Grapevine Lake spillway (USACE photo)

Identifying Environmental Opportunities for the Trinity River:

Report from a Sustainable Rivers Program Stakeholder Workshop

Prepared by the Fort Worth District, U.S. Army Corps of Engineers,
and The Nature Conservancy

May 25, 2025

US Army Corps of Engineers®

The Nature Conservancy

Introduction

This report describes the progress of the Trinity River Working Group led by the U.S. Army Corps of Engineers (USACE) Fort Worth District (SWF). In October 2023, SWF utilized funding from the Sustainable Rivers Program (SRP) to host a stakeholder workshop to identify ecosystem problems, opportunities, data gaps, and research needs within the watershed.

The Trinity River watershed is entirely in Texas flowing 710 miles south of the high bluffs in north Texas (near Red River) to the Gulf of Mexico near the cities of Houston and Galveston. The Trinity River has four branches in the Dallas/Fort Worth (DFW) Metroplex: Clear Fork, Elm Fork, West Fork, and East Fork. The Trinity River basin covers 15,589 square miles and includes six SWF USACE reservoirs: Benbrook Lake, Joe Pool Lake, Lavon Lake, Lewisville Lake, and Ray Roberts Lake, all of which are located in the DFW Metroplex area.

These multipurpose reservoirs support flood risk management, water supply, and recreation use. Each reservoir is guided by project-specific Water Control Manuals (WCMs) to ensure project compliance with congressionally approved operating purposes. In addition, the USACE Galveston District operates Wallisville Lake on the Trinity River with the following multipurpose uses: navigation, salinity control, water supply, fish and wildlife enhancement, and recreation.

Downstream of the USACE reservoirs, the Texas Parks and Wildlife Department has designated a section of the Trinity River above Lake Livingston as an ecologically significant river segment because it supports one of the two largest remaining populations of Texas heelsplitter, an endemic and endangered mussel species. The Trinity also supports the endangered Texas fawnsfoot mussel and is an important fishery for freshwater drum, striped bass, white bass, yellow bass, flathead catfish, channel catfish, and numerous sunfish species. Another ecologically significant river segment further downstream supports oxbow lakes and marshes, bottomland hardwood forests, riparian conservation areas (Wallisville Lake Project, the Trinity River National Wildlife Refuge, and Davis Hill State Park), threatened and state-listed endangered species (wood stork and alligator snapping turtle), and the estuarine delta.

The Trinity River SRP work was originally conceived during the South Region Regional Operations and Water Management Meeting held virtually on September 22-23, 2020. Meeting attendees included representatives from The Nature Conservancy (TNC) and seven USACE districts (New Orleans, Memphis, Vicksburg, Galveston, Little Rock, Fort Worth, and Tulsa). The goal of the meeting was to identify environmental opportunities at reservoirs and other water infrastructure related to implementing operational changes that would result in ecosystem benefits. Each district was tasked with identifying the environmental actions and associated reservoirs that had potential to produce more ecosystem benefits. The Fort Worth District (SWF) team reviewed all environmental actions (**Table 1**) for the collective portfolio of SWF reservoirs and then ranked each of those 24 SWF reservoirs, individually, as candidates for select environmental actions that were judged to have promising combinations of ecological potential and feasibility.

Table 1. Environmental actions considered during the South Regional Meeting.

Water Infrastructure Types		Environmental Action/Objectives
General Reservoirs	**In pool**	Level management for fisheries
		Level management for mussels
		Level management for overwinter biota
		Level management for vegetation
		Level management for waterfowl
		Level management for shorebirds, gulls, other migrants
		Nutrient and pathogen management
		Rate of change management for bank integrity (WQ considerations)
		Suppress - Level management for fisheries
		Suppress - Level management for mussels
		Suppress - Level management for overwinter biota
		Suppress - Level management for vegetation
		Suppress - Level management for waterfowl
	Connect Up and Down	Manage distribution of depositing sediments
		Reallocations
		Management of harmful algal blooms
		Sediment management - bed and bank
		Restrict passage of invasives
	Downstream	Outflow temperature management for nature
		Outflow temperature management for humans
	Environmental flow targets	Geomorphic process support
	.	Floodplain connectivity
	.	Wetland management
	(ecological components)	Life stage support - Fisheries
	.	Life stage support - Mussels
	.	Life stage support - Waterfowl
	.	Life stage support - Shorebirds, Gulls, other migrants
	Environmental flow targets	Life stage support - Herps
		Rate of change management for bank integrity (WQ considerations)
		Recreation
		Water quality for nature
		Water quality for humans
		Management of gas bubble trauma
		Habitat creation (use of dredged material, oxbows/floodplain restoration)
L&D Reservoirs	**In pool**	Level management for fisheries
		Level management for mussels
		Level management for overwinter biota
		Level management for vegetation
		Level management for waterfowl
		Level management for shorebirds, gulls, other migrants
	Connect Up and Down	Conservation locking of fish
		Management of harmful algal blooms
	Downstream	Environmental flow targets (see green highlighted cells above for examples)

Workshop Development

SWF submitted an SRP proposal in July 2022 requesting support for a stakeholder workshop to identify environmental opportunities for the Trinity River. Specifically, SWF wanted to determine if there are needs that could be addressed with the SRP and develop a plan forward to assess opportunities, data gaps, and a timeline for future proposals under the SRP. The workshop also sought to identify actions by other agencies and organizations that could be leveraged with the SRP. The proposal was funded in January 2023.

On March 20, 2023, SWF and TNC hosted an SRP kickoff meeting with the Trinity River Authority (TRA), Upper Trinity River Water District (UTRWD), Trinity River Water District (TRWD), Texas A&M AgriLife Extension Service, City of Fort Worth, Dallas Water Utilities, North Central Council of Governments, the Texas Water Development Board (TWDB), and the Texas Parks and Wildlife Department (TPWD). These entities formed the Trinity River SRP project management team. During the planning meeting, it was clear that the upper half of the Trinity River from USACE lakes to Lake Livingston would be the focus area. The project team concurred and the workshop was expanded to accommodate the larger area, with the understanding that USACE would need to consider how any recommendations from SRP would affect Lake Livingston storage, outflow, and hydropower. **Figure 1** depicts the scope of the SRP exercise on the Trinity. No SRP proposals would be submitted above the SWF reservoirs.

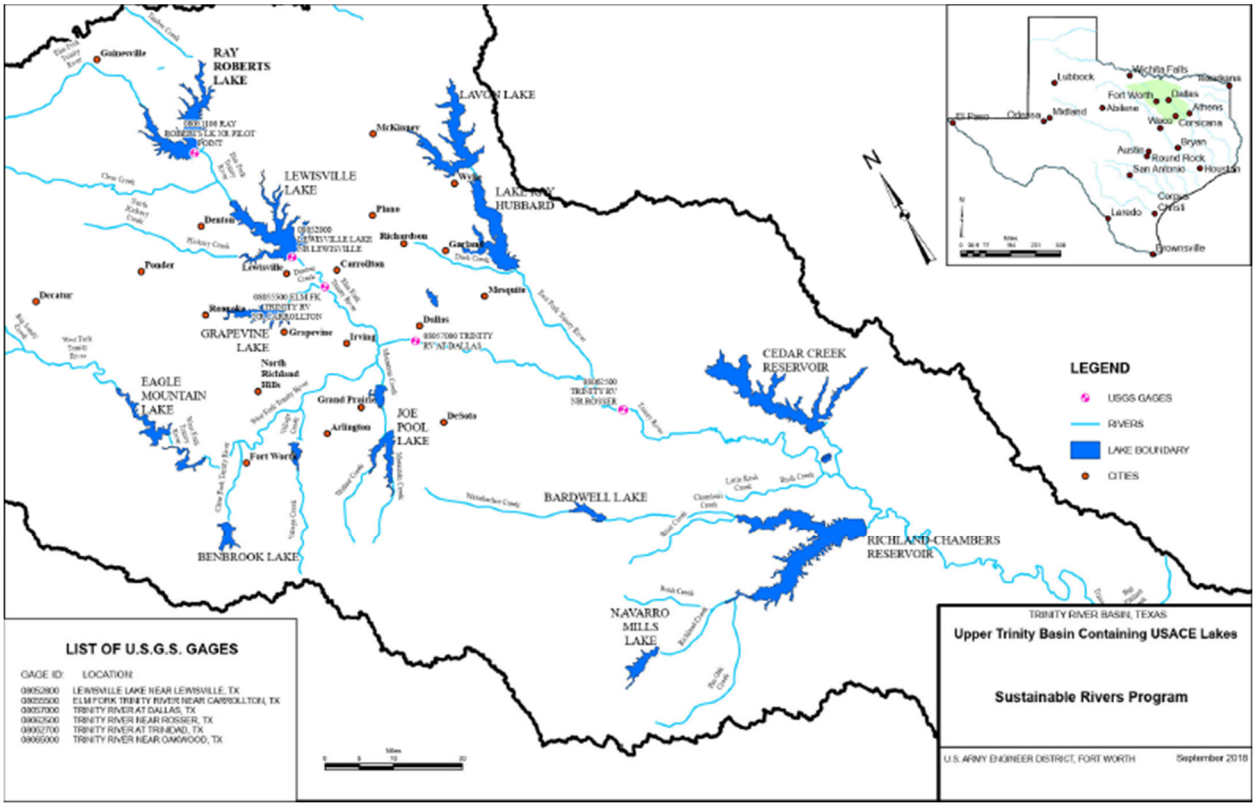

Figure 1. Map of the Trinity River.

Workshop

The workshop was conducted on October 4-5, 2023, at the Fort Worth District Office. A list of attendees participating in the meeting and their affiliation is provided in **Appendix A**.

The workshop was structured with a plenary session and two sessions of three breakout groups (Biological Resources; Water Management/Geomorphology/Water Quality; and Floodplain and Riparian Habitats). The first day's breakout session identified the focal flow-dependent elements associated with the specific resource, the challenges for the focal flow-related elements, and the opportunities that exist to address the challenges with flow management. In the second breakout session, participants continued to identify opportunities, data gaps, and research needs, and developed a list of actions that could be formed into SRP proposals. The agenda for the workshop can be found in **Appendix B** and the list of key questions used to facilitate the breakout sessions is provided in **Appendix C**.

Plenary Session

The plenary session started with Jerry Cotter (USACE, SWF, Chief of Water Resources) providing an overview of USACE programs that could be relevant to environmental opportunities in the basin, including Planning Assistance to States, Section 206 and 1135 Continuing Authority Programs, and General Investigation Ecosystem Restoration Studies. In addition, USACE presented on the Forecast Informed Reservoir Operations (FIRO) program that looks at using better weather modeling and forecasting to improve reservoir management. Although this program may not be implemented at the Trinity for several years, it was presented at the workshop with the other USACE programs so that participants could think about future needs that could be leveraged with the SRP.

Ryan Smith (TNC) provided an overview of the SRP on a national and state level. In particular, the Big Cypress SRP program in east Texas was used as an example of how the SRP could benefit lacustrine and riverine ecosystems in the Trinity. Danny Allen (USACE, SWF, Environmental Planning) provided context for the overall effort, detailing how the proposal for the workshop was initiated, the SRP proposal process, and schedule for future proposal submissions.

Presentations were also given by TWDB, TPWD, USACE Operations, and the River Authorities on their roles in river management and how they felt the SRP could fit into the water planning activities of the river.

Breakout Sessions

After the plenary session, attendees were invited to participate in one of the three breakout sessions: Biological Resources; Water Management, Geomorphology, and Water Quality; and Floodplain/Riparian Resources. Participants were also given the ability to move between breakout groups. At the conclusion of the breakout sessions, facilitators of each session reported on the key discussion points of their breakout to the rest of the group. There was a lot of overlap in the elements, challenges, and opportunities between the three groups. This is not unexpected as each of the three breakout topics are interdependent. A summary for each breakout group is provided below.

Biological Resources

During discussions on the first day, the Biological Resources breakout group identified potential opportunities, as well as challenges and issues, for biological benefits to be derived from SRP in the Trinity:

- Benefits primarily to tributaries -- Because the USACE dams in the Trinity basin are mostly in the tributary rivers, tributaries are where the most ecological benefit would be derived. The mainstem would likely not see a lot of effect of such operations and flow of the mainstem is normally elevated compared to historical flows due to return flows from water uses in the metroplex.

- River-reservoir connectivity, particularly in reservoirs such as Grapevine, Benbrook, and Ray Roberts -- An important aspect to consider in operations is maintaining connection of the reservoirs to the upstream rivers for species movement, including white bass runs (e.g., in Denton Creek).

- Erosion control -- Changes in hydrograph shape (i.e., from high, rapid peaks to lower, extended high flow periods) have contributed to changes in channel shape and bank erosion in some places in the basin; USACE needs to ensure that changes in operations do not exacerbate this. There have also been related issues and impacts on riparian zones that may be addressed through restoration programs. There has been some study in the Richland-Chambers system by TRWD and Baylor University and TRA has established study sites on the mainstem.

- System-wide perspective -- An area for further study may be to look at the whole reservoir system in the basin, including flood risk management operations, and identify any system-wide strategies that could result in ecological benefits.

- Data gaps in the tributaries --There are significant biological data gaps in many of the tributary reaches areas due to limited access for field studies and other factors.

Water Management, Geomorphology, Water Quality

All USACE lakes on the Trinity are on branches of the Trinity in the upper half of the Trinity River Basin upstream of Lake Livingston. Because of this, most of the upper Trinity is unmanaged, and large rain events can cause flooding without contributions of reservoir releases. In such an event, USACE reservoirs must hold water until flooding downstream resides or until their flood pools are full. If a Corps reservoir has more than 20% of its flood pool full, USACE will release the maximum amount of water it can from the reservoir without causing downstream flooding or damage to the dam. Once the flood pool is lowered to 10-20% full, releases will gradually taper off to smoothly transition to smaller conservation pool releases.

Generally, reservoirs close their gates once the conservation pool is reached. However, there are exceptions for USACE Lakes in the Trinity system. Benbrook Lake, Lewisville Lake, and Lake Grapevine all make releases for downstream water supply purposes. Benbrook Lake's water supply releases tend to be below 50 cfs, but more than half the time is a single-digit cfs release. Benbrook also requires an environmental release that ranges from 1-8 cfs depending on the time of year. Grapevine Lake has two

water users downstream. It makes a release for one user immediately downstream, which holds a 16 cfs flow. Lake Grapevine and Lewisville Lake feed the other water users and generally request releases in the 150-600 cfs range, with about two-thirds of those releases coming from Lewisville, but can be fed from a single lake if needed. Trinity River Authority can have releases made from Joe Pool Lake, but they are seldom exercised. Ray Roberts Lake feeds into Lewisville Lake when needed and has a 3-39 cfs environmental release depending on the time of year.

The Trinity River currently has multiple operational and climatological studies being performed within the watershed. Specifically, these are the USACE-sponsored Trinity Operations Study (TOS) and Climate Risk Informed Decision Analysis (CRIDA). TOS is studying different operational alternatives for USACE reservoirs within the Trinity watershed, including changes to Conservation Pool/Flood Pool boundary operations and development of a flexible Seasonal Rule Curve at select USACE reservoirs. CRIDA and FIRO could both result in loosening operations in the lower flood pool, possibly allowing operations to resemble conservation operations. These are all just possibilities that could ultimately result in little to no change.

Inter-basin transfers are also a factor in managing the Trinity. A system of pipelines pumps water from Tawakoni Lake to Lake Ray Hubbard to Lavon Lake; from Jim Chapman Lake to Lavon Lake; from Lake Texoma to Lavon; and from Lavon Lake to Lewisville Lake, moving water from the Sabine River Basin and the Red River Basin to the Trinity River Basin. A second system of pipelines pumps water from Lake Palestine to Cedar Creek Reservoir to Bardwell Lake; from Richland Chambers Reservoir to Bardwell Lake; and from Bardwell Lake to Benbrook Reservoir to Lake Bridgeport, which moves water from the Neches River Basin to the Trinity River Basin and recycles water lower in the Trinity to the upper end of the Trinity. These two pipeline systems introduce a significant amount of water into the upper Trinity River Basin that would not otherwise be there.

The upper half of the Trinity River Basin's geomorphology consists mostly of rolling hills and prairies with some brush and trees such as oak. Near the river, brush and tree density tends to greatly increase, which helps to reduce erosion. The riverbed soil has high amounts of sand and clay, which tends to succumb to erosion. The erosion helps to produce oxbows and can change the river's flow path.

The Trinity River is the most polluted river in Texas which is related to being the most populated river basin in Texas. That said, the river's water quality has been improving thanks to a consorted effort between municipalities, water districts, Trinity River Authority, and the Texas Commission on Environmental Quality. Wastewater treatment facilities have been converting organic nitrogen and ammonia to nitrite and nitrate -- a process that requires oxygen -- before releasing water back into the river, subsequently increasing the river's dissolved oxygen. Water quality is the worst in low precipitation periods when stream flow is low and dominated by wastewater treatment effluent and a small amount of stormwater runoff from urbanized areas. During these periods, the Trinity experiences lower dissolved oxygen levels; changes in pH levels; and algal and bacterial growth, including *E. coli*. There is also the presence of PCBs, chlordane, and pesticides, generally in small amounts, which have sometimes caused fish consumption advisories in four segments of the river.

Floodplains and Riparian

The Floodplain and Riparian breakout group identified floodplain connectivity as an important issue for the Trinity River. The connection of oxbows and backwater areas was deemed to be important for turtles and fish species that require backwater areas to complete their life cycle. Seasonal pulse flows were identified as an important factor in the connection of oxbows and backwater areas to the Trinity River that would facilitate this life requisite for these species.

Bank erosion was also identified as an issue with the floodplain/riparian breakout group. Any seasonal pulse flows should not exacerbate excessive erosion of the riverbanks. Land use practices within the adjacent riparian zones were identified as a potential solution to excessive erosion of the riverbanks.

Recommendations

The stakeholders in the workshop were divided on whether to pursue SRP actions at this time. Much of the discussion centered on whether a better approach would be to wait for the completion of other studies (e.g., re-regulation study, CRIDA, FIRO, etc.). The pursuit of a Trinity SRP study should be reconsidered once these other studies are complete and there are not as many variables that could alter the Trinity SRP study. Some possibilities for next steps that could be evaluated sooner than the completion of these studies include:

1. Conduct a basin-wide analysis of hydrologic regime, ecological information, existing assessments and studies (e.g., Environmental Flow Information Toolkit) and opportunities below each dam/tributary. The goal of this assessment would be to identify the potential ecological challenges/impacts below each dam, which would form the starting point for designing flow release changes for downstream benefits.
2. After step one above, select one (or two) dams to do a deeper dive on operational potential for e-flows with ecological benefit. The best possibilities to consider may be Lewisville, Grapevine, and maybe Benbrook.
3. Develop science projects to work on together, even if they aren't good fits for SRP funding. Ideas include modeling low flow habitat on the mainstem Trinity using a joint Lidar/field bathymetry approach or funding supplemental freshwater mussel studies to add to ongoing research and monitoring by TRA, Texas A&M, and TPWD.

Appendix A

List of Invitees/Attendees

Danny Allen	USACE
David Byczek	USACE
Matthew Whelan	USACE
Ryan Smith	TNC
Mark Wentzel	TWDB
Fouad Jaber	Texas A&M Agrilife
Kathy Jack	TNC
Blake Alldredge	UTRWD
Cody Graham	North Texas Municipal Water District
Jerry Allen	North Texas Municipal Water District
Suzanne Pierce	Texas Advanced Computing Center, University of Texas
Aaron Hoff	TRWD
Megan Paliwoda	City of Fort Worth
Nicole Rutigliano	TPWD
Adam Whisenant	TPWD
Semu Moges	Dallas Water Utility
Jai-W Hayes-Jackson	North Central Texas Council of Governments
Lisa Biggs	City of Fort Worth
Tom Hungerford	TPWD
Marty Kelly	TPWD

Appendix B

Brazos River SRP Workshop Agenda

Trinity River Sustainable Rivers Program Workshop Framework

Day 1

9:00	Welcome – Housekeeping	Danny Allen
9:10	Welcome – TNC Texas Leadership	Ryan Smith
9:15	Introduction to the Sustainable Rivers Program	Ryan Smith
9:30	Dallas Water Utilities	Denis Qualls
9:40	NTMWD	Galen Roberts
9:50	Tarrant Regional	Aaron Hoff
10:00	Upper Trinity Regional Water District	Blake Alldredge
10:10	Trinity River Authority	Mangham Webster
10:20	TWDB Presentation	
10:30	TPWD Presentation	Marty Kelly
10:40	FIRO/Jerry's Talk	Jerry Cotter
11:00	Operations of USACE Reservoirs – USACE	Matt/John
11:20	Workshop Objectives and Structure	Danny Allen
11:30	Questions/Discussion	
11:40-1:00	Lunch	
1:00	Intro to Break-out Groups	
1:10	Breakout Groups – Opportunities	

Biological Resources; Water Management/Geomorphology/Water Quality; Floodplains/Riparian

3:00	Report Out	
3:30	Discussion/Identification of Key Points	
4:00	Discussion of challenges/opportunities for operational changes	
4:30	Adjourn	

Day 2

9:00	Welcome – USACE Leadership	Colonel Calvin A. Kroeger
9:10	Introduction, review of Day 1, plan for Day 2	Danny Allen
9:20	Breakout Groups – Research Needs/Data Gaps	
	Biological Resources; Geomorphology/Water Quality; Floodplains/Riparian	
10:30	Report Out	
10:50	Discussion/Identification of Key Points	
11:10	SRP Proposal Matrix for FY22 Charge	
11:30	Conclusion	

Appendix C

Breakout Session Guidance Questions

Trinity River Basin SRP Workshop Break-out Sessions Agenda

Break-out 1 – Opportunities, Goals

- Introduction to the break-out session, discussion questions, what need to accomplish (5 min)
- Participant introductions (5 min)
- Questions/Discussion:
    - Do you have any clarification questions (e.g., on SRP, on the geographic scope of this project)?
    - What are the focal flow-related elements (e.g., flow-dependent biological elements for the biology group)?
    - What are the flow-related challenges to the focal elements? What components of the flow regime do they relate to (i.e., base flows, higher flow pulses)?
    - What opportunities exist to address the challenges with flow management?

Break-out 2 – Research Needs, Data Gaps

- Introduction to the break-out session, discussion questions, what need to accomplish (5+ min)
- Participant introductions (if we have new participants on Day 2) (5 min)
- Questions/Discussion:
    - Do you have any clarification questions?
    - What opportunities exist to address the challenges with flow management (continue from Day 1 break-out session if needed)?
    - What research needs are there?
        - Note: these are research items needed to inform flow management changes to improve our focal elements, that could inform supplemental flow recommendations
    - Building off from the SB3 workplan, what research/monitoring items are needed to inform our understanding of the ecosystem benefit of tweaking the lower end of the flood pool? And, can these be formed into SRP proposals? Could they be better suited to other Corps authorities/funding sources?