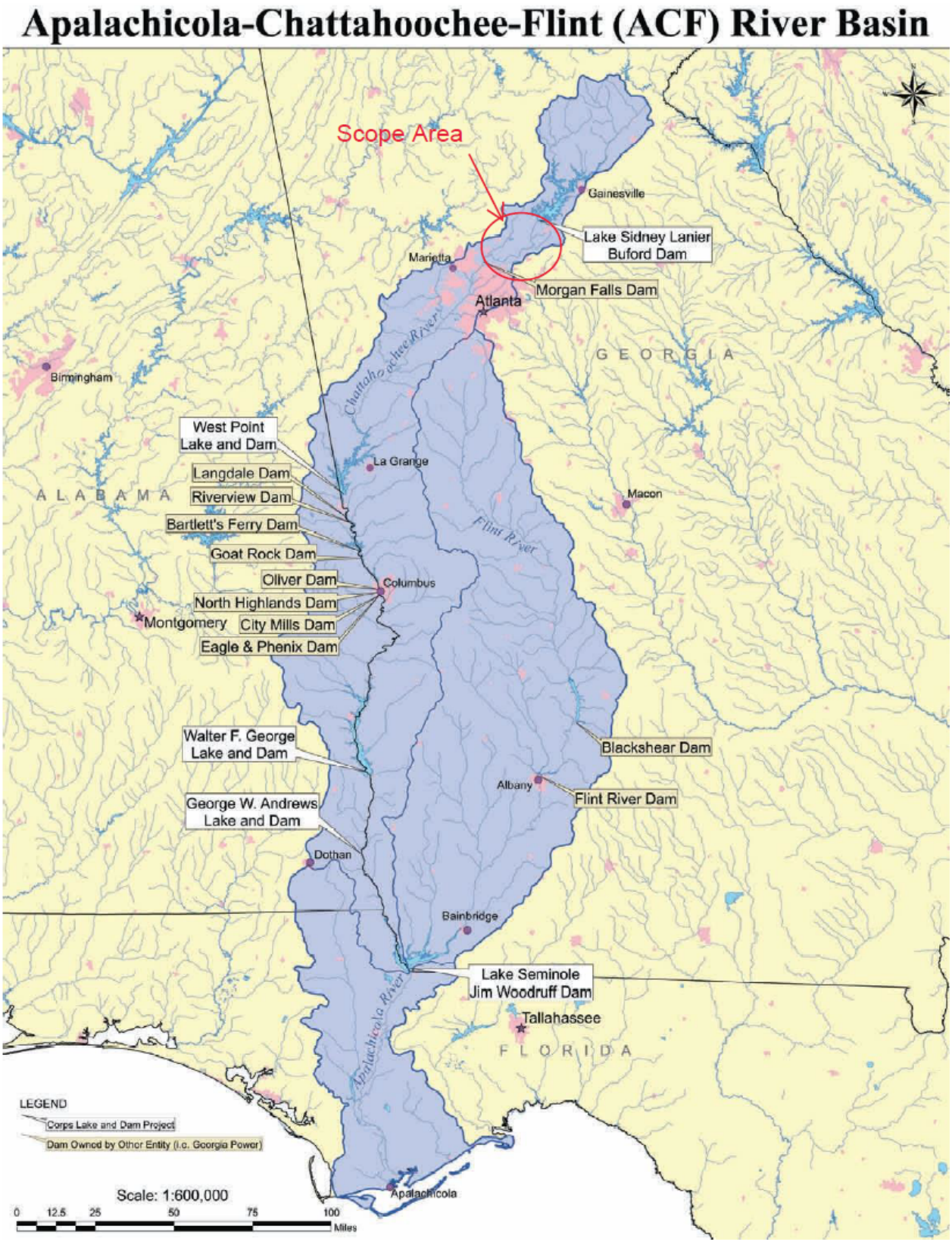

Figure 2: ACF Basin

Figure 3: Lanier Tailwater (scope area)

Purpose:

The purpose of this effort was to coordinate and conduct a workshop to bring Lanier Tailwater stakeholders together to identify:

- Ecosystem problems and concerns,
- Existing data and data gaps,
- Research, study, data needs,
- Opportunities to improve water quality that will benefit aquatic ecology and overall ecosystem function.

This report documents the discussions and opportunities identified in the workshop. This information may be used to inform and guide the submission of future SRP proposals or to guide actions of participants to accomplish outside of the SRP funding.

Pre-Workshop:

Prior to the workshop, the USACE conducted a preliminary planning meeting with stakeholders on June 29, 2022. This preliminary meeting was to expose participants to the Sustainable Rivers Program and to identify the purpose and scope of this effort. Information was also exchanged to identify issues and concerns from various stakeholders to include in planning and preparation for discussion at the workshop. Issues and concerns identified included:

- Overall water quality.
- Dissolved oxygen (DO; lake forebay and tailwater).
- Dissolved metals (lake forebay and tailwater).

- Sedimentation.
- Adjacent development.
- Data for Water Control Manual is decades old.
- Invertebrate diversity and population.
- Bacteria Alert Program.
- Chattahoochee River Protection Act
- Recreational flows.

Workshop:

The USACE conducted the workshop January 24-26, 2023, with water managers, water users, natural resource agencies, academia, and other scientific experts and environmental practitioners. Participants discussed a myriad of topics concerning the Lanier Tailwater with the goal of identifying opportunities to improve the overall health of the ecosystem in the Lanier Tailwater. Discussions emphasized the desire to identify actions that can occur within the confines of the current Water Control Manual. It was also recognized that this is the beginning stages of improvement efforts and the opportunities identified may or may not come to fruition, and some may change as discussions are continued and/or additional data and information is obtained.

Participants in the workshop included representatives from the following organizations:

- USACE, Operations Division, Lake Sidney Lanier Project.
- USACE, Mobile District, Operations Division, Natural Resources Management Section.
- USACE, Mobile District, Engineering Division, Water Management Section (WM).
- USACE, Mobile District, Planning Division, Inland Environment Section.
- National Park Service, Chattahoochee River National Recreation Area.
- Georgia Department of Natural Resources, Environmental Protection Division (EPD), Watershed Protection Branch.
- Georgia Department of Natural Resources, Wildlife Resources Division (WRD).
- Georgia Department of Natural Resources, Wildlife Resources Division, Buford Trout Hatchery.
- University of North Georgia (UNG).
- University of Georgia (UGA).
- Cobb County Marietta Water Authority.
- Gwinnett County Water.
- Georgia Association of Water Professionals.
- The Water Tower.
- Georgia Water Planning and Policy Center.
- Chattahoochee Riverkeeper.
- River Through Atlanta.

Discussions throughout the workshop included issues and concerns regarding the existing Lanier Tailwater conditions, causes of those conditions, and impacts from those conditions. While many issues and concerns were discussed, it became clear that the primary concerns were: 1) Dissolved oxygen levels during the late summer and fall during lake stratification and 2) Temperature regimen within the lower tailwater during summer months. Discussions also identified existing data and data gaps, and any trends identified by existing data. Opportunities identified for actions, additional data collection, and

data analysis include the following (for documentation purposes, a raw summary of discussion topics is included in Appendix A):

1. Add U.S. Geological Survey (USGS) gauge for Temperature, Turbidity and DO at Hwy 20 bridge for continuous monitoring.
2. Add DO sensor to existing USGS gauge below Buford Dam for continuous monitoring.
3. Conduct sluicing for minimum flows in late summer and fall.
4. Conduct a variety of combinations of flows from sluicing and unit 3 operation for minimum flows in late summer and fall.
5. Collect more detailed DO data, to include cross sections, in immediate tailrace utilizing data loggers.
6. Conduct analysis of power generation data, time of day, time of year, flows, DO, air temperature, and water temperature.
7. Provide better communication with stakeholders regarding evacuation of flood waters or other times of long duration high releases.
8. Conduct more frequent routine special releases for temperature during summer months.
9. Research feasibility of introducing oxygen enriched air into air venting tubes.
10. Collect additional macroinvertebrate data in the Lanier Tailwater.
11. Conduct analysis of existing macroinvertebrate data.
12. Conduct data analysis to determine relationship, if any, of water temperature and recruitment.
13. Conduct imaging / mapping of riverbanks and riverbed for erosion and sedimentation impacts.
14. Establish control points or ranges on riverbanks.
15. Identify location of USACE retrogression ranges in the Lanier Tailwater.
16. Conduct additional data collection for metals (iron, manganese) in the lake forebay.
17. Conduct an Oxidation Reduction Potential (ORP) test in lake forebay and immediate tailrace.

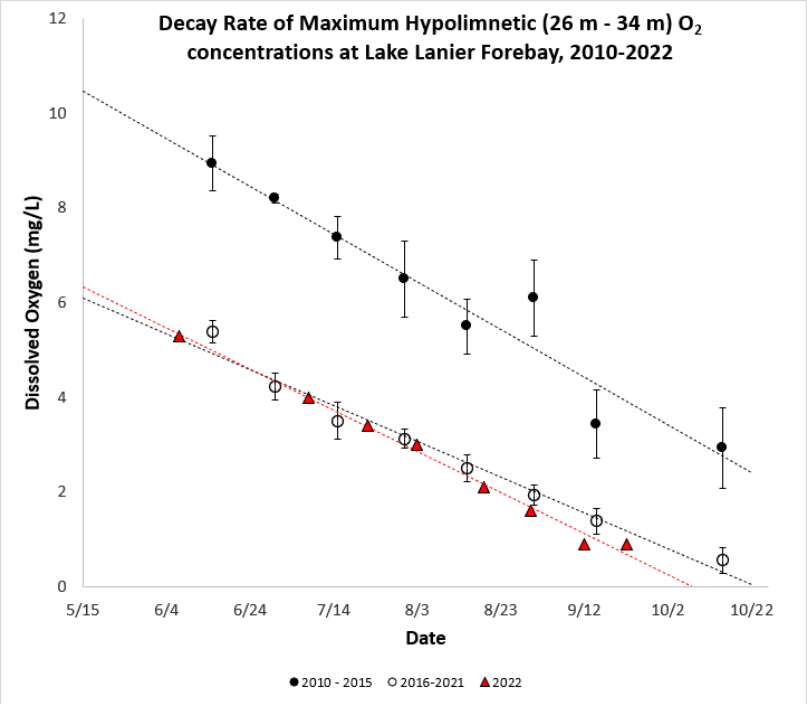

Figure 4: Lake Forebay Stratification – DO Downward Trend

Next steps:

Advance:

- Conduct additional data collection:
    - Add USGS gauge for Temperature, Turbidity and DO at Hwy 20 bridge for continuous monitoring.
    - Add DO sensor to existing USGS gauge below Buford Dam for continuous monitoring.
    - Collect additional dissolved metal data in forebay.
- Conduct additional analysis:
    - Determine how dissolved oxygen (DO) fluctuates downstream of Buford Dam on seasonal time scales.
    - Cross-check these trends with power generation data to determine how power generation (number of generators being used) influences these relationships.
- Conduct temporary modified minimum flow operations for data collection.

Implement: Conduct analysis of additional data collected and determine feasibility of implementing modified operations.

Integrate: Explore incorporation of any operational changes, demonstrated as beneficial by data analysis, into a Water Control Manual update.

APPENDIX A:

Issues and Concerns:

- Wastewater discharges
    - Fulton, Gwinnett, Forsyth
- Sewer Overflows
- 750/650 cfs flows too low? – Studied for Water Control Manual and State agreed - NO.
- Invertebrate surveys – macroinvertebrate diversity and richness improve further away from dam (Holt – UGA)
- Brown trout growth rates (O'Rouke)
- Sloughing of the banks at the mouth of creeks
- Population
- Buffer enforcement (Metropolitan River Protection Act, MRPA)
- Decline in certain species of bugs (better below Morgan Falls Dam)
- Insecticides / Pesticides
- DO
    - EPD Total Maximum Daily Load (TMDL) for DO
    - Data may show river below Buford Dam listed as not meeting GA State standards
    - Typically in the late Summer and Fall
    - Warm tributaries
- Temp
    - Typically in the summer
    - How do discharges and withdrawals impact temperature?
        - Johns Creek, Dekalb, Fulton, Gwinnett
- Hydrogen Sulfide – No Data – related to DO – can be lethal to fish at levels too low to detect.
- Turbidity – Total Suspended Solids (TSS)
- Sedimentation / Bank Scouring, Turbidity, TSS
- Wastewater discharge in combination with drinking water intakes
- Dissolved metals (iron, manganese) – related to DO
- Late Fall 2 unit long duration generation increases temperature *(operations)*
- HAB's lake – river – Bull Sluice
- Wet – Dry Cycles *(weather)*
- Stormwater *(temperature)*
- Primary/Secondary Trout stream standard? 22 degrees Celsius at Eaves Rd. (Slinky streams) *(Temperature)*
- PCB listing *(DO)*
- Fecal Coliform – E-Coli *(Sediment)*
- Bank erosion *(Sediment – Scouring)*
- Better coordination for flood water evacuation

Impacts:

- Violate State water quality standards (Low DO) river
- Biological impacts (Low DO) river (temp)
- Increased costs to hatchery (Low DO) river

- Effects in water chemistry (soluble metals)
- Increased costs to treat water (water treatment facilities – drinking water)
- Temp impacts and DO issues (related)
- Biological impacts – Sediment – feeding and spawning
- Aesthetic value – sediment, turbidity, TSS
- Recreation – sediment, turbidity, TSS
- HAB (cyanobacteria) – sediment (metals – E-Coli)
- Indirect economic effects – Degradation of river = economic decline – Improvement of river = economic increase.

Causes:

- Dam operation – DO
- Flow – erosion
- Sediment – E-Coli
- Rain events – E-Coli
- Development – Sediment
- Instream channel erosion, sediment – high generation
- Tributary instream channel erosion feeding river – Sediment
- Food sources for flies (invertebrates) fewer #'s
- Volume "blows out" invertebrates below dam. They just can't hold on.

Flows:

- Long duration flows (4 hours) not good Aug – Dec. Prefer one unit over two units
- Recreation
- Instream channel erosion
- Minimum flow too low? No – worked out during Water Control Manual update
- 1100 – 1200 more real for fall recreation (anecdotally)
- 2 unit releases beneficial further downstream
- Fluctuation impacts invertebrates
- Consider Sluice DO v. Generator DO

Existing Data and Data Needs/Gaps or Studies:

- Tailrace DO
    - Seasonal
    - Fall
    - Generating
    - Sluicing
- Long term continuous monitoring. DO to USGS gauges. More HOBO data loggers
- DO and temp continuous monitoring
- Grab samples for dissolved metals
- Sedimentation event driven
- Precipitation
- Bathymetry of River
- TSS – Turbidity

- 2017 Generation – summer flows – operations
- ORP – monitor the reach
- Weekend release frequency
- Temp and flow of tributaries
- Water treatment
- Harmful Algal Blooms (HABs)
- Macro Biological

Studies:

- DO and Temp Impacts

Trends:

- Decrease in DO in the Hypolimnion in Forebay (2016 – 2022)

Mitigation Actions:

- Aerate house unit – it is aerated with vent tubes
- Routine weekend special release for temperature
- Increased coordination if evacuating flood waters in summer and late fall
- River spawn management
- In fall, use sluice for flood evacuation
- Biological minimum flows. EPD water quality model
- MRPA enforcement
- Oxidation Reduction Potential (ORP) - The Water Tower – AVSSEM premature now
- UNG – Dr. Panda model
- Diversion weir – instream structure
- Release every 24 hours helps temp
- Recon study
- Mixing releases depending on pool – unsigned MOA like fish spawn

Positives:

- Special releases for temperature are a benefit. Weekend releases. Infrequent (when needed)
- Hatchery improvements
- Dam pool de-listed (forebay?)
- DO in river improved except immediately below dam
- Bacteria Alert Program
- Chatt River Protection Project (Water Resources Development Act of 2022)
- No E-Coli out of dam
- Volunteer Riverkeeper tributary monitoring program
- Water quality model - Hydrodynamic (EPD)
- MRPA

Way Forward:

- Explore adding USACE gauge for Turbidity and DO at Hwy 20 bridge (Continuous monitoring – USACE Water Management Data Collection Group)

- More detailed DO data set in immediate tailrace (HOBO data loggers)
- DO sensor to existing (USACE/USGS?) gauge below dam for continuous monitoring
- USACE notification of release (internal) where is water coming from?
- Explore oxygen enriched air into sir venting tubes (and other mitigation actions)
- PD analysis of macroinvertebrate data (fiscal year 2025) (or university do analysis)
- 2017 temps exceeded state water quality standard. Perform analysis to see if it affected recruitment to determine if temp is an issue (EPD – WRD?)
- Side scan imaging of river exists but it is not mapped. Can this be used as a baseline for sedimentation?
- Bathymetric survey of river. EPD has depths (EPD - USACE WM?)
- Explore monumenting and surveying banks (UNG Model Dr. Panda)
- Survey of USACE **retrogression ranges** (Doppler data). USACE WM has capability to obtain data. It currently does not exist. Provide info to UNG for model.
- Sample for metals (iron, manganese) in forebay (intake). Gwinnett Water may have data or can do additional sampling.
- ORP test. Not probe, just test. (Chris, Bridgette – Gwinnett Water)
- Drone LiDAR (Light Detection and Ranging)

APPENDIX B

Preliminary Data (Figures B1 to B13)

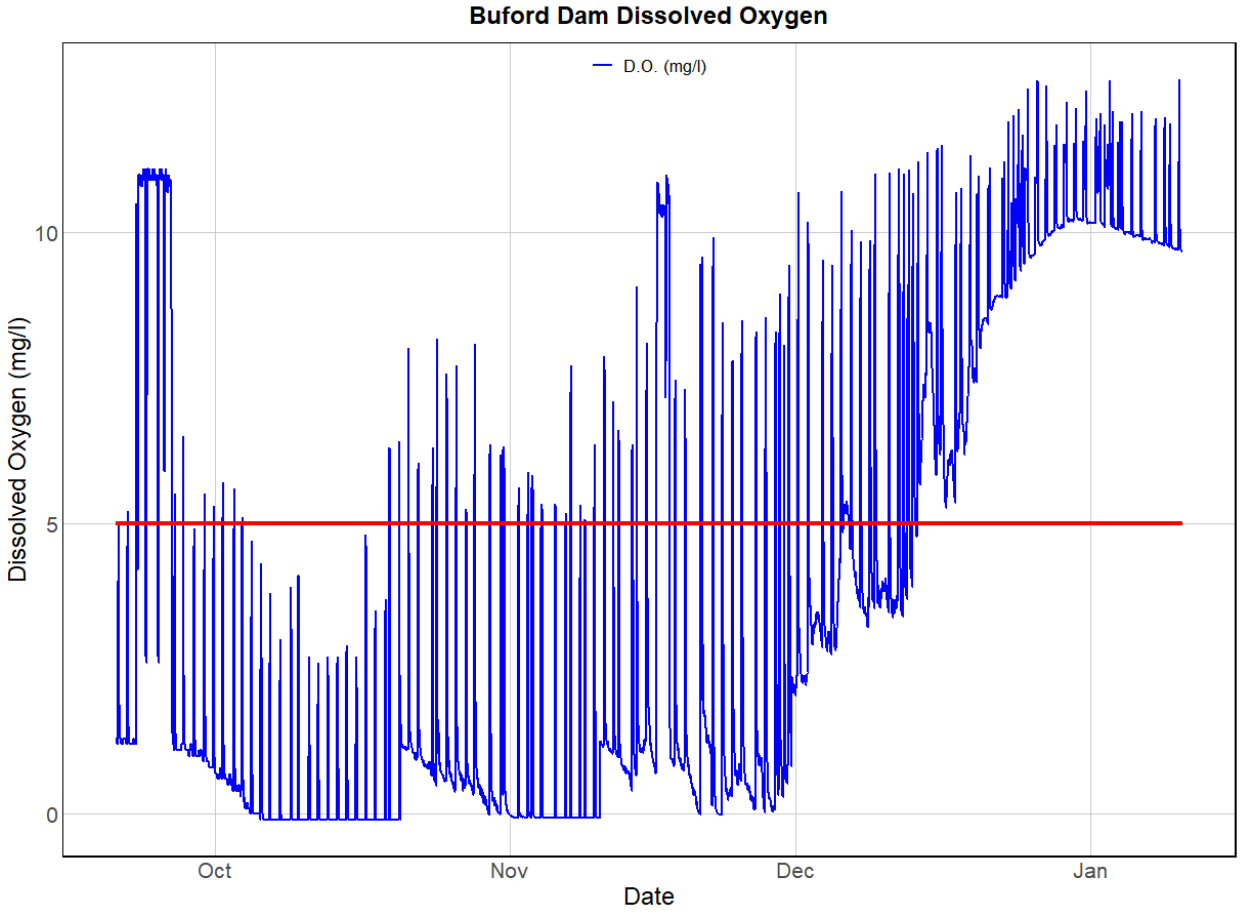

Figure B1: Continuous dissolved oxygen (mg/l) data collected below Buford Dam from 9/19/22 – 1/10/23. Frequent fouling of precipitated metals on the HOBO data logger optical sensor produced erroneous readings (0 mg/l) throughout the reservoir stratification period (September – December).

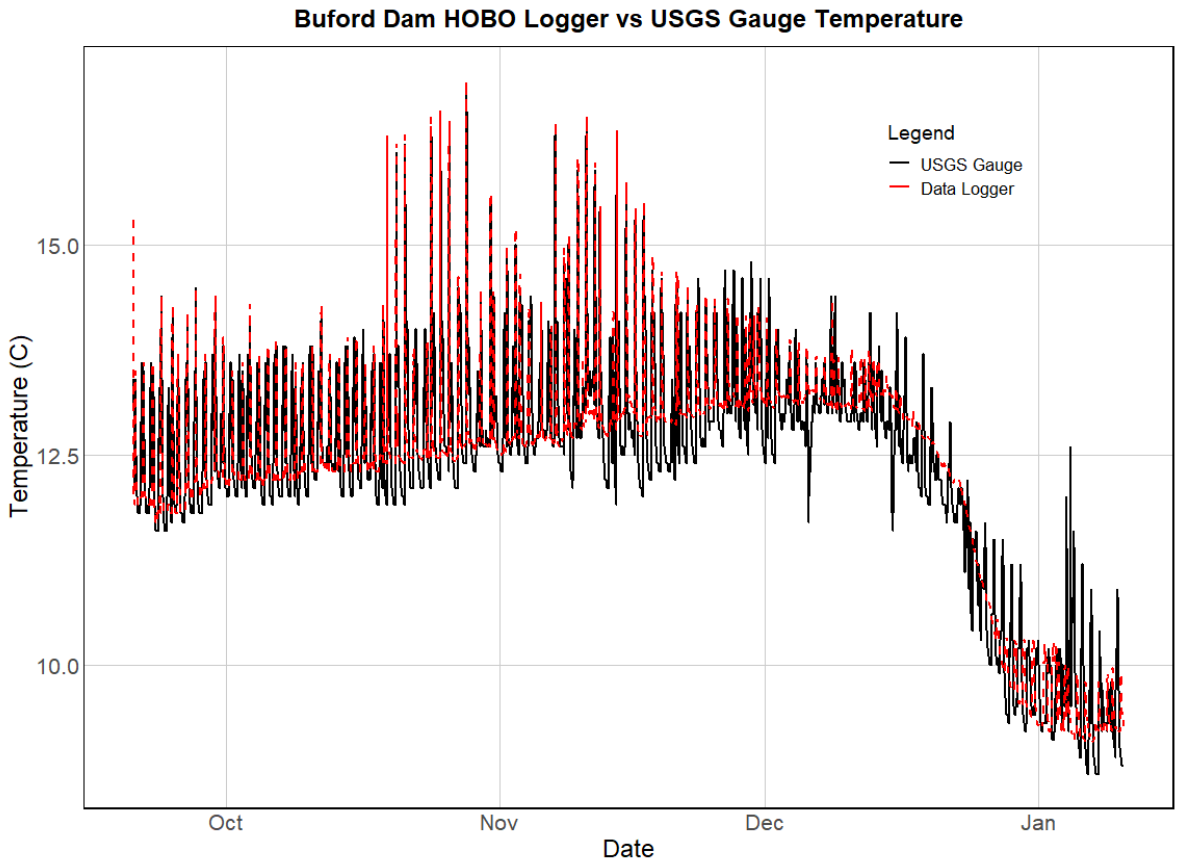

Figure B2: Continuous temperature monitoring data collected at Buford Dam from 9/19/22 – 1/10/23 (red dashed line) compared to USGS monitoring data on the Chattahoochee River below Buford Dam.

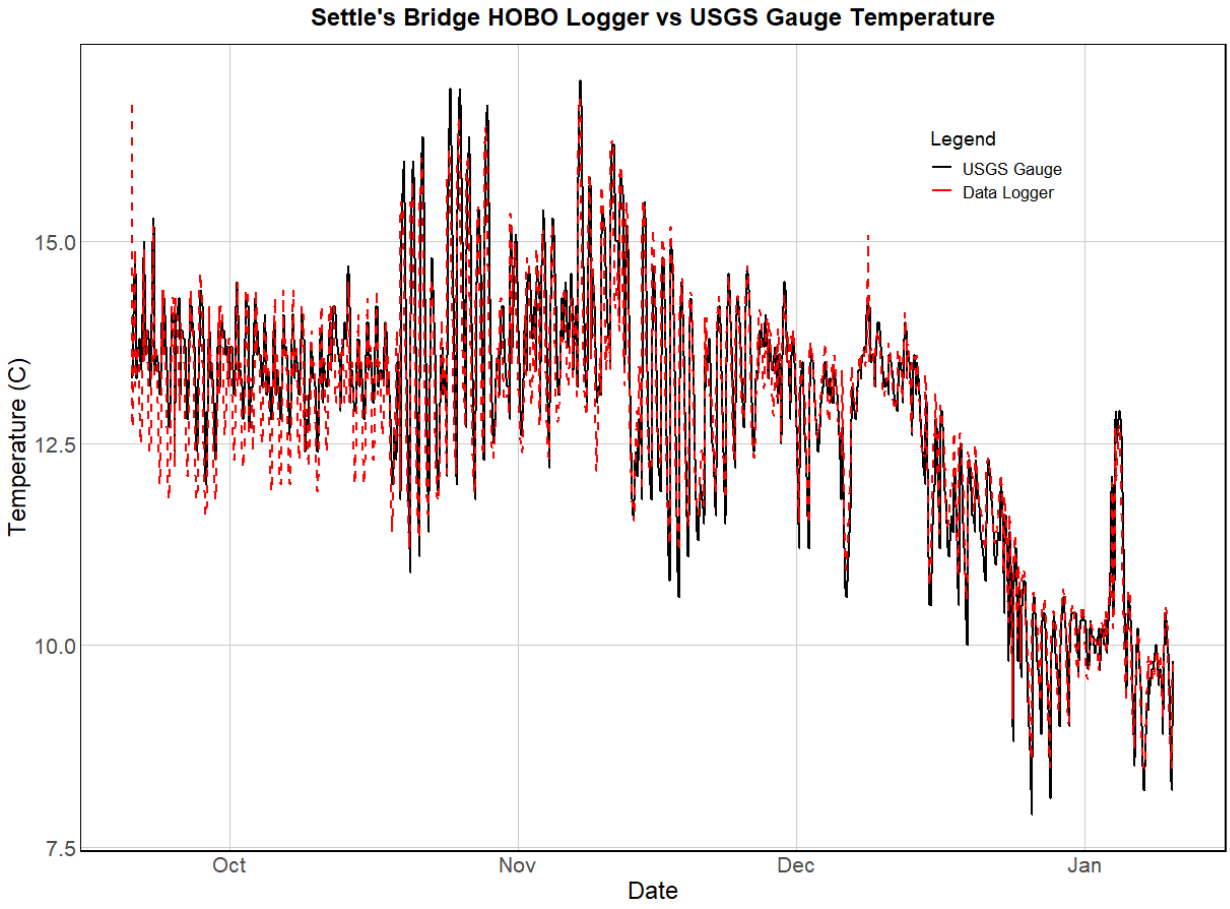

Figure B3: Continuous temperature monitoring data collected at Settles Bridge from 9/19/22 – 1/10/23 (red dashed line) compared to USGS monitoring data on the Chattahoochee River at McGinnis Ferry.

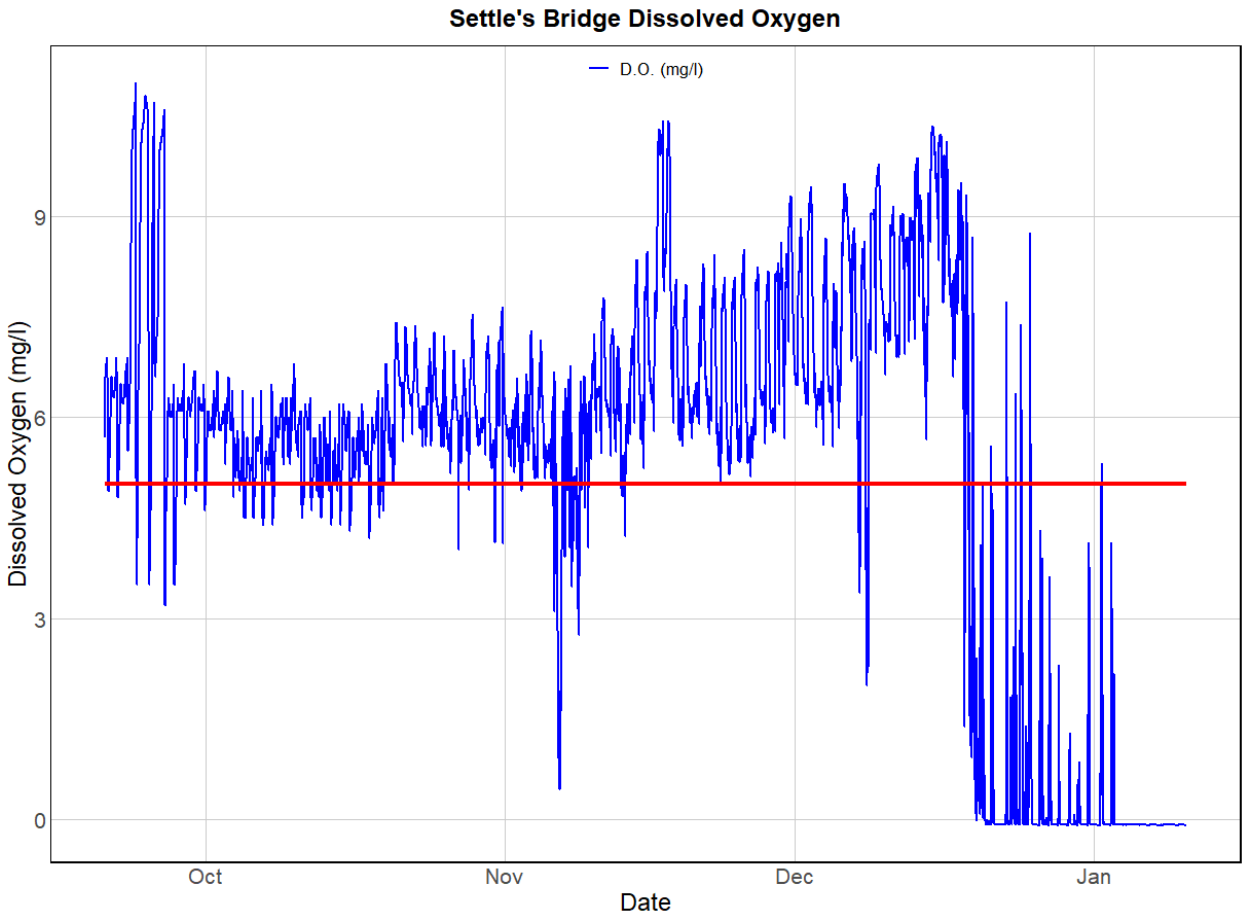

Figure B4: Continuous dissolved oxygen (mg/l) data collected at Settles Bridge from 9/19/22 – 1/10/23. The red dashed line is set at 5 mg/l. Debris observed in the collection tube produced erroneous readings (0 mg/l) from late December through January.

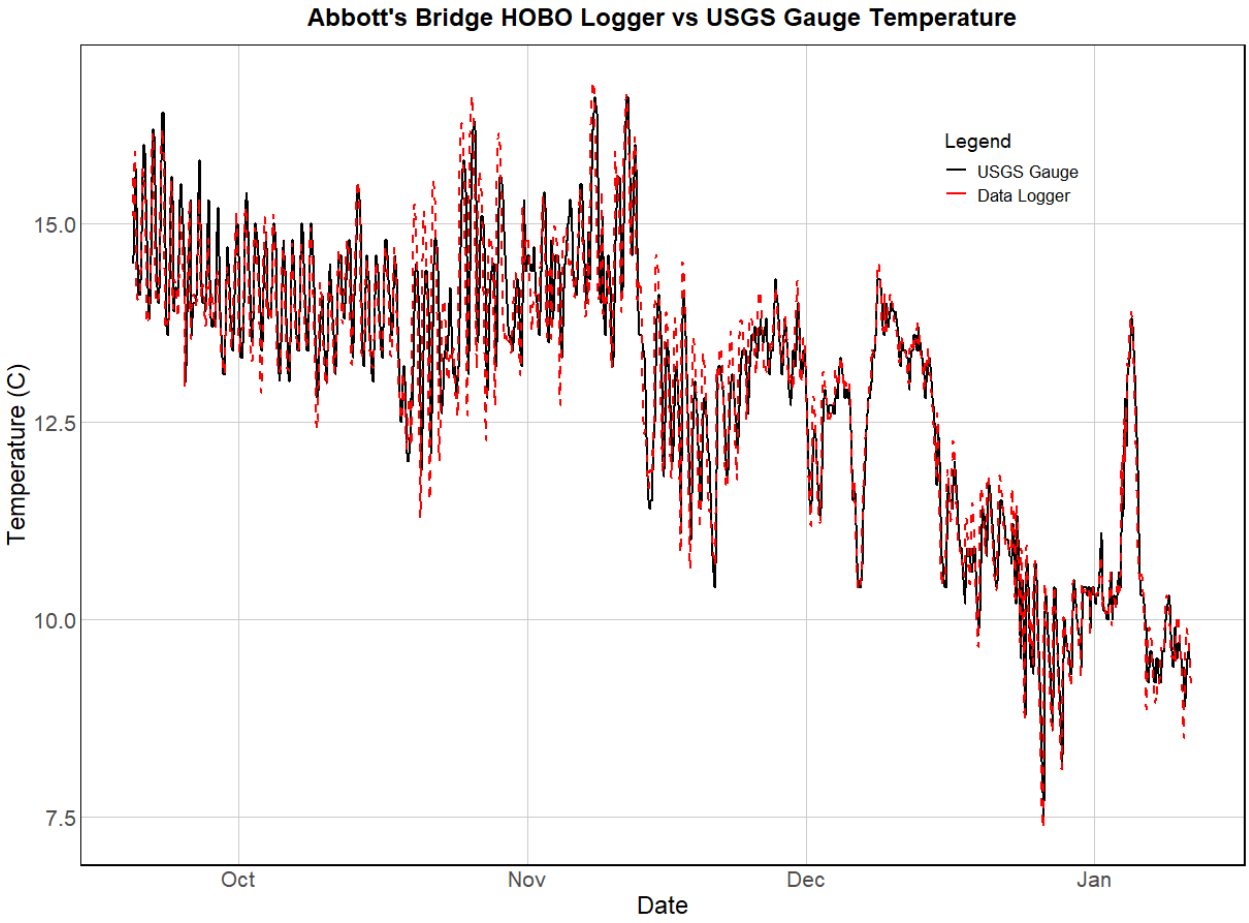

Figure B5: Continuous temperature monitoring data collected at Abbott's Boat Ramp from 9/19/22 – 1/10/23 (red dashed line) compared to USGS monitoring data on the Chattahoochee River at Medlock Bridge.

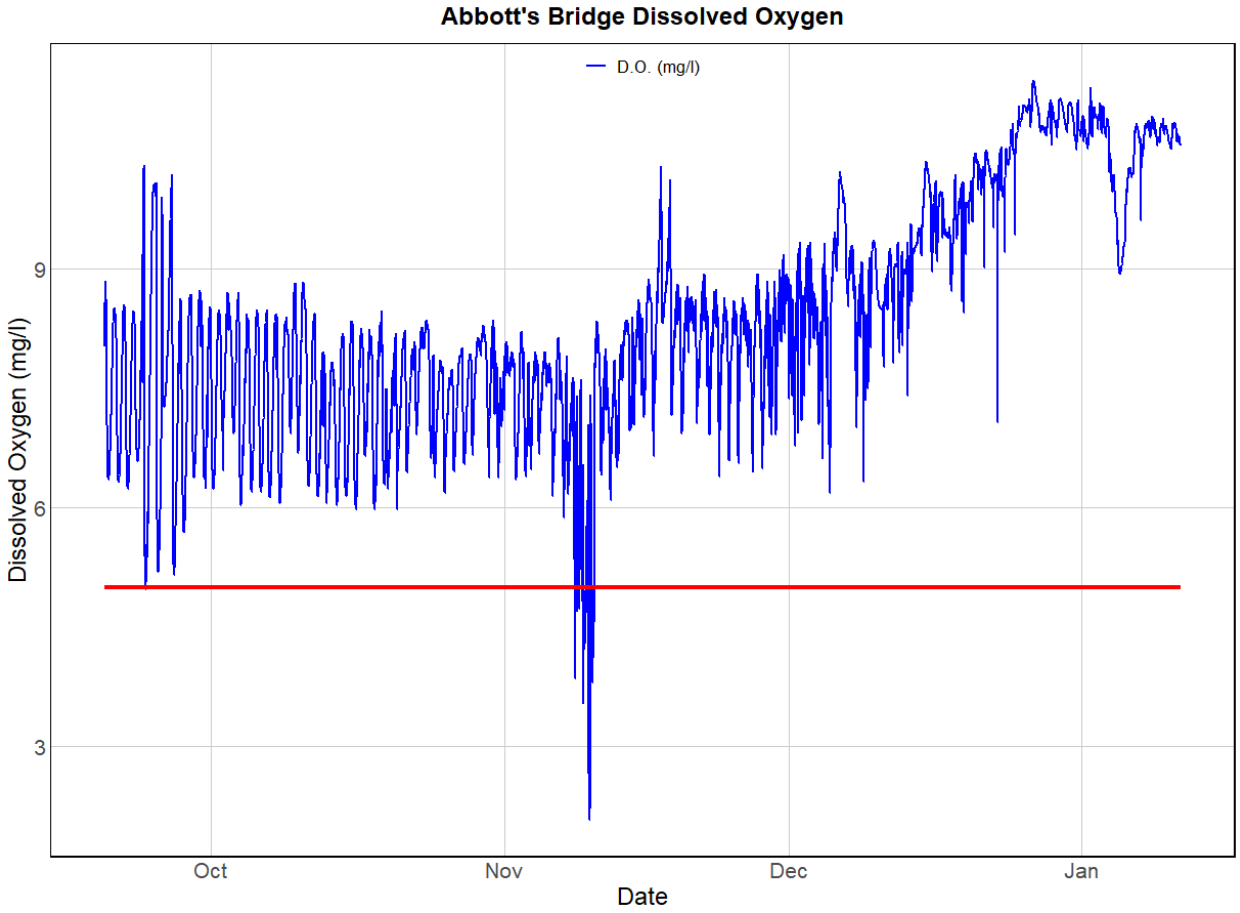

Figure B6: Continuous dissolved oxygen (mg/l) data collected at Abbott's Boat Ramp from 9/19/22 – 1/10/23. The red dashed line is set at 5 mg/l.

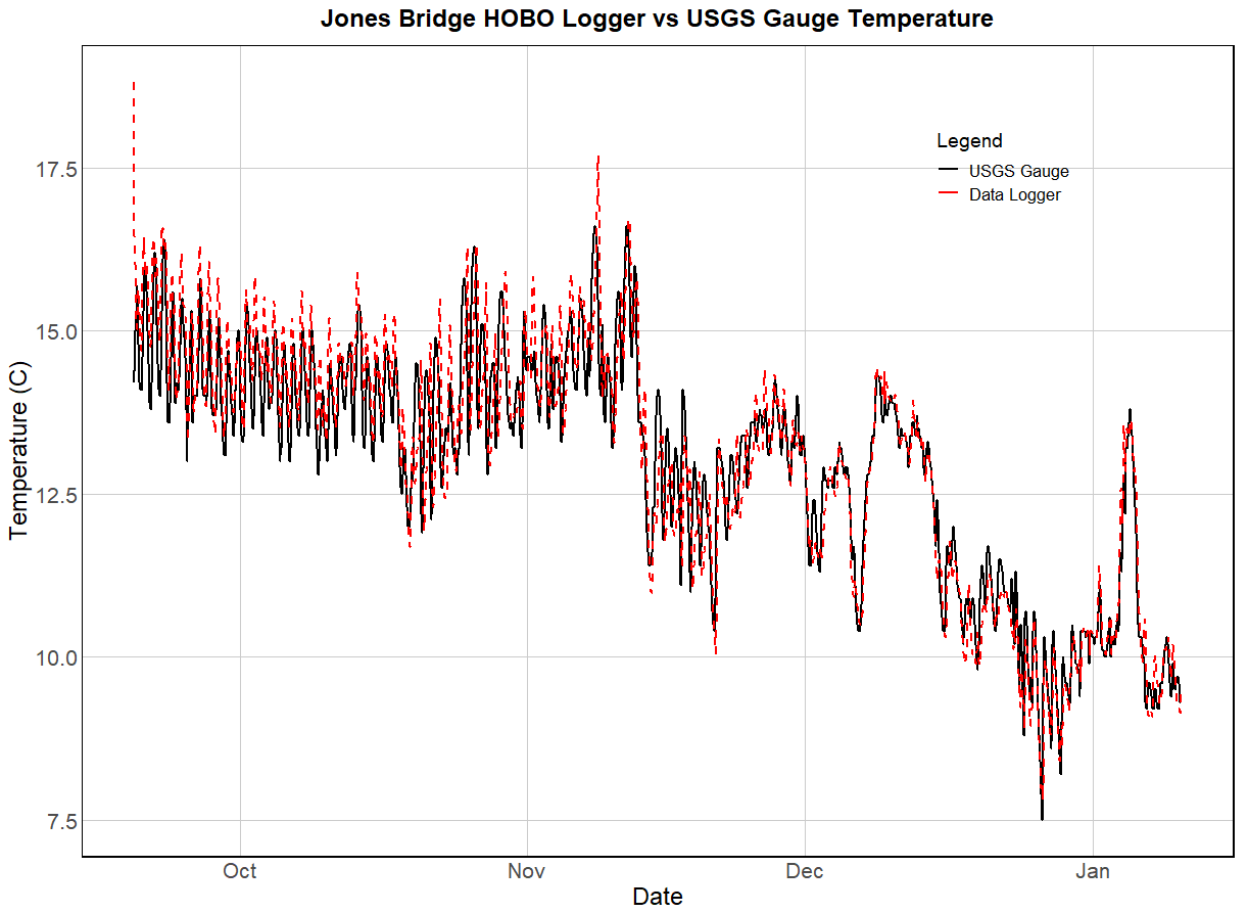

Figure B7: Continuous temperature monitoring data collected at Jones Bridge Park from 9/19/22 – 1/10/23 (red dashed line) compared to USGS monitoring data on the Chattahoochee River at Medlock Bridge.

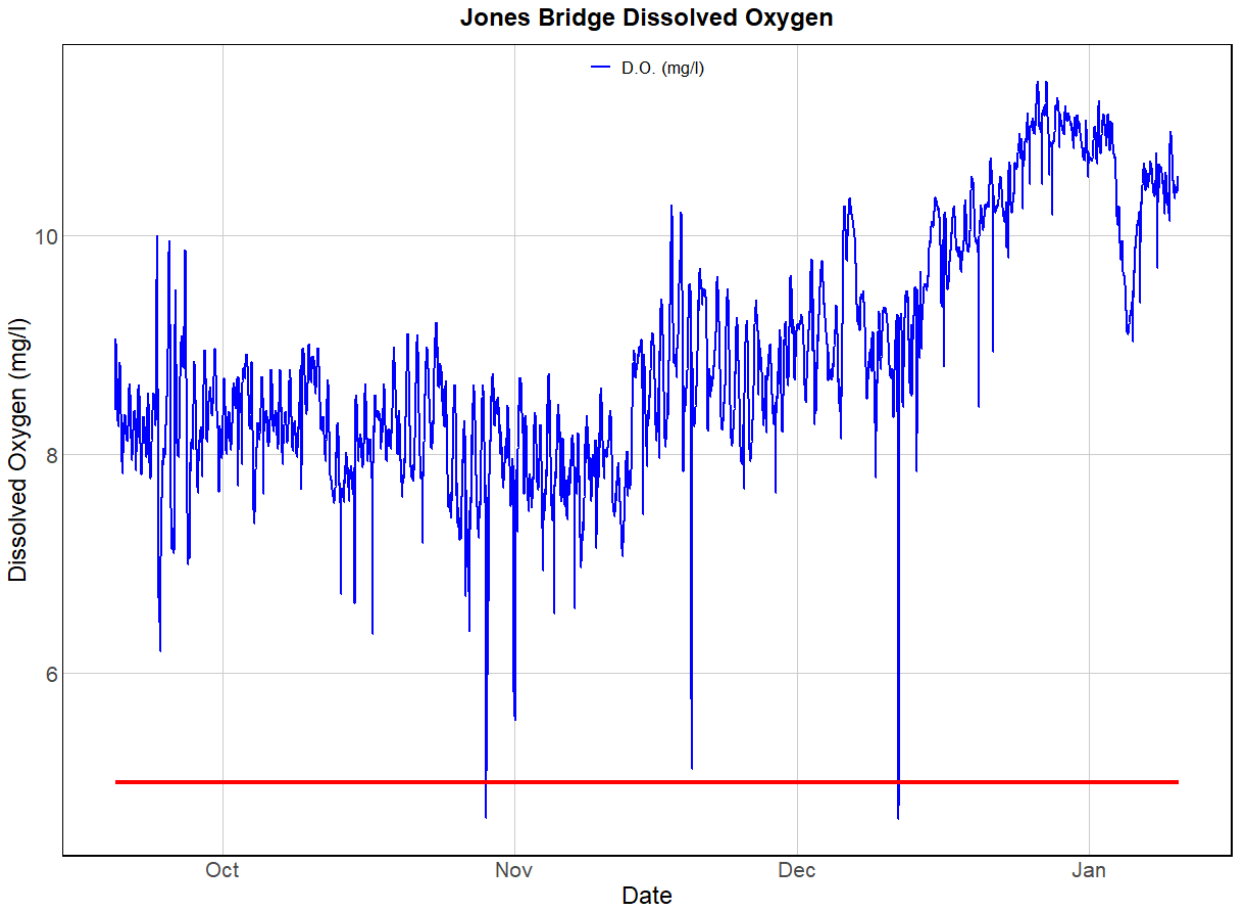

Figure B8: Continuous dissolved oxygen (mg/l) data collected at Jones Bridge Park from 9/19/22 – 1/10/23. The red dashed line is set at 5 mg/l.

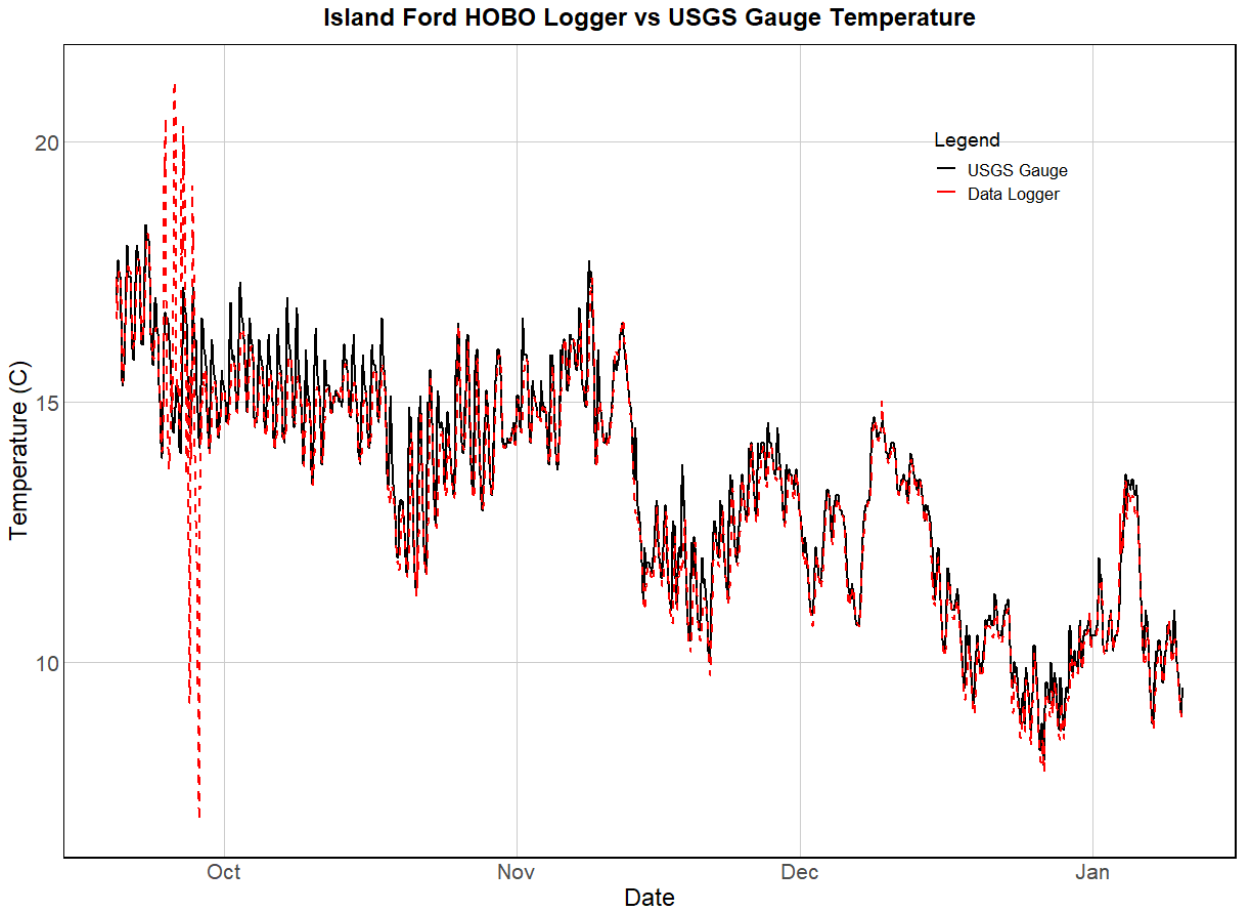

Figure B9: Continuous temperature monitoring data collected at Island Ford Park from 9/19/22 – 1/10/23 (red dashed line) compared to USGS monitoring data on the Chattahoochee River at Eves Road (Roswell).

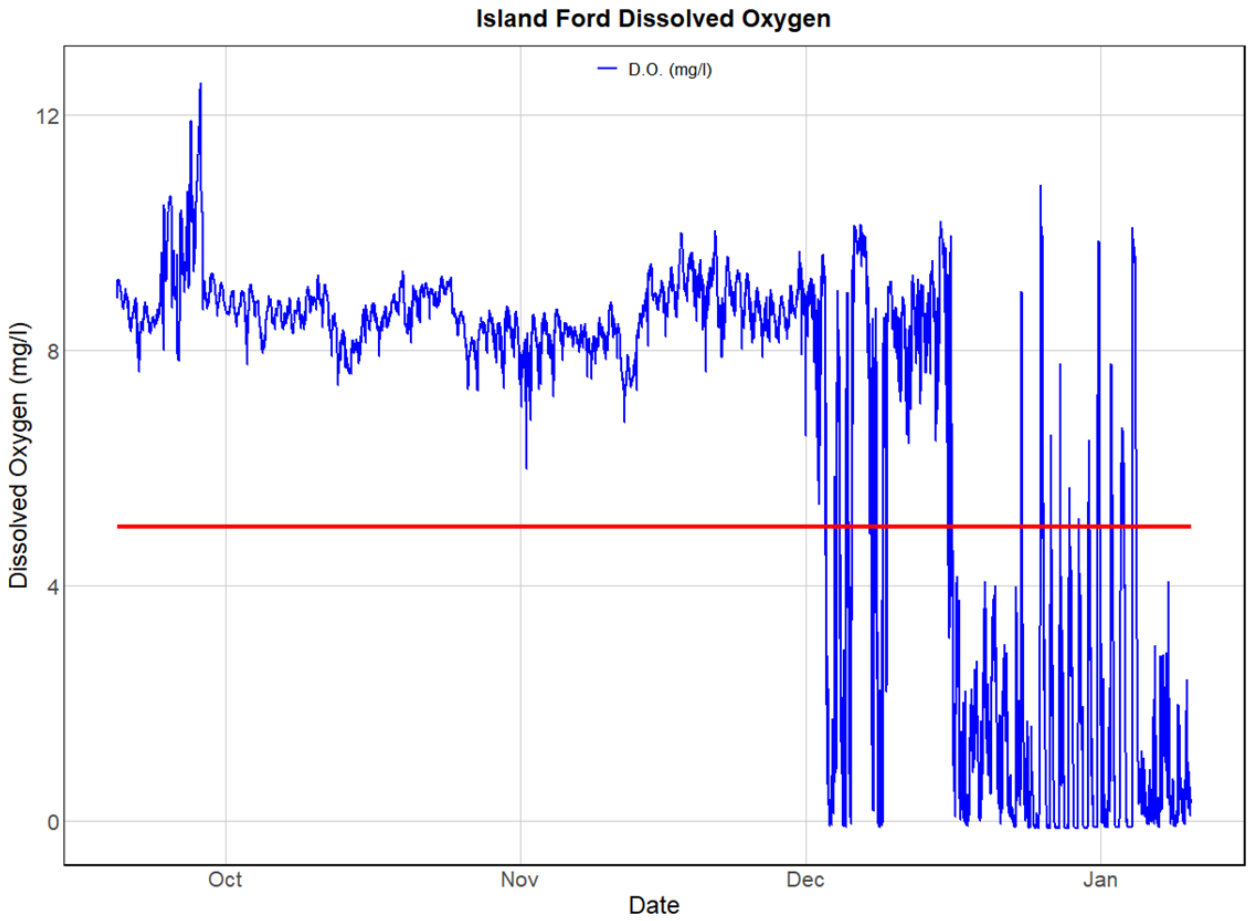

Figure B10: Continuous dissolved oxygen (mg/l) data collected at Island Ford Park from 9/19/22 – 1/10/23. The red dashed line is set at 5 mg/l. Debris observed in the collection tube produced periods of erroneous readings (0 mg/l) from December through January.

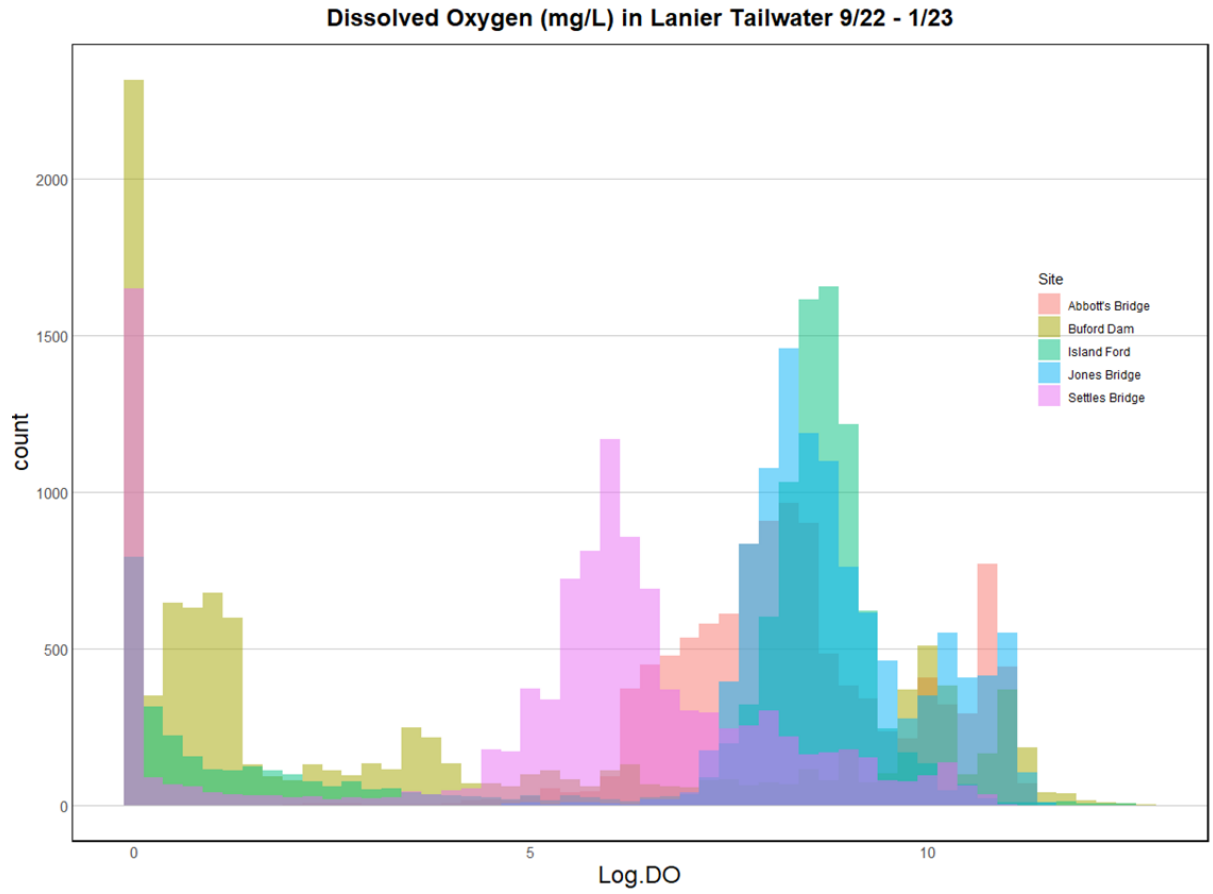

Figure B11: Frequency distributions of dissolved oxygen readings taken at five temperature and dissolved oxygen monitoring stations along Lanier Tailwater (Chattahoochee River) from 9/19/22 – 1/10/23.

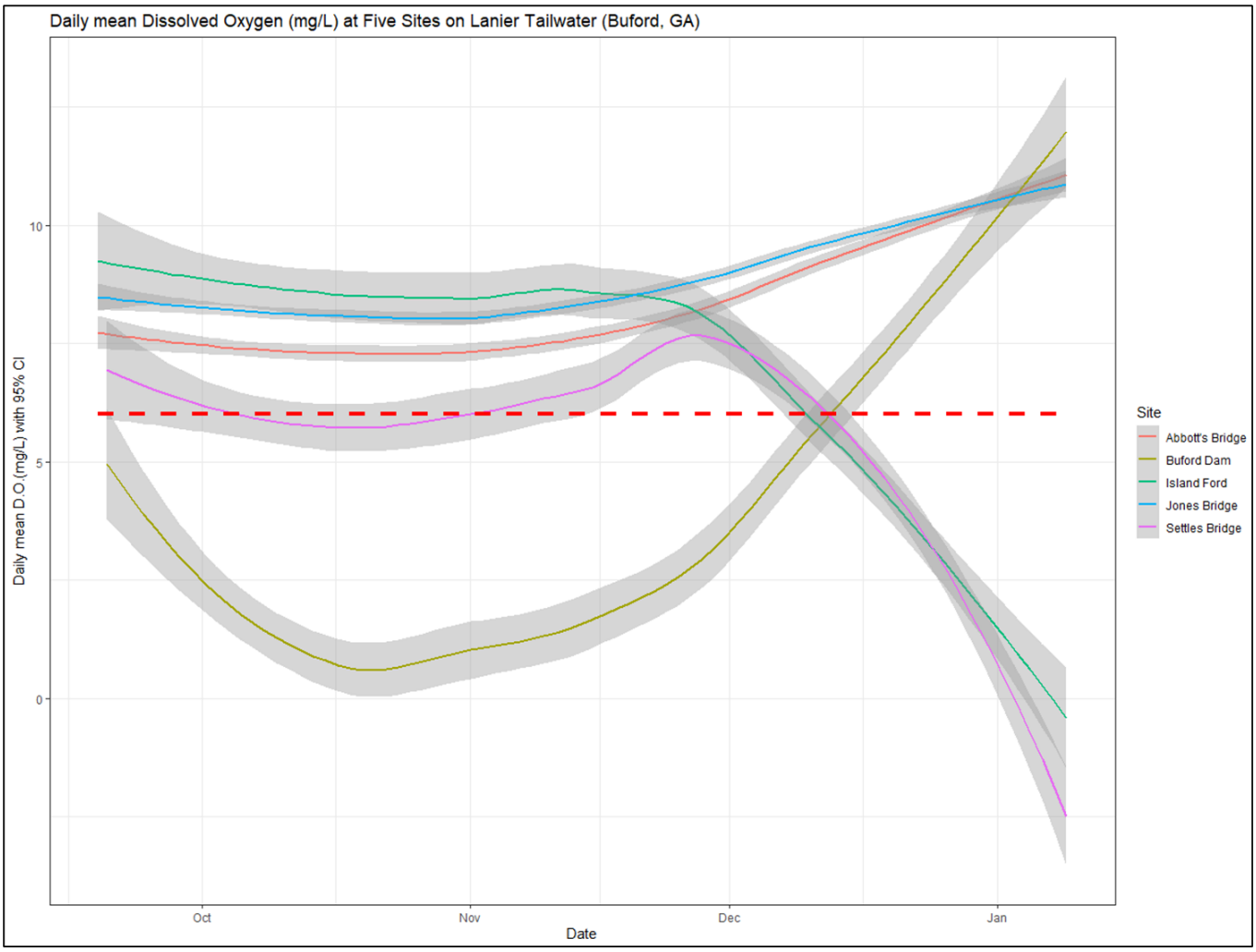

Figure B12: Daily mean dissolved oxygen concentrations measured at five monitoring locations along Lanier Tailwater (Chattahoochee River) from 9/19/22 – 1/10/23. The red dashed line denotes the daily average of 6 mg/l. Note: The daily average dissolved oxygen at Island Ford and Settles Bridge is biased by erroneous readings caused by debris accumulation in the collection tube.

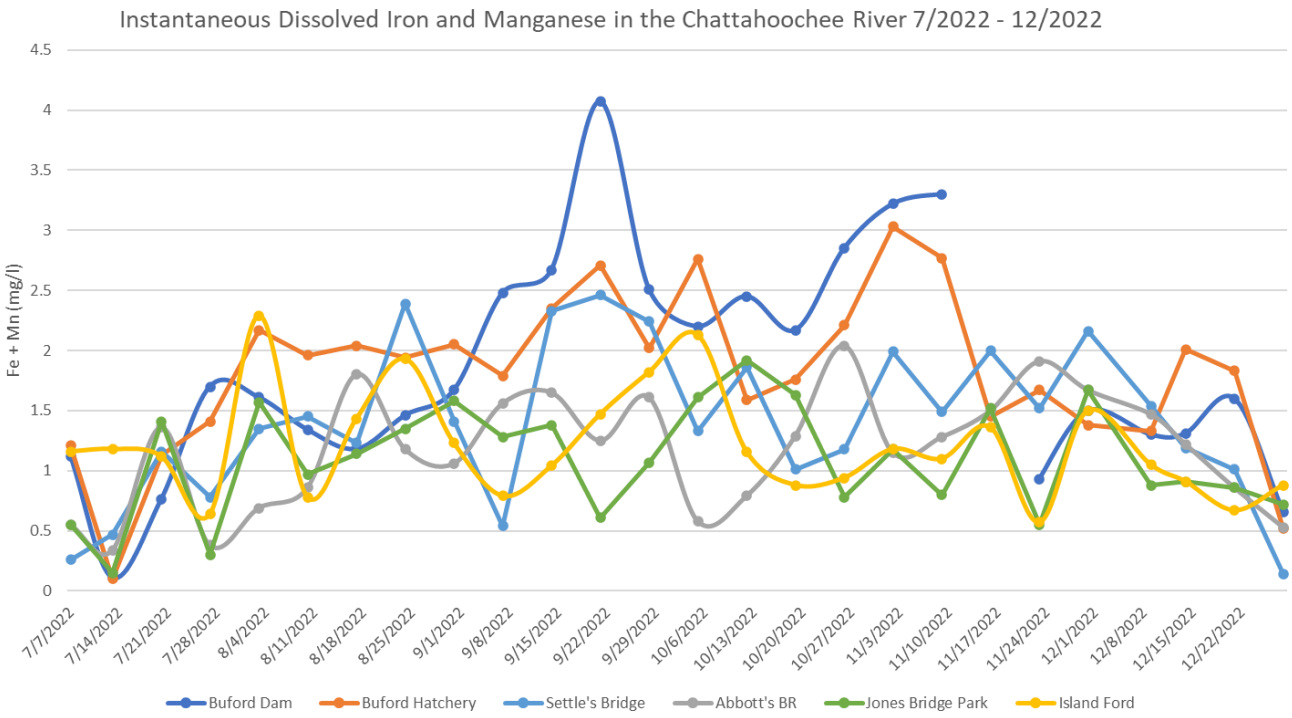

Figure B13: Total dissolved metals (iron and manganese; mg/l) measured by Buford Hatchery staff at monthly intervals at five locations along Lanier Tailwater (Chattahoochee River).