Sustainable Rivers Program

In Progress Review

FY 2024

US Army Corps of Engineers

The Nature Conservancy

1/21/2025

Prepared for U.S. Army Corps of Engineers, The Nature Conservancy, and other organizations involved with Sustainable Rivers

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Overview

The Sustainable Rivers Program (SRP) is a national partnership between the U.S. Army Corps of Engineers (USACE) and The Nature Conservancy (TNC). The mission of SRP is to improve the health and life of rivers by changing dam operations to restore and protect ecosystems, while maintaining or enhancing authorized uses and other project benefits.

SRP began in 1998 with an initial collaboration to improve the ecological condition of Green River, Kentucky. The SRP was formally established in 2002 and involved eight river systems. At the end of fiscal year (FY) 2024, SRP worked in 25 USACE districts and 7 divisions. Individual projects affect more than 90 USACE reservoirs, 50 rivers, and 13,000 river miles (RMs) (Figure 1). This growing program is the largest scale and most comprehensive program for implementing environmental flows (e-flows) below USACE reservoirs. Twelve new rivers joined the SRP in FY 2024: Cherry Creek; the Tennessee-Tombigbee Waterway; and the Chattahoochee-Apalachicola, Coosawattee, Cumberland, James, Kootenai, Mississippi (Pool 10), Neuse, Nolin, Rough, and Tule rivers.

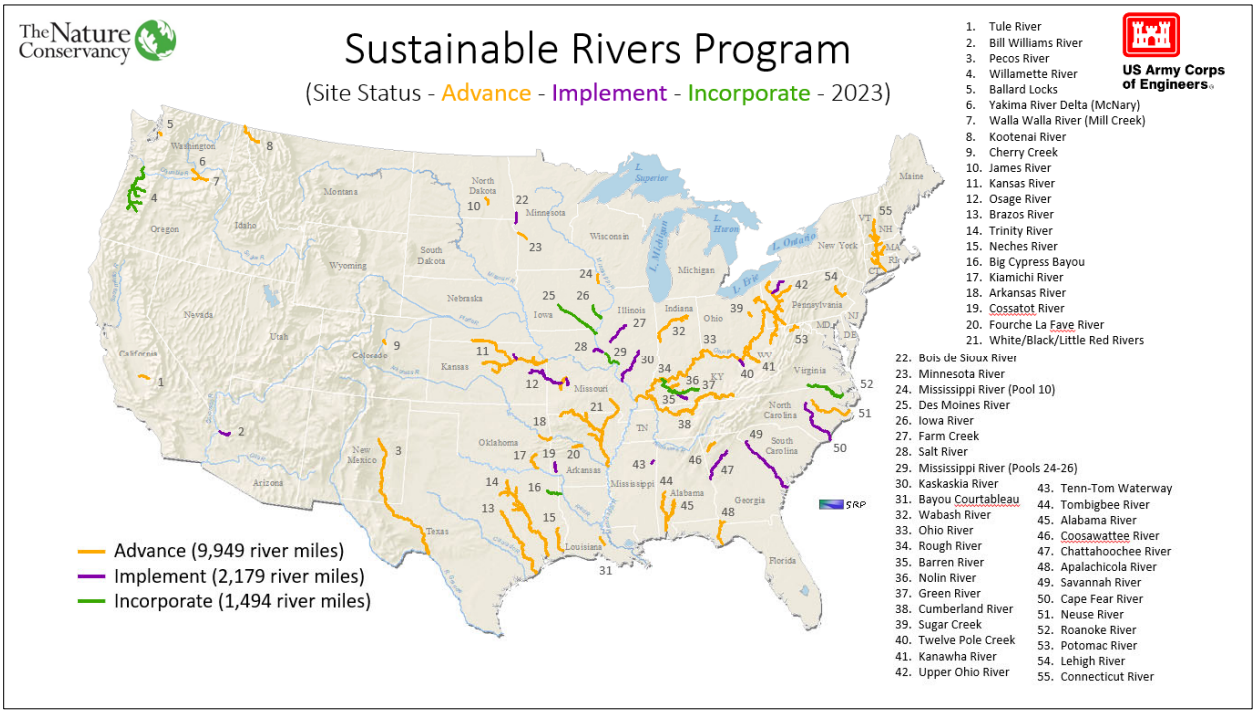

Figure 1. Status of rivers engaged in the Sustainable Rivers Program at the end of fiscal year 2024.

E-flows are defined as the quantity, timing, and quality of water flows required to sustain ecosystems. For reservoir operators, e-flows manifest as management decisions manipulating water and land-water interactions to achieve ecological or environmental goals.

The SRP multi-step process for e-flows has three key phases: advance, implement, and incorporate (Figure 2). Advancing e-flows involves engaging stakeholders in a science-based process to define the flow needs of riverine ecosystems. Implementation involves testing the effectiveness and feasibility of the defined flows. Incorporation involves including e-flow strategies in reservoir operations policy, such as water control manuals (WCMs). The founding objective of SRP is searching for e-flow opportunities at

general multiple purpose reservoirs with storage space for flood risk management and other conservation purposes. This objective remains a key focus of the program. In recent years, the SRP began exploring other reservoir-oriented actions with potential to produce environmental benefits. SRP initiatives have expanded to explore opportunities for environmental pool level management and actions to modify the land/water interface to provide environmental benefits.

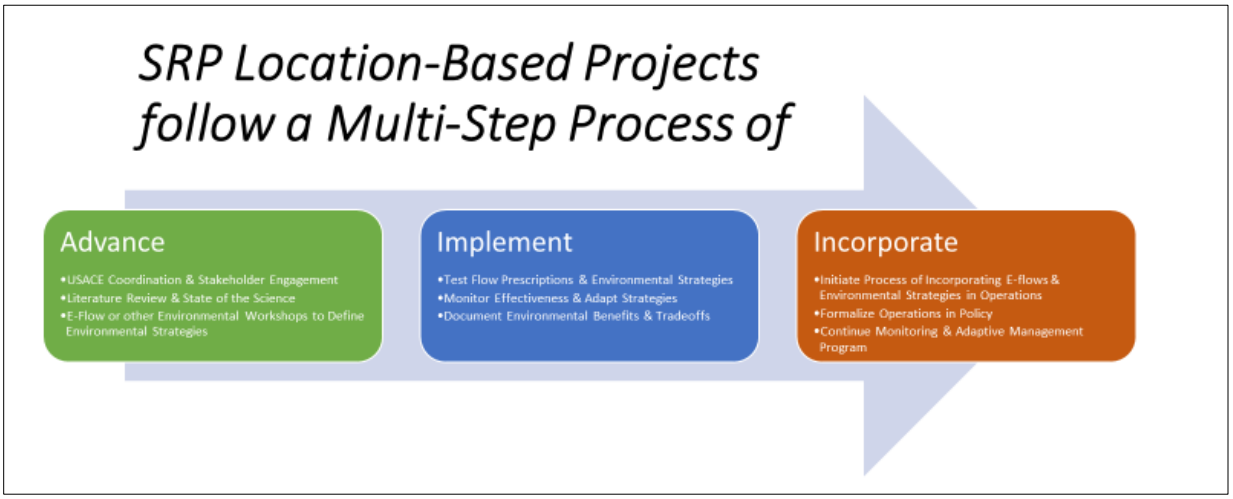

Figure 2. Sustainable Rivers Program location-based process.

As in previous years, SRP funds will be used to accomplish a combination of programmatic and location-based work in accordance with the following principles: 1) build capacity within the water management community to implement environmental strategies with little or no direct funding from SRP, 2) engage partners to focus on sustainability and avoid conflict, and 3) advance innovative efforts to implement environmental strategies.

In broad terms, programmatic work focuses on how best to generate more environmental benefits from water resources infrastructure while location-based work focuses on advancing, implementing, and incorporating environmental strategies at specific facilities. The two are complementary with each generating new ideas, honing SRP methods, and demonstrating the benefits of environmental actions.

Ideas for programmatic work originate from and are shaped by several influences. Regional and national SRP meetings, other USACE programs, strategic directions of SRP's governmental and non-governmental partners, and especially interactions with and commonalities amongst location-based work teams are all important sources. Staff involved with SRP programmatic support refine and initiate ideas.

This document details status of SRP programmatic and location-based work and provides short backgrounds, FY 2024 progress, proposed FY 2025 work, and future visions of active SRP projects. In addition, four projects are highlighted as a distinct category of SRP programmatic work: SRP-Science. Project updates were compiled based on communications with SRP teams and supporting information. Appendix A summarizes metrics that tally outreach and ecological impacts of SRP. Appendix B includes deliverables and milestones for location-based work. Appendix C provides a summary of funding and expenditures for FY 2024. Other information and publications are available online at: https://www.hec.usace.army.mil/sustainablerivers/ and https://www.nature.org/en-us/what-we-do/our-priorities/protect-water-and-land/land-and-water-stories/sustainable-rivers-project/, respectively.

SRP Highlights

The SRP budget decreased from $7 million in FY 2023 to $5 million in FY 2024. The SRP program added 12 new sites in FY 2024: Cherry Creek; the Tennessee-Tombigbee Waterway; and the Chattahoochee-Apalachicola, Coosawattee, Cumberland, James, Kootenai, Mississippi (Pool 10), Neuse, Nolin, Rough, and Tule rivers. The location-based teams provide some of the most exciting aspects of the program each year and FY 2024 was no exception. Many teams executed e-flow and stakeholder workshops helping identify environmental actions driving SRP growth.

Three SRP location-based sites transitioned to the implementation phase of their e-flows programs: the Kansas, Osage, and Tenn-Tom rivers. The Mississippi River (Pools 24-26) site advanced to the incorporate phase. Seven sites held workshops to identify and hone environmental strategies for their rivers. Three regional operations and water management meetings were held, thereby completing a national review of actional environmental ideas for all operable USACE water resources infrastructure in the United States that was initiated in 2019.

Work continued on refinement of a metrics framework for SRP (Figure 3) to better encourage communications, applicability, and accuracy across the SRP, including across sites and types of environmental actions supported (e-flows, Environmental Pool Management [EPM], and physical habitat improvement; Appendix A).

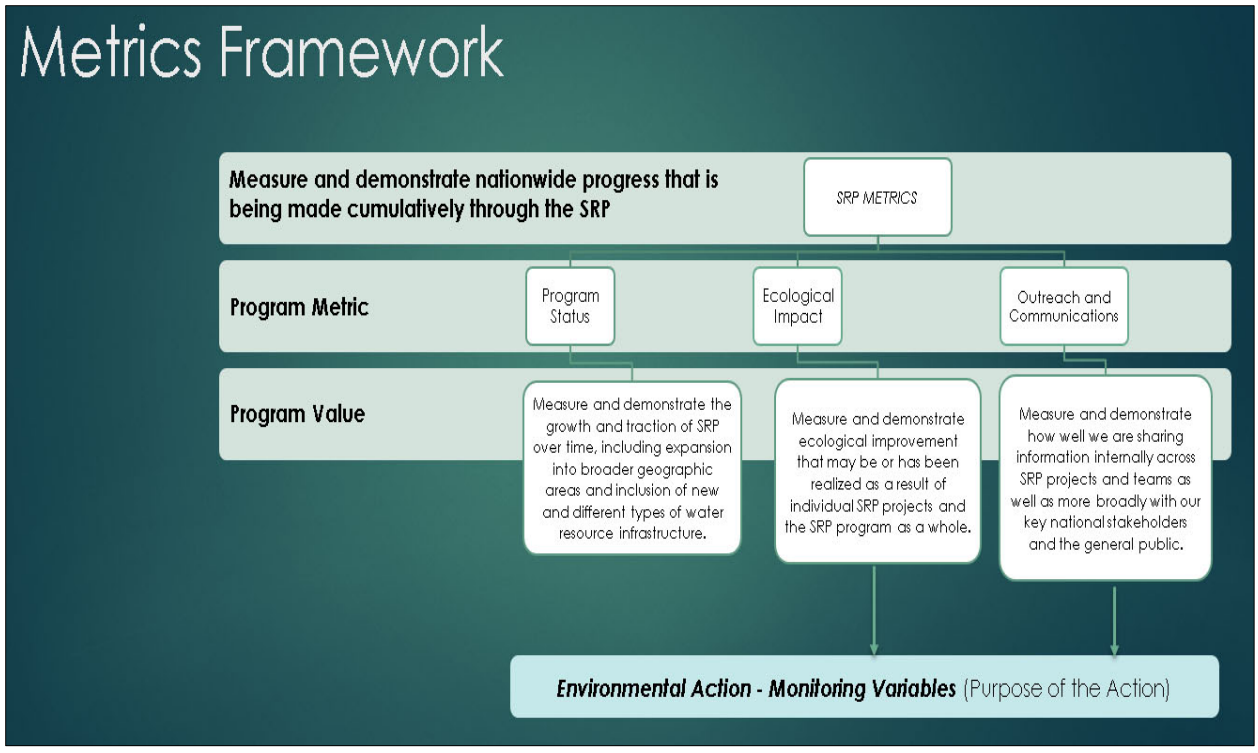

Figure 3. Metrics framework for the Sustainable Rivers Program.

Programmatic Work

Programmatic work in FY 2024 comprised program support, technologies, and validation of environmental strategies.

Program Support

Program support includes administration of the program, partner engagement, capacity building, and assistance for location-based efforts (outreach, implementation, and innovation). Program support is key to understanding and communicating the portfolio of structures involved (distribution and relevant characteristics of structures) and the spectrum of possible environmental actions (enabling setting and other considerations). Programmatic work includes administration of the program, engaging partners, capacity building, and assistance for location-based efforts. In FY 2024, SRP organized three regional meetings—South Pacific, Lakes and Rivers, and Pacific Ocean Regional Operations and Water Management—where twelve USACE districts worked to identify potential environmental opportunities. Collectively, these regional meetings identified 100 actionable environmental ideas.

Technologies

Technologies includes investments in ecological and water resource software applied broadly within Sustainable Rivers as well as technical support for software applications led by location-based teams. Software enhancements benefit SRP modelers and others using the tools for ecological applications. Ongoing technologies efforts include ecological software development - including formulation of ecosystem management alternatives, ecological time series analyses, and spatial habitat mapping - and engineering software development - including water quality modeling.

Formulation of River Management Alternatives

Environmental strategies promoted by SRP generate environmental benefits by changing the operation of water resource infrastructure. The “advance, implement, and incorporate” process described above is the overall plan that guides SRP work. As part of the advance phase, groups of scientists, engineers, water managers, operators, and stakeholders work together to formulate alternative ways to manage the infrastructure and associated aquatic systems.

Several software are used during alternative formulation, including the Regime Prescription Tool (HEC-RPT). RPT is a communications tool that contributes to the early stages of planning by formalizing ideas and expert knowledge into alternatives that are easily visualized and considered in more detailed modeling tools. Contributions of RPT to the formulation process include simple navigation and visualization of hydrologic data, tracking of hydrologic condition, electronic creation and shaping of alternatives, documentation of justifications and uncertainties associated with alternatives, simple comparisons of alternatives from different management perspectives, and assistance with integrating different perspectives into a single unified alternative.

RPT is used by SRP location-based teams during definition of environmental flows and is a key facilitation software for environmental flows, environmental pools, and adaptive management workshops. Recent applications generated development ideas for the software, including more user control of ordering spatial locations and focal ecosystem aspects, added user control of hydrologic time series display, custom displays of alternatives per location and hydrologic condition, alternative formulation in terms of elevations and stages in addition to flows, and alternative formulation in user-

specified data types and units. These enhancements are being supported by SRP to improve program capabilities during alternative formulation. In FY 2024, developmental versions of RPT were used by the Osage, Neches, Brazos, and Fourche La Fave river teams. RPT 3.0 was released in September 2024 (https://www.hec.usace.army.mil/software/hec-rpt/).

Ecological Time Series Analyses

Time series analyses are a fundamental part of technical support for a wide range of ecological projects and are used throughout the SRP process. During the advance phase, time series analyses are used to assess hydrological and ecological status and trends. During implementation, time series analyses are used to explore alternatives that are not easily done and monitored in real-world operations. During incorporation, time series analyses are used to measure the degree of adherence to operational alternatives and, ultimately, to reassess status and trends of new ecological trajectories.

Two software that are commonly used by SRP teams to perform time series analyses are the Indicators of Hydrologic Alteration (IHA) and the Ecosystem Functions Model (EFM). Both statistically assess time series to gain insights about an array of ecosystem dynamics with the fundamental goal of supporting restoration and stewardship of managed aquatic systems. EFM applications in support of SRP are diverse, ranging from statistical assessments of historical hydrologic conditions to modeling ecosystem responses to ecologically designed outflows from reservoirs.

SRP is supporting EFM enhancements that enable use of multiple variables to assess ecological conditions. This multivariate approach, where condition can be based on combinations of variables such as water depths, velocities, and temperatures, allows for more complex time series analyses investigating connections between operational decisions and ecosystem responses. Multivariate features are ready for use. EFM and EFM Plotter, a software that displays outputs of ecological time series analyses performed by EFM, were entered into the HEC review process for public release in July 2024.

Spatial Habitat Mapping

Habitat mapping is performed in support of ecosystem restoration projects, habitat conservation plans, and investigations related to species of interest. It is also an effective platform for communications, producing visual displays of habitat distributions, connectivity, and sometimes functionality across landscapes or within aquatic systems. Habitat mapping is less common than and often lags time series analyses and alternative formulation in the SRP process, but the approach has excellent potential as an information source for ecosystem restoration and management and to further inform development of alternatives and communication of expected benefits.

As a spatial endeavor, habitat mapping is underpinned by geographic information systems (GIS). The Environmental Systems Research Institute, Inc. (ESRI) produces several GIS software as part of the Arc suite of tools. GeoEFM is a spatial accessory for EFM programmed to work with Arc software and offers several features related to management of spatial data sets, computation and comparisons of habitat areas, and assessment of habitat functionality.

SRP supports GeoEFM enhancements for features allowing users to generate habitat suitability maps, display spatial statistics, and assess habitat functionality in terms of how much habitat and the configurations of habitat members of ecological communities need to survive and reproduce. These

habitat mapping features are ready for use. GeoEFM 2.0 was released in August 2024 (https://www.hec.usace.army.mil/software/hec-geoefm/).

Ecological Population Dynamics

The mission of SRP is to improve the health and life of rivers by changing water infrastructure operations to restore and protect ecosystems. Conceptually, improved operations for the environment should lead to more robust populations of plants, birds, fish, and other involved ecological communities. Practically measuring and understanding population dynamics can be difficult, especially in cases where populations are influenced by multiple variables and ecological responses can require years to complete.

In restoration ecology, population models are used to simulate and gain insights to population dynamics though ecological models tend to have some common weaknesses. The majority of ecological models are site-specific and single use. Ecological models are seldom applied to the geographical areas, periods of record, and levels of ecological detail necessary to comprehensively simulate ecological resources. Most do not connect sequences of events for time periods longer than one year, which limits insights to long-term ecosystem dynamics.

SRP is supporting a new software platform designed to help with these limitations by applying data and computer resources at scale to simulate ecological dynamics. It is primarily a software to simulate populations. Applications are inherently spatial, and the software includes embedded GIS capabilities that are applied for model inputs, computations, outputs, and visualizations. The software allows users to create and characterize ecological communities that are simulated in a virtual environment where they interact with that environment, themselves, and each other. The initial version of the software, called EFMSim, entered the HEC review process for public release in September 2024.

Real-Time Water Quality Modeling

The single largest investment of SRP FY 2024 funds involved development of engineering software, specifically adding water quality (WQ) modeling to a reservoir system simulation model, HEC-ResSim. HEC management directed the use of SRP funds to support this effort. The software effort progresses and promotes environmental sustainability at reservoirs. WQ modeling is critical due to its direct impact on drinking water, water treatment, public safety, and the economy. It also improves the safeguarding against accidental and intentional contamination. These funds allowed for important bug fixes and improvements to the WQ module and major progress towards integrating WQ into the real time modeling platform.

Science (Validation)

The success of SRP is a function of ecological improvements in river health, which are of key importance to gage. The health of a natural system is very difficult to measure due to uncertainties in understanding ecological concepts, changing influences of water management, and time required for ecological responses to become measurable. Through SRP-Science, SRP seeks to cultivate scientific understanding of the connections between reservoir operations and ecosystem responses for select rivers in unique ecoregions around the United States. Development of scientific knowledge is leveraged through implementation of e-flow prescriptions at SRP sites, which alters land-water interactions thereby stimulating ecosystem responses that can be studied and quantified using field monitoring protocols and analysis. If operational changes are studied, resulting knowledge can be used to improve

prescriptions and perpetuate a culture of adaptive management, both locally and more broadly across USACE, as results are shared. Monitoring does not need to be exhaustive to be effective and requires constructive, informative, and timely guidance from science practitioners to dam operators.

SRP-Science began in FY 2020 and continues with funding of four regional efforts, including the Des Moines River, North Carolina rivers (Cape Fear and Roanoke), Upper Ohio River Basin (Allegheny River), and Willamette River. These current studies and adaptive-management efforts are intended to promote implementation of environmental strategies at reservoirs across USACE by reducing uncertainties about flow-ecology responses and quantifying and communicating benefits of e-flows. Additional rivers may be included in SRP-Science in the future as new opportunities for learning and transferability come to light.

Des Moines River, Iowa (Sustainable Rivers Program–Science)

SRP-Science activities on the Des Moines River and Lake Red Rock include agreements with the United States Geological Survey (USGS) Cooperative Research Unit at Iowa State University (ISU) and partnerships with the Iowa Department of Natural Resources (IDNR) fisheries, Rock Island District (MVR) Operations, the MVR Water Control Center, the Engineering Research and Development Center (ERDC), Ecosystem Management and Restoration Research Program (EMRRP), and Engineering with Nature (EWN) program. Field work began in 2021 to evaluate how dam operations can influence fish recruitment below the Red Rock Dam. The effort created momentum with partnering agencies and resulted in the Iowa DNR conducting fish recruitment studies on the lower Des Moines River that focus largely on sturgeon spawning.

In FY 2024, SRP-Science work on the Des Moines River focused on nitrate dynamics for Saylorville Reservoir, located upstream of Lake Red Rock and upstream of the City of Des Moines. Past studies show nitrate-nitrogen concentrations in rivers are reduced as water flows through reservoirs. For example, at Lake Red Rock, the Des Moines River created a delta of sediment within the pool that is periodically inundated by changes in reservoir stage. Using a combination of sediment sampling, laboratory assays of nitrate loss measurements and satellite imagery mapping, the amount of nitrate lost with various amounts of land area inundation within the delta was quantified. Results indicated that raising pool elevations to inundate more of the delta would result in nitrate losses equivalent to installing nearly 650 edge-of-field practices in the watershed.

The Des Moines River is a critical resource for the City of Des Moines, providing water supply, recreation opportunity, and connection with nature. Like Red Rock, Saylorville Reservoir contains a delta that is regularly flooded by changes in reservoir stage. Research is needed to assess the potential for pool management in Saylorville Reservoir to reduce downstream nitrate concentrations in the Des Moines River. Efforts to reduce nitrate concentrations in Saylorville Reservoir have local and regional ecological consequences. The State of Iowa is the largest state contributor of nitrate to Gulf of Mexico hypoxia. The three USACE flood control reservoirs in Iowa already reduce state-wide nitrate loads by roughly eight percent without any prescribed operations to that effect. Actively managing reservoir stage for nitrate reduction at Saylorville is expected to produce additional ecological benefits by decreasing nitrate loads delivered to sensitive downstream ecosystems. Integrating active pool management for nitrate reduction with the current ecological goals of provision of habitat and forage for wildlife and migratory waterbirds will be an important output for this work.

North Carolina Rivers, Virginia and North Carolina (Sustainable Rivers Program–Science)

The Roanoke and Cape Fear rivers in North Carolina have been involved with SRP-Science since FY 2020. The Roanoke River is one of the original rivers in SRP and is now in the incorporate phase of the process. In 2016, the WCM was amended to allow for quasi-run-of-river operations when USACE enters flood operations. Building on the momentum of the Roanoke River, the Cape Fear River was added to SRP in FY 2017. The Cape Fear River is in the implement phase of the SRP process, actively conducting and monitoring e-flow releases.

Their status in the SRP process and semblance to other Atlantic coastal plain rivers make the Roanoke and Cape Fear compelling candidates for scientific exploration. SRP-Science efforts in these two rivers entail formal work with the USGS across four topics: creating a long-term adaptive management plan for both rivers, learning about bank stability after high flows on the Roanoke River to learn how to reduce the stress on the system with the new operational flexibility, studying algal blooms and water quality in relation to flows using advanced technologies and techniques, and investigating how climate change is influencing the timing and magnitude of inflows into reservoirs.

The Roanoke River is considered one of the most important riverine systems for diadromous fish reproduction on the Atlantic seaboard. In 2021, the Corps and TNC launched an environmental DNA (eDNA) effort to sample multiple locations in the river for juvenile alosines in relation to flow and habitat. FY 2024 SRP-Science work for the Roanoke is a continuation and expansion of the eDNA work to also assess the movement of sturgeon, another endangered and economically important diadromous fish in the Roanoke River. In collaboration with TNC, USACE, North Carolina Wildlife Resources Commission (NCWRC), and Department of Marine Fisheries, water samples for eDNA analyses are being collected and evaluated for eDNA abundance trends in relation to river flow conditions. Results will be compared with fish counts and juvenile/larvae surveys to determine how eDNA correlates with flow and presence of both life stages in a broader context. Methodology and results will provide a framework that can be incorporated into long-term monitoring plans both in the Roanoke River and other critical watersheds of diadromous fish. This work also advances development of eDNA methodologies related to management of rivers nationwide.

Upper Ohio River, Pennsylvania (Sustainable Rivers Program–Science)

The Upper Ohio River basin contain both warm- and cold-water world class fisheries as well as many mussel beds with multiple Federally endangered species. Through the SRP, TNC and USACE evaluated how the operation of reservoirs in the basin have changed the natural flow regime.

In FY 2023 and FY 2024, and in alignment with defined e-flow recommendations, spring pulses of water from Kinzua Dam to the Allegheny River were released to mimic the natural hydrologic frequency, magnitude, and duration of spring rain events. Implementation of this spring pulse enhances riverine habitat through disturbance processes (sediment, detritus, seed movement, etc.) and provides environmental cues for aquatic life.

SRP-Science work focuses on characterizing the effects of altered flows on downstream flow-sensitive ecosystems. Past work includes geomorphology and mussel surveys. In FY 2024, SRP-Science work focused on collecting topographic data for use in river hydraulics and ecological models (HEC-EFM) that will be applied to predict flow-related effects on freshwater mussels and riparian and submerged aquatic vegetation at various river stages. Ultimately, decision support tools incorporating habitat

suitability criteria will be constructed from this data using HEC-EFM to evaluate flow release criteria and demonstrate how these technologies can be used to help inform water management in the region.

Willamette River, Oregon (Sustainable Rivers Program–Science)

Through SRP, USACE and TNC worked together to determine e-flow requirements downstream of USACE dams in the Willamette River Basin and identified opportunities to restore key aspects of the natural flow regime. SRP-Science efforts were initiated to assess implementation of e-flow targets in the Willamette River Basin, evaluate ecological implications of flow objectives, and develop communication products that can support the implementation and adaptive refinement of prescriptions for the basin and other watersheds.

Past efforts focused on development of a simple, streamlined process for annually reporting SRP e-flows implementation and monitoring connections between sediment transport and benthic macroinvertebrate populations. In FY 2024, work focused on leveraging river hydraulic models to better quantify inundation (relating flow to wetter perimeters) of side channels and floodplains, which provide important habitat for fish and other aquatic species. Inundating these features is a common goal of many of the Willamette e-flow targets, however, there is significant uncertainty regarding at what flows these features are activated.

Using existing models as a starting point, the project is evaluating how closely e-flow targets align with modeled inundation and thus informing whether existing flow targets need re-evaluation and updating. Model results would likely span the range of very low flows up to bankfull stage. Historical event flows would be used for calibration and verification purposes. Hardware could be used to collect verification and calibration data. This work is anticipated as an important ecological complement for river hydraulics models developed and calibrated primarily to simulate high flows.

Location-Based Work

SRP identifies and executes location-based work via the following process: 1) evaluate program objectives and topics of interest, 2) highlight objectives and topics as part of a request for proposal (RFP), 3) compile and prioritize responses, 4) scope priority tasks, 5) arrange funding and other logistics, and 6) perform work. The annual In-Progress Review (IPR) reports summarize status, including work completed in each FY and anticipated work in the coming FY for those funded projects. IPR reports are available at https://www.hec.usace.army.mil/sustainablerivers/publications/.

In FY 2024, one SRP location-based RFP was announced. The SRP received and reviewed 62 proposals on behalf of 40 rivers - including 23 proposed rivers that would be new to SRP - and funded 28 teams.

This section is organized alphabetically by river team funded as shown in Table 1. Subheaders are titled according to “river name (facility), state abbreviation – district abbreviation (infrastructure type)”. Infrastructure type is “Gen” for general multi-purpose reservoirs or “L&D” for locks and dams. Water infrastructure that do not fit either of those categories (e.g., diversions) are included in “Gen”. The “Other Sustainable River Program Accomplishments” section of this report includes accomplishments for previously funded efforts.

Table 1. Fiscal year 2024 location-based efforts.

SRP Supported Rivers (facilities) – FY 2024	District Name
Alabama River (Claiborne and Millers Ferry locks and dams)	Mobile District (SAM)
Bayou Courtableau (Henderson Lake)	New Orleans District (MVN)
Brazos River (multiple reservoirs)	Fort Worth District (SWF)
Chattahoochee River (Buford Dam and Seminole Lock and Dam*)	Mobile District (SAM)
Cherry Creek* (Cherry Creek Dam)	Omaha District (NWO)
Clarion River (East Branch Dam)	Pittsburgh District (LRP)
Coosawattee River* (Carters Dam)	Mobile District (SAM)
Cumberland River* (multiple reservoirs)	Nashville District (LRL)
Des Moines River (Saylorville and Lake Red Rock)	Rock Island District (MVR)
Fourche La Fave River (Nimrod Dam and Lake)	Little Rock District (SWL)
Green, Nolin*, and Rough* rivers (Nolin and Rough lakes)	Louisville District (LRL)
James River* (Pipestem Dam)	Omaha District (NWO)
Kansas River (multiple reservoirs)	Kansas City District (NWK)
Kaskaskia River (multiple reservoirs)	St. Louis District (MVS)
Kootenai River* (Libby Dam)	Seattle District (NWS)
Licking River* (Cave Run Lake)	Louisville District (LRL)
Mississippi River* (Lock and Dam 10)	St. Paul District (MVP)
Mississippi River (Locks and Dams 24-26)	St. Louis District (MVS)
Mississippi River (multiple reservoirs)	St. Louis District (MVS)
Neuse River* (Falls Reservoir)	Wilmington District (SAW)
Osage River (multiple reservoirs)	Kansas City District (NWK)
Rio Grande (multiple reservoirs)	Albuquerque District (SPA)
Salt River (Clarence Cannon Dam)	St. Louis District (MVS)
Stones and Cumberland rivers (Old Hickory and J. Percy Priest)	Nashville District (LRN)
Tombigbee River* (multiple reservoirs)	Mobile District (SAM)
Tule River* (Lake Success)	Sacramento District (SPK)
Upper Ohio River (multiple reservoirs)	Pittsburgh District (LRP)
Wabash River (multiple reservoirs)	Chicago District (LRC)

* New location-based effort in FY 2024

Alabama River (Claiborne and Millers Ferry), AL - SAM (LD)

The Mobile River basin includes the Alabama and Tombigbee rivers which join to form the Mobile River, which then flows for approximately 45 miles to the Gulf of Mexico. Rivers in the basin support a high diversity of aquatic species (fishes, mussels, amphibians, and reptiles) and bottomland habitats. The Alabama River alone supports more than 180 fish species with a relatively high proportion of endemic species. Claiborne and Millers Ferry Locks and Dams are located on the Alabama River at river miles 72.5 and 133, respectively. These are the lowermost dams on the Alabama River and are operated by the USACE Mobile District, with authorized missions for hydropower (Millers Ferry), navigation, recreation, and fish and wildlife conservation. Under current operations only a small number of fish are able to pass over Claiborne Lock and Dam during flooding and none can pass over Millers Ferry Lock and Dam. Due to

the low number of commercial lockages, Claiborne and Millers Ferry locks and dams were identified for study to improve operations for migratory fish passage within the Mobile River Basin.

SAM has assembled an interdisciplinary team comprised of USACE personnel, federal, state, and non-government entities. Past work supported by SRP included gathering and assessing baseline data on operations and ecological conditions in FY 2023. As a result of this effort, the team recommended evaluation of a twice per day lockage accompanied with feeding within the lock chamber.

Status of Fiscal Year 2024 Work

In FY 2024, Mobile District continued collection of ecological data and began evaluating alternative operations. Mark-recapture methods were utilized to evaluate lockage efficiency.

Anticipated Work in Fiscal Year 2025

A submittal was approved for FY 2025 to conduct a final monitoring and implementation year at Millers Ferry L&D. In October 2024, the team completed the FY 2023 and FY 2024 monitoring reports and compiled results in preparation for FY 2025 work.

Future Vision

The project plans to complete operational evaluations in FY 2025 with results informing an updated Standard Operating Protocol (SOP) for conservation lockages at the L&Ds on the lower Alabama River.

Bayou Courtableau (Henderson Lake), LA - MVN (Gen)

The Atchafalaya River Basin is one of the most ecologically important places in the country with a complex system requiring thoughtful interventions that balance multiple constraints. The SRP Atchafalaya project team spent 2021–2022 compiling science and evaluating multiple structures in the basin for opportunities. Throughout 2022, the team looked at multiple existing water control structures in the Atchafalaya River Basin to identify opportunities to modify current flows, within the structures' existing authorizations, to improve downstream ecological conditions in areas that could serve as a learning ground for other control structures in the Atchafalaya. The team identified Bayou Courtableau as a potential structure that could be studied and re-operated to improve the downstream Henderson Lake.

The Bayou Courtableau Basin is about 50,000-60,000 acres and is hydrologically separated from the rest of the Atchafalaya River Basin. Bayou Courtableau historically flowed naturally into the Atchafalaya River prior to the construction of the West Atchafalaya River Basin Protection Levee (WABPL). The Bayou Courtableau Control Structure was built as a part of the WABPL construction to regulate flow into the Atchafalaya River. During the wet winter months, when the Bayou Courtableau structure is open, excessive water from the North (via Bayou Cocodrie, Bayou Little Teche, and Bayou Teche) flows through the Bayou Courtableau Control Structure and down the Grimmet Canal into the Atchafalaya River Basin towards Henderson Lake. In total, these inflows affect about 50,000-60,000 acres of the Atchafalaya River Basin. Yet, the hydrology of these flows is not conveying as expected with water being stunted as it moves through the Bayou Courtableau Structure. As a result, the stunted conveyance of water creates environmental issues in Henderson Lake and the surrounding areas in the Atchafalaya River Basin. For example, areas downstream toward Henderson Lake experience water issues such as

low dissolved oxygen (DO), decreased fish and wildlife habitat including for crawfish that support the largest fishery in the basin, and overall decreased health of the surrounding floodplain vegetation.

In FY 2023, the SRP funded efforts were focused on using the Bayou Courtableau structure to familiarize the Atchafalaya River Basin stakeholders with the science and process of looking for environmental opportunities to improve conditions. The Atchafalaya River SRP team engaged USACE, TNC, the Governor's Office of Coastal Activities, and the Louisiana Coastal Protection and Restoration Authority (CPRA) through three teams: Core Management Team, Science Team, and Stakeholder Team. The core management team for the project includes the district, state partners, and TNC. The team confirmed the Bayou Courtableau Control Structure should be studied and have operations reevaluated to improve the downstream Henderson Lake. The Stakeholder Team established an initial stakeholder engagement strategy and stakeholder list and continued to refine stakeholders with the narrowed focus of the Bayou Courtableau and Lake Henderson areas of the Atchafalaya River Basin. After gaining support and valuable input from these three groups, the Corps continued moving forward with field data collection and modeling efforts.

The goal of this SRP task is to work within the current authorizations of water control structures in the Atchafalaya Basin Floodway to perform and monitor experimental environmental flow(s) within four years to see if environment improvements can be realized. The proposed flow will incorporate considerations for navigation and flood risk reduction, in alignment with existing authorizations.

Status of Fiscal Year 2024 Work

The team continued to engage with stakeholders in the area to better understand concerns, ongoing work, planned future work, proposed work, and the overlap between their efforts and the work to be conducted under the SRP Bayou Courtableau effort, including meetings about fisheries in the Atchafalaya Basin. Stakeholders were made aware of existing monitoring being conducted in the area near Henderson Lake. The team heard firsthand from fisherman, landowners, and recreational users about the condition of the ecosystem.

The science team worked with an engineering contractor performing hydraulics and hydrology (H&H) modeling for the Henderson Lake area. The team communicated with other teams conducting work in the area and leverages data recently collected.

Anticipated Work in Fiscal Year 2025

MVN submitted a new SRP proposal for FY 2025 to conduct an e-flows workshop at the Old River Control Structure. The team will complete remaining work on the Bayou Courtableau effort but has not proposed implementation at this structure for FY 2025.

Future Vision

MVN continues to look for opportunities to implement e-flows in the Atchafalaya Basin for both the Bayou Courtableau Structure and Old River Control Structure.

Brazos River (multiple reservoirs), TX - SWF (Gen)

The headwaters of the Brazos River start near the Texas-New Mexico border north and west of Lubbock, Texas, and flow 1,280 miles to the Gulf of Mexico near the city of Freeport. The Brazos River basin encompasses approximately 16 percent of the land area of Texas, including all or part of 70 counties,

stretching across more than 42,000 square miles. The Brazos River begins at the confluence of the Salt Fork and Double Mountain Fork and major tributaries include the Clear Fork of the Brazos, the Paluxy River, the Bosque River, the Little River, Yegua Creek, the Nolan River, the Leon River, the San Gabriel River, the Lampasas River, and the Navasota River.

Nine USACE reservoirs are located within the Brazos River basin, one of which is located on the mainstem of the river (Lake Whitney). The remaining reservoirs include: Aquilla Lake located on Aquilla Creek, Lake Waco on the Bosque River, Proctor Lake on the Leon River, Belton Lake on the Leon River, Stillhouse Hollow Lake on the Lampasas River, Lake Georgetown on the North Fork of the San Gabriel River, Granger Lake on the San Gabriel River, and Somerville Lake on Yegua Creek. The multipurpose uses of the reservoirs include flood control, water supply, and recreation. Each reservoir is guided by a project-specific WCM to ensure project compliance with congressionally approved operating purposes.

The Brazos River supports the endangered smalleye shiner (*Notropis buccula*) and sharpnose shiner (*Notropis oxyrhynchus*), and the Texas fawnsfoot (*Truncilla macrodon*) and False Spike (*Fusconaia mitchelli*), both of which are Candidate mussel species. The Brazos River and its reservoirs also support a robust recreational fishery.

Near the Gulf of Mexico, the river passes through bottomland hardwood systems in the San Bernard National Wildlife Refuge (NWR), the MidCoast NWR Complex, Justin Hurst Wildlife Management Area (WMA), the Nannie M. Stringfellow WMA, and Brazos Bend State Park. Potential SRP actions could benefit these areas as well as aquatic, floodplain, and riparian habitats throughout the basin.

In 2021, SWF and TNC coordinated a workshop with the Brazos River Authority, natural resource agencies, academia, and other scientific experts and environmental practitioners to identify ecosystem condition, relevant data and data gaps, flow-related elements of resources in basin, environmental opportunities, and the challenges of changes in the system. In FY 2023, the Brazos Working Group conducted an e-flows workshop to define flow relationships for ecological resources of the river basin.

Status of Fiscal Year 2024 Work

In FY 2024, the team initiated modeling recommendations from the 2023 workshop. Proposed e-flows and pulses from the flood pool were modeled and compared to current USACE operations. Comparing modeled (e-flows implementation) and current operations allows for adapting proposed e-flows, remodeling, and rechecking proposed e-flows. This modeling work allows the district to investigate how proposed e-flows affect reservoir levels and outflows for all operating purposes.

RiverWare modeling was initiated in FY 2024.

Anticipated Work in Fiscal Year 2025

RiverWare modeling will be completed in FY 2025. HEC-RAS modeling will be initiated and completed for parts or all (as needed) of the RiverWare simulated period of record to estimate river conditions resulting from proposed e-flows and pulses. Resulting mapping was reviewed to check that proposed e-flows and pulses produce the expected inundations and desired hydraulic conditions while also being within acceptable levels for all operating purposes.

RiverWare and HEC-RAS results will be used in HEC-EFM to model ecological relationships with different e-flow scenarios formulated during the flow-ecology workshops. HEC-EFM and HEC-RAS results will be

used to assess ecological benefits spatially. The team may also use other ecological models or tools to evaluate benefits to other recommended e-flow components.

A summary report detailing modeling and related benefits analyses is anticipated in FY 2025.

Future Vision

The team will get stakeholders on board for test releases and test the flow recommendations from the modeling and establish methods for monitoring the releases.

Chattahoochee River (Buford and Seminole), FL and GA - SAM (Gen and LD)

The Chattahoochee River is within the Apalachicola-Chattahoochee-Flint (ACF) River basin which encompasses a 19,600 mi^2 watershed. Lake Sidney Lanier is the first USACE reservoir on the Chattahoochee River and is impounded by Buford Dam. Below Buford, the Chattahoochee River encounters a series of active hydropower infrastructure, and inactive hydropower facilities and historic milldams enroute to its convergence with the Flint River at Lake Seminole in the far southwest corner of Georgia. The USACE Water Management Section of SAM operates five federal reservoir projects: Buford Dam (Lake Lanier), West Point Dam, Walter F. George Lock and Dam, George W. Andrews Lock and Dam, and Jim Woodruff Lock and Dam (Lake Seminole) as components of the ACF system. The multipurpose uses of the Corps reservoirs include flood control, water supply, water quality, navigation, hydropower, recreation, and fish and wildlife management (environmental stewardship). Each Corps reservoir is guided by a project-specific Water Control Manual (WCM) to ensure project compliance with congressionally approved operating purposes. Seminole L&D is the lowest impoundment of the Chattahoochee River.

The Chattahoochee River was new to SRP in FY 2022 and began with a multi-year work plan focused on environmental opportunities below Buford. In FY 2023, SAM held an e-flows workshop that resulted in the following actions: 1. add continuous monitoring gage for temperature, turbidity, and dissolved oxygen (DO) on Chattahoochee River at Hwy 20 bridge, 2. add continuous monitoring DO sensor to existing gage on Chattahoochee River below Buford Dam, 3. conduct sluicing (release from sluice gate via jet value) for minimum flows in late summer and fall, 4. conduct variety of flow combinations 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, and 6. conduct analysis of power generation data, time of day, time of year, flows, DO, air temperature, and water temperature.

In FY 2024, SAM also initiated SRP work for operations related to fish spawning at Lake Seminole. Currently, the Lake Seminole standard operation procedure (SOP) encourages SAM to avoid dropping the pool elevation by more than half-a-foot between 01 March and 01 May to avoid the stranding of fish eggs in the lake. Under normal conditions, Seminole L&D operates as a run-of-the-river project passing its inflows from the Chattahoochee and Flint rivers directly into the Apalachicola River. This type of water management makes it difficult to avoid frequent drops in pool elevation.

The SAM seeks to update the SOP to an operation that makes it more feasible for the project to improve fisheries habitat conditions. The SAM will investigate the locations of important fish nursery beds, determine the elevations of these beds, and evaluate raising the minimum pool during the spawning season to a level that protects important fish beds from stranding during normal pool fluctuations.

Status of Fiscal Year 2024 Work

Water quality work below Buford Dam in 2024 continued the efforts of testing implementation of e-flow prescriptions using these new data monitoring tools and SAM will adapt e-flows as needed.

The Lake Seminole team worked to complete the final report detailing recommendations for fish spawn operations for FY 2025 publication.

Anticipated Work in Fiscal Year 2025

The team will publish the report. No additional work is anticipated in FY 2025 except for adaptation of new goals.

Future Vision

Mobile District will implement the new fish spawn operations from the FY 2024 study in FY 2025. It is also anticipated that the water quality implementation actions funded by SRP will benefit seasonal water quality conditions in the Chattahoochee River.

Cherry Creek (Cherry Creek Dam), CO - NWO (Gen)

Cherry Creek Dam and Reservoir are in Denver, Colorado, on Cherry Creek, a tributary to the South Platte River. The dam was completed in June 1950 for the authorized purpose of flood control, and later was authorized for general recreation and fish and wildlife recreation.

Cherry Creek Reservoir is currently on the State of Colorado's 303(d) list of impaired waters due to high chlorophyll-a levels and low DO conditions not supporting aquatic life. During the summer, the reservoir can become thermally stratified and the volume of water below the thermocline (the hypolimnion) fails to mix with the surface water (the epilimnion). While thermal stratification at the reservoir has historically been limited, there is enough inhibition of mixing to allow hypoxic to anoxic conditions to regularly develop near the reservoir bottom. These low oxygen conditions at the sediment water interface result in sediment release of phosphate and ammonia, which accumulate in the hypolimnion until the reservoir mixes and becomes available for algal growth (increase in reservoir chlorophyll-a). In the winter, the resulting algal growth dies back and sinks, adding to the oxygen demand of the sediment and further fueling the anoxic conditions in future years. Concentrations of phosphate and ammonia in the hypolimnion of Cherry Creek Reservoir tend to peak in July.

The Omaha District will implement the storage of a small amount of water in the flood control zone, if available, in January through March. The maximum storage allowed is in the first foot of the flood control zone, which is also known as the transition zone. This zone amounts to 925-acre feet or about 1 percent of the flood control zone. If available, this storage would be released via the reservoir's low-level gate in July. The release would flush some nutrients from the hypolimnion before it fuels algal growth. The July release also has potential to increase downstream flows when historically they were reduced or non-existent due to low reservoir inflows. The WCM allows this first foot of flood storage to be used for maintenance of the multipurpose zone, which includes water quality. If the transition zone is full, the target discharge for July would be 10 to 25 cubic feet per second (cfs) depending on inflow.

To verify the release of nutrients through the low-level gate and evaluate downstream effects, nutrient grab samples and physical data will be collected in-pool and downstream throughout the summer.

Status of Fiscal Year 2024 Work

During the winter of FY 2024, the team worked closely with several local agencies to obtain feedback and support for the first low-level water quality release. Support was gained in January 2024, and the transition zone was filled. This water was kept in the reservoir through June 2024 and released steadily in July 2024 in hopes of improving the reservoir water quality. The monthly water quality sampling from May through September was obtained. The team is waiting for ERDC to complete the sample analysis.

Anticipated Work in Fiscal Year 2025

The team initiated the FY 2024 preliminary report for publication by December 31, 2024. The final report is dependent on ERDC laboratory analysis completion. The team will present preliminary results and request agency support for a second round of the project in FY 2025 at an agency meeting in November 2024. As long as agency support can be gained and there is water available to store in the winter of FY 2025, the team will perform the low-level water quality release again in July 2025. The local watershed authorities' sampled results from May through September will be reviewed by November 30, 2025, to further understand the impact the low-level release is having on the reservoir's water quality. The FY 2025 report will be circulated and finalized by December 31, 2025.

Future Vision

As long as there continues to be agency support, available water, and a positive reservoir water quality impact, the team would like to continue performing the low-level water quality release at Cherry Creek Reservoir into the future.

Clarion River (East Branch Dam), PA - LRP (Gen)

Current operations on the East Branch Dam eliminated bankfull events, reduced the magnitude and frequency of high flow pulses, reduced the magnitude of spring baseflows, significantly elevated the magnitude of summer baseflows, and created winter flows lower than early fall flows. TNC generated provisional flow recommendations in the 2017 Provisional Ecosystem Flow Recommendations for the Allegheny and Clarion Rivers Briefing Paper. The goal of the current effort is to implement and monitor a portion of the provisional flow recommendations at the East Branch Dam on the Each Branch Clarion River.

Status of Fiscal Year 2024 Work

In FY 2024, a project delivery team (PDT) consisting of USACE employees from Planning, Water Quality and Water Management, Operations, and the Natural Resource staff from East Branch Dam met three times to discuss the provisional flow recommendations and the constraints relating to the downstream flow and temperature requirements.

Anticipated Work in Fiscal Year 2025

Two PDT meetings will be held in December 2024 during which a schedule will be developed for the creation of the implementation and monitoring plan. The implementation and monitoring plan will outline the flow recommendation(s) to be implemented, the conditions which must be met, who will be notified, and what monitoring activities will take place.

If the appropriate conditions are met, the flow recommendation(s) will be implemented and monitored. A summary report will be created at the end of FY 2025 which details the outcome of the project and any future recommendations.

Future Vision

Depending on the outcome of the project, a future SRP effort may include incorporating the flow recommendation(s) implementation and monitoring plan into the water control manual.

Coosawattee River (Carters Dam), GA - SAM (Gen)

The Coosawattee River is part of the Alabama-Coosa-Tallapoosa River basin (ACT) in northwestern Georgia. The river starts near Ellijay, Georgia, and flows to the Oostanaula River near Calhoun, Georgia. The river is approximately 50-miles long and runs through the Carters project which includes Carters Dam and Carters Re-Regulation Dam. The ACT basin supports a high diversity of species along its waterway and the Coosawattee River alone supports approximately 17 protected species.

The U.S. Fish and Wildlife Service (USFWS) along with the Georgia Department of Natural Resources (GADNR) stocked an experimental population of lake sturgeon in the Coosa, Etowah, and Coosawattee Rivers. These populations show some evidence of spawning behavior below the Carters Re-Regulation Dam. SAM biologists believe flows have not been conducive to successful spawning and this effort attempts to identify the minimum releases necessary to support the species. FY 2024 was the first year of support by SRP on the Coosawattee River.

Status of Fiscal Year 2024 Work

In June 2024, the team conducted extensive monitoring and data collection on the River below the Carters Re-Regulation Dam. Data analysis shows spawning conditions can be improved by splitting the flow between gates 2 and 3, this increases the spawning area and has no effect on hydropower.

Anticipated Work in Fiscal Year 2025

A proposal for FY 2025 was accepted to conduct biological monitoring working with the State of Georgia and the University of Georgia (UGA) to monitor sturgeon on the Coosawattee River during modified operations.

Future Vision

The project anticipates implementation of a modified gate schedule.

Cumberland River (multiple reservoirs), TN - LRN (Gen and LD)

The Cumberland River Watershed drains approximately 18,000 square miles of southern Kentucky and north-central Tennessee. The Cumberland River flows generally west from its source in the Appalachian Mountains to its confluence with the Ohio River near Paducah, Kentucky, and the mouth of the Tennessee River.

The headwaters of the Cumberland River are comprised of three separate forks that begin in Kentucky converging near Harlan, Kentucky. Near the confluences of the Laurel and Rockcastle Rivers, the Cumberland is impounded by Lake Cumberland, a USACE multipurpose reservoir and one of the largest artificial lakes in the eastern United States.

The Cumberland River flows into Tennessee near Celina and is joined by several large rivers, including the Obey River that forms Dale Hollow Lake and the Caney Fork River that forms Center Hill Lake, before being impounded near Nashville by Cordell Hull and Old Hickory Dams. After picking up the Stones River and Harpeth River, the river is dammed by Cheatham L&D. Flowing north and northwest toward Clarksville, Tennessee, the Cumberland River picks up Red River and is later impounded in Kentucky by Barkley Dam. The river terminates at its confluence with the Ohio River.

Spanning approximately 688 river miles and draining approximately 18,000 square miles, the Cumberland River is one of the most important waterways in the southeastern United States economically, ecologically, and recreationally. Historically considered one of the most biologically diverse watersheds in North America, the Cumberland River once hosted more than 70 endemic mussel species. The construction of ten dams along the Cumberland River brought resilient commercial navigation, hydropower generation, and flood control, which were critical for the region, but caused negative impacts to aquatic ecosystem and species diversity.

USACE operates five projects on the mainstem of Cumberland River—Barkley L&D, Cheatham L&D, Old Hickory L&D, Cordell Hull L&D, and Wolf Creek Dam. Five additional projects are operated on tributaries—J. Percy Priest Dam on Stones River , Center Hill Dam on Caney Fork River, Dale Hollow Dam on Obey River, Martins Fork Dam on Martins Fork River, and Laurel Dam on Laurel River. The multipurpose reservoirs on the mainstem support navigation and hydropower while the tributary projects support flood control, hydropower, water supply, water quality, and recreational uses. Each reservoir is guided by a project-specific Water WCM to ensure project compliance with congressionally approved operating purposes.

Status of Fiscal Year 2024 Work

The LRN team created a Cumberland River Basin Working Group to execute a stakeholder workshop and summary report with priority actions. A multi-day technical meeting was conducted in June 2024 with stakeholders in the Cumberland River Basin to gather information on the ecological state of the basin with the immediate goal of developing future SRP proposals.

The meeting included a combination of presentations, discussions, and planned site visits demonstrating the current state of the Cumberland River Basin and the diversity of ecological habitats. This workshop served as a platform to identify data gaps, existing and ongoing work by stakeholders, and opportunities for operational improvements targeting downstream ecology within project purpose limitations.

The information collected was used to develop a report documenting the results of this task and identifying critical needs within the basin that may be met with a future SRP proposal, paving the way for future environmental consideration throughout the Cumberland River Basin.

The team is wrapping up the meeting report and drafting proposals for FY 2025.

Anticipated Work in Fiscal Year 2025

In FY 2025, the team will wrap up the meeting report from FY 2024 and begin modeling, monitoring, comprehensive assessment, and outreach.

Future Vision

The overall vision of this work is to get more environmental benefits from the existing water resource infrastructure of the Cumberland basin. This is a multi-year effort. Success will depend on several variables and will require organizational support to fully realize the environmental opportunities already identified for the Cumberland.

Des Moines River (Saylorville and Lake Red Rock), IA - MVR (Gen)

The Des Moines River watershed drains about 1,350 square miles (3,496 square kilometers) of flat to gently rolling agricultural land that once was glaciated in Minnesota and Iowa. Saylorville Dam and its reservoir became operational in 1977 and is located upstream from the City of Des Moines, Iowa. Red Rock Dam became operational in 1969 and is located approximately 50 miles downstream of the City of Des Moines, Iowa. These USACE dams are operated for flood risk management, recreation, water supply, and fish and wildlife conservation.

Des Moines River dam operations alter river flow by increasing summer flows, lowering spring flows, reducing peak flows, and substantially reducing connectivity to floodplain features like oxbow lakes. River scientists documented the changes to the river from impoundments and were looking for options to improve conditions for fish and wildlife habitat. Around 2015, MVR began the process of updating the WCM at both dams, which provided the opportunity to evaluate and add environmental considerations. SRP helped support USACE and stakeholders included e-flows and e-pool strategies in the WCM update. At the same time, SRP supported the development of the Des Moines River AMMP. This is a product of the e-flows workshop from 2016, resulting in a summary report that identified eight river flows and reservoir-level management practices to improve conditions for aquatic biota, terrestrial habitats, and water quality. The reservoir WCM now includes seasonal conservation bands for the reservoir that will support aspects of the natural flow regime to benefit fish and wildlife.

There are six on-going SRP location-based efforts for the Des Moines River, including completion of the mussel recruitment and survival, waterbird and invertebrate study, satellite tracking of shorebirds, effects of reservoir operations on fish recruitment and survival, Red Rock Delta species inventory, and study of herptile movements and brumation.

A reality for reservoirs on the Des Moines River is that e-flows and environmental pool management (e-pools) can be implemented when the reservoirs are not operating for flood risk management, which is most of the time. However, there are also times, as in FY 2024, when flood risk management objectives override environmental flow or pool strategies. FY 2024 proved to be a case in point.

Status of Fiscal Year 2024 Work

Mussel recruitment and survival. Early spring 2024 weather in the Upper Midwest was uneventful, and, as in 2022 and 2023, MVR staff and the Des Moines River team coordinated spring pulse conversations with the IDNR, along with fish and wildlife experts at Iowa State University. Despite ideal planning, ample spring precipitation caused the Red Rock pool to have two seasonal crests above the conservation band. As a result, Red Rock Dam outflows had occasions when releases were at the maximum outflow according to release schedules.

Research to estimate the impact of experimental flows on the recruitment and survival of freshwater mussels below Red Rock Dam is a two-year field effort that concluded in 2024. The research provides

information regarding the response of mussel habitat and communities to the operational activities identified in the Des Moines River Adaptive Management and Monitoring Plan (AMMP), with the goal of evaluating whether the implemented operations are achieving the desired ecological goals for the Des Moines River system within the context of the SRP. Field data collection activities concluded in 2023.

Waterbird and invertebrate study. Shorebirds migrating to the Red Rock delta, spend time resting and feeding on invertebrates before continuing their migration. It was unknown what they were feeding upon and behaviors at the delta; thus, the "waterbird and aquatic invertebrate responses to managed reservoir drawdowns at Lake Red Rock" project was envisioned. It is a 3-year (2 field seasons) project on waterbird and invertebrate monitoring in the delta region of Red Rock Reservoir. This work will result in new information that can be used to adaptively manage environmental flows and pool at Red Rock in line with the AMMP. The research consists of randomly placed line transects in the delta region collecting water column and benthic core samples for invertebrates. These samples are processed in the lab to identify invertebrate taxa, characterize prey size, and characterize relative abundance. In addition, it continues weekly surveys for migratory waterbirds to document the species composition, abundance of shorebirds, waterfowl, herons, and other avian taxa using the delta region. Lastly, the effort includes monitoring Pectoral Sandpipers with transmitters to characterize residency times in relation to pool level changes and other environmental factors. The last field season was in 2024.

Satellite tracking of shorebirds. Related to the preceding project is the "shorebird tracking in response to Sustainable Rivers Program environmental flows" research project. The goal of this research project is to estimate residency time for Pectoral Sandpipers during fall migration and to characterize local movement of shorebirds at Red Rock, plus two other sites in response to SRP e-flows and e-pool strategies. Shorebirds are tracked using satellite tags. Because of the flooding conditions and other factors in FY 2024, two out of state alternative locations were not available for drawdowns.

Instead, Saylorville Lake, a USACE reservoir further upstream on the Des Moines River flyway, and Coralville Lake, a USACE reservoir in eastern Iowa were selected. All birds fitted with satellite tags were monitored on a real-time web interface to promote tracking share data with the public (see https://faculty.sites.iastate.edu/cootjr/iowa-pectoral-sandpiper-stopover-study). The results are a presentation of their fall migration path from the Midwest to wintering areas. The last year for the field portion of this project was 2024.

Effects of reservoir operations on fish recruitment and survival. A project initiated in 2024 is the "effects of reservoir operation on fish reproduction, movement, and survival in the Des Moines River system." This project has two objectives serving the common goal of understanding Shovelnose Sturgeon movement ecology to better manage flows downstream of Saylorville and Red Rock Dams to promote the survival and reproduction of these migratory river fishes and the overall ecosystem integrity in the lower Des Moines River. The first objective compares spring migration phenology of Shovelnose Sturgeon using acoustic telemetry in two Mississippi River tributary systems, one with and one without experimental flows. This design examines how environmental flows influence species movement and may affect the location, timing, and reproduction. A second objective is monitoring behavioral movements and habitat selection in relation to flows and temperature during the summer period when water temperatures are the warmest (July–August). This specifically aims to advance the understanding of Shovelnose Sturgeon summer movement ecology and spatial variation in water quality during the

summer aiding in the implementation of opportunistic heat wave pulses. Field work and associated data collection began in 2024.

Red Rock Delta species inventory. The delta region of Lake Red Rock is a large dynamic refuge with little recreational disturbance and no development. Yet, little is known about what wildlife species use the area and how pool manipulations affect them. The team sought to pursue a multi-species, multi-season assessment of animals using the delta habitats created by e-pool or e-flows management. It is something that has not previously been investigated using standardized survey methodology. The "multiple species inventory at Lake Red Rock" project, led by Iowa State University and the Iowa Department of Natural Resources (IDNR), employs protocols from the Iowa Multiple Species Inventory and Monitoring Program (MSIM) to document in 2024 (as a pilot year) a subset of birds, mammals, amphibians, reptiles, crayfish, odonates, bumblebees, and butterflies during summer and fall seasons (1 July to 15 October). This effort was initiated in FY 2024. The goal is to use this multi-species community assessment to learn how certain species and communities respond to e-flows and e-pool and to compare this to changes at sites adjacent to Lake Red Rock. The crew of two began fieldwork in mid-August 2024 and continued through the end of October 2024. The pilot work is going well and they set up sixteen sites for sampling in the pilot year. There is a mix of upland and floodplain sites in a mix that favors those most affected by SRP actions.

Study of herptile movements and brumation. One of goals arising from the Des Moines River e-flows workshop which became part of the Des Moines River AMMP was to improve conditions for reptiles and amphibians. Turtle species native to Lake Red Rock are dependent on water habitat during all life stages except while in the egg. SRP e-flow and e-pool adjustments have the potential to impact turtle movements, overwinter ecology, and nesting activities. Most individuals overwinter under the ice and very little is known about their ecology. A research project entitled "Turtle movements related to water levels at Lake Red Rock" will use VHF radio-transmitters and activity data loggers to track adult turtle movements (including water depth) to determine how they respond to water level changes. The primary objective of this study is to monitor indigenous turtle movements to understand their behavior from early fall, before brumation, to early spring, post-brumation. This informs biologists, water managers and others about the life cycle of these reptiles, and possibly other herptiles generally, of their overwintering behaviors and habitats and should help determine ideal reservoir pool levels from approximately ice-up to ice-out. The Lake Red Rock water control plan allows for holding the fall pool rise until March 1 to avoid harm to bromating herptiles. A secondary objective is to note by casual observation the suite of herptiles that inhabits the Lake Red Rock environs. Efforts to trap turtles was initiated in fall 2024.

Anticipated Work in Fiscal Year 2025

FY 2025 is shaping up to be an active and productive year for Des Moines River teams. 8 reports related to the location-based work described above are planned for completion. Additionally, coordination continues for other infrastructure within MVR, including work on the Iowa and Mississippi rivers.

Future Vision

The activities of the Des Moines River Team and partners have pursued are a comprehensive approach to improving the sustainability of the Des Moines River by way of modifying USACE operations that do

not interfere with flood risk management and other authorized purposes. The guiding force in these actions has been the Des Moines River AMMP.

Future vision for the team includes:

- Continue work on understanding the ecological responses to environmental flow and environmental pool strategies at the two USACE dams and reservoirs on the Des Moines River
- Implement flow or pool strategies at Coralville Dam, a USACE project on the Iowa River
- Study effects of dams on mussel genetic diversity and connectivity in the Des Moines River
- Study effects of environmental flows on native and invasive fish species in the Des Moines River and into Pool 20 of the Mississippi River
- Tagging of pectoral sandpipers at Coralville Lake
- Conduct hydraulic studies on fish spawning for Locks and Dams where similar conditions exist as those at Melvin Price L&D, a successful study previously conducted for lake sturgeon spawning
- Host an e-flow and e-pools workshop to learn the benefits, lessons-learned, and limitations of SRP activities on the Des Moines River from an operations perspective

Fourche La Fave River (Nimrod Lake), AR - SWL (Gen)

The Fourche La Fave River forms in western Arkansas, flows north eastwardly through the Ouachita Mountains and is impounded as Nimrod Lake. After leaving Nimrod, the Fourche La Fave River flows 62.6 miles until its confluence with the Arkansas River. The Fourche La Fave River has one major tributary, the South Fourche La Fave River. Nimrod Lake is a multi-purpose reservoir in the Little Rock District (SWL). The Environmental Protection Agency (EPA) has listed the river as impaired for fisheries, particularly for the alligator gar, Arkansas' state fish. There is also one endangered mussel species and one endangered plant species within the river system. Therefore, enough water needs to be maintained in the system during specific times of year to support these species.

A unique feature to Nimrod Lake is a seasonal wetland referred to as a Green Tree Reservoir (GTR). This wetland uses a system of levees and water control structures to flood surrounding forests, providing migrating waterfowl (and other species) shelter, food, and mating opportunities from late fall through early spring. The area is flooded by capturing natural runoff or by pumping during the winter season, which coincides with the bottomland hardwood’s dormant season. Although this time is less likely to cause damage to the hardwoods from standing water, there has been considerable tree die-off over the last few decades due to a significant increase in precipitation in the region.

Releases from Nimrod Dam currently follow the 2002 Water Control Manual (WCM) requirements. It has been identified that temperature, hydrology, and spawning habitat characteristics of depth, vegetation, and flow are environmental drivers of alligator gar recruitment success in Texas streams. These drivers have been confirmed and successfully applied using a hydraulic model, in-channel thermal conditions, and a detailed land cover data set to determine years of strong alligator gar recruitment on the middle Trinity River in Texas. The SWL team will use a similar approach to compare the flow needs of the alligator gar in the Fourche La Fave River to determine if flexibility within the WCM can accommodate operational changes to sufficiently support spawning and recruitment. The SWL team will also use the model to determine the optimal releases needed to evacuate water from the Nimrod Lake GTR, as well as look at releases that may minimize inundation of farmers' lands adjacent to the river.

The Fourche La Fave River is in its third year of the SRP with the last funded year being FY 2021. This study has two major completed components: 1. Update a hydrologic HEC-RAS model for the Fourche La Fave River to simulate and analyze various operational prescriptions and 2. Use the modeling results to inform an environmental flows workshop and development of environmental flow recommendations. Once fully realized, implementing environmental flows can have positive and lasting impacts on multiple environmental factors. Additionally, the modeling results and environmental flows and environmental pool management workshop can be used to inform a potential water control plan update.

Status of Fiscal Year 2024 Work

In July 2024, an environmental flows and environmental pool management workshop was held to develop streamflow and pool level management recommendations. The workshop and resulting recommendations aimed to restore eco-hydrological function by examining possibilities for reservoir management modifications within the range of authorized reservoir releases to create streamflows and in-pool water levels beneficial to the Fourche La Fave River and Nimrod Lake ecosystem and its biota. An accompanying report detailed the outcomes and recommendations from that environmental flows and environmental pool management workshop.

Anticipated Work in Fiscal Year 2025

The team will start implementing environmental pool management for Nimrod Lake beginning fall of 2024 and assess environmental flow implementation opportunities for spring of 2025.

Future Vision

The team will continue to look at implementation opportunities going forward, based on the results of the e-flows and environmental pool management workshop with plans to provide an implementation report during future funding cycles.

Green, Nolin, and Rough rivers (Nolin and Rough dams), KY - LRL (Gen)

The Green River Basin (GRB), encompassing approximately 9,230 square miles, is in west-central Kentucky and extends into north-central Tennessee. The headwaters of the Green River originate in Lincoln and Casey Counties, Kentucky in the Mississippian Plateau. The river flows in a northwesterly direction for 330 miles to its confluence with the Ohio River near Henderson, Kentucky. The GRB is largest of the 12 Hydrologic Unit Code (HUC) 4 watersheds in Kentucky; six United States Geological Survey (USGS) HUC 8 sub-basins are contained within the GRB (051100) including the Barren River, Upper Green, Middle Green, Rough River, Pond Creek, and Lower Green watersheds. The GRB contains four Louisville District (LRL) USACE reservoirs including Green River Lake, Barren River Lake, Nolin River Lake, and Rough River Lake. These multi-purpose reservoirs on the main tributaries to the Green River support flood control, water supply, water quality, and recreation uses. Each reservoir is guided by project-specific Water Control Manuals (WCMs) to ensure project compliance with congressionally approved operating purposes.

The FY 2024 scope of work includes the proposed formation from the GRB E-flow Working Group by LRL and the subsequent preparation of workshops to identify ecosystem problems, opportunities, data gaps, and research needs within the watershed related to e-flows. A summary report will document the workshop findings, priorities, recommendations, and potential future environmental work. The inaugural workgroup meeting will be scheduled in early FY 2025, in-person or virtual depending on

logistics, allowing for reports and recommendations to be completed with time to plan for testing/implementing recommendations later in FY 2025 and FY 2026 under a different scope of work.

Status of Fiscal Year 2024 Work

LRL began internal meetings to discuss the format of the virtual workgroup meetings and contacted stakeholders to schedule the initial workgroup meeting.

Anticipated Work in Fiscal Year 2025

The team will start/finish the virtual monthly workgroup meetings that will help refine the e-flow workshop format/agenda.

The team will host a 2- or 3-day e-flows workshop using the materials compiled during the workgroup meetings.

Future Vision

The team will form a provisional implementation and adaptive management strategy in the e-flows workshop summary report to be utilized through another scope of work in late FY 2025 or early FY 2026.

James River (Pipestem Dam), ND - NWO (Gen)

Pipestem Dam is located on Pipestem Creek, a tributary of the James River near Jamestown, North Dakota. Pipestem Lake is regulated in conjunction with Jamestown Lake, which is managed by the Bureau of Reclamation under normal operating conditions with flood control operations ceded to USACE. The two dams operate cohesively to reduce flooding in the James River Basin. Authorized purposes at Pipestem Dam are flood risk management, recreation, and fish and wildlife. Harmful Algal Blooms (HABs) are a significant challenge due to high runoff rates washing heavy nutrient loads into the reservoir.

The James River (Pipestem Lake) is in its first year with the SRP. SRP work will be used to advance environmental pool management and environmental flows (e-flows) in the James River basin.

Status of Fiscal Year 2024 Work

The team took WQ samples at the project through the summer and into fall 2024. A PDT was developed to engage ideas on environmental opportunities, and the PDT continues to grow. Many stakeholders were identified in the basin, and some rough analyses were begun to consider operational changes for pool management, mimicking the natural flow regime, and WQ releases. A stakeholder meeting took place in Jamestown, North Dakota, where stakeholders learned about current and past conditions at Pipestem Dam and were given the opportunity to share ideas and considerations for operations.

Anticipated Work in Fiscal Year 2025

The original scope contains continued work through FY 2025 which includes additional WQ sampling, updating the WQ model, and analyzing different operations to understand the benefits of releases.

Future Vision

Based on analysis, PDT ideas, and stakeholder buy in, the team will continue to investigate opportunities to enhance environmental benefits at Pipestem Reservoir and along the James River. If fully realized,

implementation of operational changes identified via the SRP process can have positive and lasting impacts on water quality and the entire ecosystem while continuing to provide flood risk management and supporting all other authorized project purposes. These include but are not limited to potential reduced occurrence and severity of HABs, expanding the reservoir littoral zone, greater fish recruitment, enhanced migratory bird habitat, and improvement in the aesthetic use of the reservoir. The outreach to stakeholders and associated report, literature review, and future workshop would inform water control plan updates, highlighting the authorized purpose of environmental stewardship.

Kansas River (multiple reservoirs), KS and NE - NWK (Gen)

The Harlan County, Kanopolis, Milford, Perry, Tuttle Creek, and Wilson lakes are reservoirs located on tributaries of the Kansas River. Authorized missions include flood risk management, recreation, water supply, irrigation, and fish and wildlife management. Reservoirs in the Kansas River Basin have been active with the SRP since FY 2016 and have accomplished several e-flow workshops and developed e-flow implementation plans. Additionally, in FY 2023, Kansas City District received funds to update the WCMs for all lake projects in the Kansas River Basin, including the six mentioned above. WCM updates are scheduled to occur over the next 5–10 years with the Milford, Perry, and Tuttle Creek dam manuals beginning in FY 2023 and the Harlan County, Kanopolis, and Wilson dam manuals beginning in FY 2028.

Decades of sedimentation have altered shallow water habitat at reservoirs in NWK. The sedimentation at reservoirs has created, removed, disconnected, and/or fragmented shallow water habitat. Shallow water areas provide migratory shorebirds, waterfowl, fish, reptiles, amphibians, mammals, and other aquatic organisms habitat for concealment, feeding, and breeding. USGS telemetry data and research indicates that the six lakes are utilized as stopover habitat by migrating whooping cranes (*Grus americana*) and fall within the species 95 percent core migration area. Potential SRP actions could benefit shallow water habitat and the fish and wildlife species it supports.

Status of Fiscal Year 2024 Work

GIS modeling was completed at all six reservoirs using Light Detection and Ranging (LiDAR) and bathymetry data to capture spatial relationships depicting lake surface area, water depths at 0.5 feet, and land base at 0.5 feet above multipurpose pool elevation. EPM workshops were completed at Perry and Tuttle Creek lakes resulting in development of an EPM sequence and guide curve applied to the regime prescription tool. Work to analyze EPM for nutrient loading, Kansas River e-flows, and climate change was started, but not completed. An EPM workshop with water management stakeholders was started, but not completed. These two tasks were not completed due to project lead being unavailable due to a 120-day temporary assignment.

Anticipated Work in Fiscal Year 2025

The advance phase of e-pools at Harlan County, Wilson, Kanopolis, Milford, Tuttle Creek, and Perry lakes will be completed to include analyzing proposed e-pool management sequences to nutrient loading controls and future climate change models, compare e-pools strategies to Kansas River Basin e-flows strategies for each lake project, and conduct a workshop with water management stakeholders. Following the completion of the advance phase for NWK Kansas River e-pools at the six reservoirs, the SRP team will seek opportunities to implement environmental pool management strategies in FY 2025 through coordination with NWK Water Management. Surveys and documentation of EPM implementation will be conducted to determine environmental outcomes.

Future Vision

The Kansas River e-pools project is projected to continue into FY 2026. Following the implementation of EPM at the six reservoirs with intended successful environmental outcomes, measures to incorporate these strategies into each Lake Level Management Plan will occur.

Kaskaskia River (multiple reservoirs), IL - MVS (Gen and LD)

The Kaskaskia River Basin covers 10 percent of the State of Illinois, encompassing parts or all of 22 counties, with 30 main tributaries and 5,840 square miles of drainage. It is a tributary of the Mississippi River, with headwaters just west of Champaign, Illinois, and flows southwesterly across the state for approximately 325 miles to its confluence with the Mississippi River, about 8 miles north of Chester, Illinois. Carlyle Dam was completed 1967 and Shelbyville Dam was completed in 1970; both were built primarily for flood risk management. The Jerry F. Costello Lock and Dam (originally named the Kaskaskia Lock and Dam) was completed in 1974 to provide a nine-foot navigation channel for a narrower tow barge configuration than those that transit the Mississippi River locks and dams. Flexibility of dam operations offers potential to manage water levels lower during summer growing season to enhance aquatic plant growth. The Kaskaskia River was identified as a high priority work area for SRP action at the 2019 Midwest Operations and Water Management Meeting. All three dams on the Kaskaskia River were proposed for the SRP by MVS in 2020.

In FY 2020, the team analyzed daily flows for the previous 10 years at Kaskaskia River Lock and Dam and upstream releases at Carlyle Dam to determine feasibility of water level management implementation to expose shoreline substrate upstream of Jerry F. Costello Lock and Dam. Water control managers and other stakeholders held meetings with a small group of stakeholders to propose a 0.5-foot water level reduction at the dams to expose river edge for at least 30 days during the summer. The exposed substrate has viable native seeds that will regenerate and provide fish and wildlife habitat, capture suspended sediment, and stabilize the riverbanks. FY 2021 work included public outreach, qualitative vegetation monitoring, approximately half of the desired aerial imagery analysis, and photo documentation of the plant response at Carlyle Dam and on the Kaskaskia River. In 2022, drawdowns were successfully conducted at Lake Shelbyville and on the lower Kaskaskia River. In 2023, extensive drought conditions within the basin prevented implementation of drawdowns during the growing season.

A separate project was initiated in 2024 focused on managing water levels for shorebirds. The Upper Mississippi River System is located at the center of one of the primary migratory pathways in North America and is historically significant for migratory shorebirds. Many of the species utilizing migratory stopover habitat in the region depends on recently flooded or shallowly flooded mudflat habitats, which is limited on the landscape. Water manipulations for this task were initially targeted for the spring and fall migratory period for shorebirds (March-June and July-September).

Status of Fiscal Year 2024 Work

In August 2024, MVS was able to initiate a brief drawdown of approximately three weeks on the Lower Kaskaskia River, four weeks at Carlyle Lake, and six weeks at Lake Shelbyville. Vegetation surveys could not be conducted at the Lower Kaskaskia River sampling sites because germination had just begun when pool levels had to be raised to the maximum regulated pool level. A large storm system passed through the Carlyle Lake area in September contributing enough runoff to overtop the vegetation that was

establishing. Vegetation surveys were completed just prior to the pool raise, but plants were not exposed long enough to produce seedheads. The Lake Shelbyville drawdown continued into early October and vegetation surveys were collected once. An armyworm infestation defoliated established sedges and grasses. The district team resurvey in October 2024 to see if the vegetation was able to regrow over the several weeks since the initial survey.

Water management for shorebirds was attempted in late July through mid-August on the Lower Kaskaskia River. Several temporary raises in pool levels to inundate exposed mudflat were done and followed with sampling of sediment moisture, macroinvertebrates, and shorebird use.

Anticipated Work in Fiscal Year 2025

MVS will gather vegetation data at Carlyle Lake and Lake Shelbyville for one more year in an attempt to gather the needed seed production data to effectively communicate potential benefits to the stakeholders at the lakes. The combination of brief, late drawdowns and armyworm infestations reduced vegetation extent and diversity at the reservoirs in 2024.

Future Vision

In 2025, MVS plans to continue coordinating with management partners and incorporate water level management for emergent wetland vegetation as a typical practice and consideration. Information gathered from 2024 sampling will be used during annual public meetings to convey the potential environmental benefits of drawdowns for emergent vegetation.

Kootenai River (Libby Dam), MT - NWS (Gen)

Increased coal mining in British Columbia in the Elk River - a tributary to the Upper Kootenai River - over the past 20 years resulted in a 5-fold increase in nitrate loadings into Lake Koocanusa (also known as Koocanusa Reservoir). Continued increases in nitrate loading are expected due to additional coal mines being developed in the watershed area. These increases are expected to negatively impact water quality and Endangered Species Act (ESA)-listed species such as white sturgeon and bull trout.

NWS conducted a comprehensive study of the vertical dynamics of nitrate and temperature in the forebay at Libby Dam during the 2024 sampling season. The final report will be produced in FY 2025 which will include the raw data and comprehensive study results, along with recommendations regarding Selective Withdrawal System (SWS) operations if appropriate.

Status of Fiscal Year 2024 Work

The NWS water quality team incorporated the sampling required for this study into their monthly routine sampling trips to Libby Dam, which occurs from April to October each year. In between routine trips, Libby Dam project staff conducted additional sampling. Specialized sensors were used to capture water column profiles and physical samples were also collected during each sampling event.

Anticipated Work in Fiscal Year 2025

The NWS water quality team and project staff will continue to collect samples and capture water column profiles until October 2024. The laboratory results of the physical samples will be analyzed, which includes sending off a select number of samples to a specialized laboratory for isotope analysis. Upon

reception of all lab results, the NWS water quality team will compile all the data from the project to create a report of the study's findings.

Future Vision

Depending on the findings of the project, further study may be needed to better inform possible operations. Furthermore, this project could be replicated at other projects in the USACE portfolio that have SWS capabilities.

Licking River (Cave Run Lake), KY - LRL (Gen)

Cave Run Dam and Lake is a USACE reservoir located on the Licking River, a major tributary to the Ohio River, in eastern Kentucky. Cave Run influences 173.6 miles of the Licking River to its confluence with the Ohio River. The Licking River watershed is one of the most ecologically diverse in Kentucky. Operational standards and protocols have been generally consistent since management began in 1974. Consultation with state biologists has indicated that many river miles below the dam have affected by dam operations with significant changes to mussel populations. Mussel experts have stated the Licking River could be restored to upwards of 98% of its native mussel fauna in the river, which suggests an opportunity for potential operational improvements for environmental improvements.

SRP work for the Licking River began in 2024.

Status of Fiscal Year 2024 Work

The LRL team is organizing a three-day technical workshop in Spring 2025 with subject matter experts from stakeholders including the TNC, USFWS, USFS, state agencies, and other interested parties in the Licking River Basin. The workshop's primary purpose will be to gather baseline information on the ecological and environmental conditions of the basin necessary to evaluate opportunities for environmental flows (e-flows) that can be implemented at Cave Run Lake to improve the basin's ecosystem within USACE operational constraints.

The workshop will include a combination of presentations, discussions, and planned site visits that demonstrate the diversity of the ecological habitat in the Licking River Basin. A priority of the workshop will be to evaluate the hydraulic conditions of the river and consider potential e-flow opportunities to support mussel conservation efforts improve/restore sensitive mussel habitat downstream of the reservoir. Another priority of the workshop will be to identify sources of existing ecological and environmental data, ongoing work by stakeholders, and whether these can be leveraged in determining opportunities.

The team will develop a report organizing the information gathered during the technical workshop, including literature review, future needs and data gaps, stakeholders and on-going work that might be leveraged, and a summary of operational considerations at Cave Run Lake that are critical to the ecological sustainability of the Licking River Basin. The main purpose of the report will be to identify specific recommendations for e-flows, if feasible, as well as future projects and collaboration.

Anticipated Work in Fiscal Year 2025

It is anticipated that information gathered during the technical workshop will result in environmental recommendations with feasibility at the Cave Run Lake Dam. It would then be the LRL team's intent to

pursue “implementation” of those recommendations via operational changes for environmental benefits that are put into action, monitored, and adapted as necessary.

Future Vision

Engaging stakeholders, scientists, water managers, and operators to investigate and implement environmental strategies for the ecologically-rich Licking River is a solid foundation for pursuing operational changes to get more environmental benefits from Cave Run Dam and Lake. It is hoped that related and ongoing efforts for Nolin and Rough rivers as well as past successes on Green River will add momentum to this work.

Mississippi River (Lock and Dam 10), IA and WI - MVP (LD)

Mississippi River Lock and Dam 10 operates using a primary-secondary-tertiary schedule that is unique within MVP. By redefining the operation to a hinge-point, existing navigation needs are met while creating operational flexibility to allow for an opportunistic drawdown of up to eight-tenths of a foot within a portion of the flow range. The purpose of the proposed effort is to complete the necessary development, evaluation, and documentation for a deviation from the Mississippi River L&D 10 WCM operating plan to include this small-scale annual growing season drawdown designed to enhance germination and growth of emergent wetland plants.

Status of Fiscal Year 2024 Work

In FY 2024, a project delivery team (PDT) was formed consisting of USACE staff from Planning (planning and environmental compliance), Operations (locks and dams, channel management, and natural resources), and Engineering (hydrology and hydraulics (H&H) and water control) Divisions. The PDT met and began development of public outreach materials. The team purchased automated cameras for monitoring, which were not installed in 2024 due to sustained flooding.

Anticipated Work in Fiscal Year 2025

In early FY 2025, the PDT will meet with agency partners to communicate the proposed operation change, solicit comments, and request support in communicating with stakeholders. The public outreach video will be completed to help convey the project purpose and the proposed operation change to the public and stakeholders. The PDT will finish drafting environmental assessment which will be released for public review and a public meeting held. H&H will submit a deviation request for the proposed action. Automated cameras will be installed at strategic backwater photo points to monitor aquatic vegetation growth.

Future Vision

If the trial is successful, MVP expects to continue operating Mississippi River L&D 10 using the hinge-point control method rather than returning to the primary-secondary-tertiary operation method. The new operation plan would be written into a future WCM Update.

Mississippi River (Locks and Dams 24-26), IL and MO - MVS (LD)

Environmental Pool Management (EPM) for Mississippi River Pools 24-26 has been conducted since 1994. Initially, the pools were held below full pool for 30–40 days during the growing season. It was shown that ecological conditions could be significantly enhanced for annual emergent aquatic plant production with this relatively brief drawdown. In 2014, high flows during the spring and summer

necessitated a drawdown in Pool 26 for a period of 86 days. The extended drawdown not only produced extensive beds of annual emergent plants but also was favorable for several perennial aquatic vegetation species such as Arrowhead (*Sagittaria* spp.), American Lotus (*Nelumbo lutea*), and Spatterdock (*Nuphar advena*). After meeting with stakeholders, a target of 90 or more days of EPM operations was identified to improve conditions for annual and perennial aquatic plant species during a 4-year trial period. Since then, MVS has incorporated the new targets into their water control operations. Building upon the successes on the Mississippi River, MVS has worked to implement ecological flows water level management (WLM) at new locations, including on Lake Shelbyville and Carlyle Lake and at Jerry F. Costello L&D, all on the Kaskaskia River.

EPM on the Upper Mississippi River is a long-term case study on the Corps' ability to make operational changes within the UMR Navigation System for the benefit of the environment, without impacting the navigation system. This case study documents the history of EPM for future SRP practitioners, including the key lessons learned in program genesis, public and agency outreach, implementation, program results, monitoring, and eventual incorporation into full practice.

Status of Fiscal Year 2024 Work

Work on this project was delayed due to key members of the team being delayed in getting back to their roles. A retrospective about the history of EPM was initiated in FY 2024.

Anticipated Work in Fiscal Year 2025

Interviews with key members of the EPM team throughout out its history and a summary of environmental benefits will be completed in FY 2025. The draft report will be completed by the end of FY 2025.

Future Vision

This project has no additional phases after the report is completed. The report will capture knowledge presently scattered through multiple mediums, reports, etc. (including oral history) into a single location and should prove beneficial to future SRP teams exploring EPM within both L&Ds and reservoirs.

Mississippi River (multiple reservoirs), IL and MO - MVS (LD)

The lake sturgeon is a charismatic fish species that is unique due to its longevity and sheer size. Lake sturgeon, also known as rubbernose sturgeon, can reach 8 feet long, weigh over 200 pounds, and live over 100 years. Lake sturgeon are designated as state endangered species in Illinois and Missouri. In 2015, lake sturgeon were observed spawning in the tailwater of the Melvin Price Locks and Dam on the Upper Mississippi River, about 17 miles north of St. Louis, Missouri. This site became the first confirmed sturgeon spawning location in Missouri, however some of the specifics around this event are not fully understood. It is known that water temperature, time of year, flow velocity, and substrate are critical to spawning. Ongoing work seeks to collect data necessary to operationalize e-flows for lake sturgeon through targeted operations, collaboratively monitoring lake sturgeon activity and response, and conduct agency coordination and public outreach.

Beginning in FY 2021, MVS completed baseline flow conditions of prior use years in HEC's River Analysis System (HEC-RAS) two-dimensional (2D) modeling, sturgeon sampling, tracking and spawn monitoring, as well as development and implementation of an SRP lake sturgeon conservation outreach plan. HEC-

RAS was used to simulate existing channel conditions and study velocities affected by gate-bay gate settings. Model outputs and gaged shoreline velocities were used as a starting point for generating recommended gate settings to achieve target conditions in the suitable spawning substrate area.

Lake sturgeon spawning operations have been achieved at Melvin Price L&D (lock and dam 26) in 2022, 2023, and 2024. Knowledge gained from these spawning events was utilized to assess all L&Ds on the Upper Mississippi River. USACE coordinated with federal and state stakeholders to initially identify and screen locks and dams for potential spawning locations in FY 2024. Factors such as habitat quality, ability to manage flows, lake sturgeon presence, and accessibility were considered to determine viability of a given site. This project also assisted the Missouri Department of Conservation (MDC) in conducting baseline sturgeon monitoring at Mississippi River L&D 25 near Winfield, Missouri.

Status of Fiscal Year 2024 Work

MVS, MVR, and MVP coordinated with stakeholders in a series of workshops to evaluate all 27 L&Ds on the Mississippi River for potential to manage velocities for lake sturgeon spawning. A matrix was developed assigning scores to each L&D. In addition, lake sturgeon were successfully captured, tagged, and tracked at Mississippi River L&D 25. A cursory analysis of the habitat and the development of a two-dimensional model for Mississippi River L&D 25 began.

Anticipated Work in Fiscal Year 2025

A summary report for the L&D rankings effort and lake sturgeon monitoring efforts at Mississippi River L&D 25 will be developed in early FY 2025. A submittal was approved for FY 2025 to finalize the two-dimensional model, complete a habitat assessment, and implement gate manipulation trials at Mississippi River L&D 25.

Future Vision

If conditions allow, velocity trials will take place in 2025. If efforts suggest target velocities can be attained over a suitable habitat, attempts will be made to implement and document spawning at Mississippi River L&D 25, alongside attempts to replicate successes at Mississippi River L&D 26.

Neuse River (Falls Lake), NC - SAW (Gen)

USACE owns and operates Falls Lake, which impounds the upper 22 miles of the Neuse River in North Carolina. Downstream of the dam, the river travels approximately 185 miles until it enters about 40 miles of a brackish tidal estuary that eventually flows into Pamlico Sound. The Albemarle-Pamlico Sound is the second largest estuary on the east coast, and a critical resource for fisheries and the livelihoods of many people in North Carolina. Striped bass and shad have critically declined in this river.

Falls Lake is a multi-purpose reservoir authorized to support flood risk management, water supply, water quality, fish and wildlife enhancement, and recreation. Conservation storage is fully allocated for water supply withdrawals and water quality releases. Even though fish and wildlife enhancement is an authorized purpose, current operations do not officially provide any special releases related to downstream fish spawning. However, in recent years, the SAW water management team has coordinated with basin fisheries experts such as NCWRC and USFWS to make releases from Falls Lake more beneficial for downstream spawning fish when possible.

This year, the SRP worked with a growing team of supportive and engaged stakeholders and experts, gathering and reviewing existing, obtainable information regarding the Neuse River, the subject species, and pertinent reservoir operations. This was done with the goal of determining if releases from Falls Lake could improve conditions for the Neuse River spring spawn. The data will be analyzed for correlations between river hydrology, target habitats, and measures of positive spawning activity.

Status of Fiscal Year 2024 Work

Immediately upon receiving funding, the Neuse team - including USACE water management and environmental staff, TNC, and NCWRC - began gathering data to support this effort. By the end of the first quarter, the team had identified species of interest, identified target locations for river spawn, gathered period of record hydrology data for the basin, identified available literature and data regarding species spawning needs. The team grew to include academics offering research and data from neighboring river systems so that correlations to Neuse River spawn might be found. District environmental staff worked closely with SRP agency experts to find available reports and begin synthesizing data from them. For the rest of the calendar year, efforts focused on finding correlations between river flows and locations and records of positive spawning activities. The SRP GIS team worked with environmental staff and partnering agencies to aid in geospatial representations of this analysis and will continue to work with them into FY 2025.

Anticipated Work in Fiscal Year 2025

A summary of the findings from the FY 2024 study, including a GIS story map, will be prepared. The SRP team decided to not submit a proposal for FY 2025 for staffing considerations. They also decided to allow time for partners to share the summary of findings, identify additional data needs, and develop a plan to fill those needs.

Future Vision

The SRP team anticipates this project continuing into FY 2026. The next phase is finding additional data to support correlations between river flow and successful spawning on the Neuse River, and then possibly formulating potential release strategies from Falls Lake to support the spawning activities of the species of interest.

Osage River (multiple reservoirs), KS and MO - NWK (Gen)

USACE owns and operates six reservoirs in the Osage River Basin of Kansas and Missouri. Five of those reservoirs - Melvern, Hillsdale, Pomona, Pomme de Terre, and Stockton - are authorized to support flood risk management, water supply, water quality, fish and wildlife enhancement, and recreation. Stream reaches downstream of USACE dams are prime for operations designed to generate ecological benefits associated with flow management. In the basin, the zone of influence exceeds 350 miles in 6 different and diverse stream reaches below NWK impoundments.

Growing human and ecological demands in the Osage Basin combined with declining fish and mussel abundance and diversity is the impetus for e-flow discussions and advancing SRP planning with local stakeholder agencies, USACE, and TNC. An SRP-supported e-flows workshop was held in 2024 and aligned with NWK's current WCM update cycle for four Osage reservoirs. With this team of supportive and engaged stakeholders, the SRP team is building off local knowledge of fish and mussels and planning

additional test flows based on the drought contingency test flows done in 2023 to improve the environmental operations for the Osage.

Status of Fiscal Year 2024 Work

The SRP team proposed using prior guidance to continue implementing test flows from SRP flow recommendations using processes developed for the 2023 drought contingency test flow and monitoring. Specific pulse flows were implemented to benefit fish spawning (April - June) on four stream reaches below USACE dams and recommendations to improve connectivity during late summer (June - September) for the benefit of fish and mussels were initiated in September 2024.

Anticipated Work in Fiscal Year 2025

SRP will begin to quantify available aquatic habitat, bed substrate, and flow characteristics during the implementation phase of the SRP e-flows. Additionally, SRP recommended test flows will be implemented and surveyed with the assistance of science team partners to prioritize survey sites and identify critical data needs. Two additional science team meetings will be included to refine e-flow proposals based on the collection and assimilation of new information.

The district will work with stakeholders to improve long-term monitoring programs to assess the health of the Osage River Basin mussel populations. The Osage River Basin Mussel Restoration Technical Working Group established by USFWS is actively working to improve mussel populations and restore threatened and endangered species as outlined in the Osage River Basin Freshwater Mussel Conservation and Restoration Plan. Limiting factors to aquatic mussel recovery listed in the restoration plan include site conditions and monitoring costs. Both factors could be improved by SRP activities of e-flows, adaptive management, and monitoring. Historic mussel surveys have been infrequent in both Kansas and Missouri. Providing funds for mussel monitoring within e-flow reaches would provide numerous and mutual benefits including improved collaboration among stakeholders and states.

Future Vision

Continue working with stakeholders to develop and implement an adaptive management plan including aquatic biological and habitat monitoring via hydrographic surveys to document response to e-flows.

Rio Grande (multiple reservoirs), NM - SPA (Gen)

The Rio Grande is a major watershed in the southwestern United States, and the Middle Rio Grande refers to the 170+ mile segment that passes through northern and central New Mexico. The conveyance of water in the Rio Grande is of both interstate and international interest. Within the state of New Mexico there are many federal, state, and non-government interests. Additionally, there are (10) tribal nations along the Rio Grande mainstem in New Mexico: Taos, Ohkay Owingeh, Santa Clara, San Ildefonso, Cochiti, Kewa, San Felipe, Santa Ana, Sandia and Isleta pueblos. The USACE Albuquerque District's (SPA) authorities and responsibilities on this river relate to water management for a diversity of water owners, flood control, and ecosystem restoration. USACE manages several dams that affect water delivery in this system, including Abiquiu and Cochiti dams.

Fiscal Year 2024 was the first year SRP supported work for the Rio Grande.

Status of Fiscal Year 2024 Work

SRP funded USACE team members to participate in an environmental flows workshop. Participants shared technical expertise during workshop discussions, supported workshop coordinators on behalf of USACE, and ensured that other relevant expertise from SPA is solicited per workshop objectives.

Anticipated Work in Fiscal Year 2025

The SPA team is working to complete a written summary of USACE management constraints and opportunities pertaining to environmental flows for the Rio Grande.

Future Vision

It is expected that results from the environmental flows workshop, including identification of related opportunities and constraints, will be useful for other SPA water management, partnering, and restoration activities within the Rio Grande basin.

Salt River (Clarence Cannon Dam), MO - MVS (Gen)

The Salt River, located in northeast Missouri is an important tributary of the Mississippi River. The river was dammed in 1984 via construction of Clarence Cannon Dam (CCD) to create Mark Twain Lake (MTL). The dam, with two hydropower turbines, is jointly operated by USACE and the Southwestern Power Administration (SWPA). Flows out of the dam are regulated in accordance with the USACE water control and hydropower generation plan. In addition, there is a re-regulation dam below MTL. Flows out of MTL and the re-regulation pool have a significant impact on both the species and adjacent habitats of the lower Salt River.

SRP work on the Salt River began in 2022 with a focus on operations for lake sturgeon spawning below the re-regulation pool. In FY 2024, work on the Salt was expanded to include investigation of environmental opportunities related to water flows and levels in the re-regulation pool and adjacent wetland areas.

Lake sturgeon spawning

Lake sturgeon were historically common throughout the Mississippi River and Missouri River basins. However, by the 1900s they became endemic to the Great Lakes. Multiple states have been involved in lake sturgeon reintroduction programs. The MDC began stocking lake sturgeon in the Mississippi and Missouri rivers in 1984 but only recently has breeding in the wild been observed and documented. Just below Clarence Cannon Dam, a hydropower dam on the Salt River, lake sturgeon aggregations and assumed breeding was documented from 2016 through 2020.

Status of Fiscal Year 2024 Work

An on-site meeting with USACE, the Southwestern Power Administration (SWPA), and MDC was held in January 2024 to discuss a general plan for the upcoming spawning season and set a date for the Public Outreach meeting. This was held on February 26, 2024, to inform the public of some of the lessons learned from FY 2023 test flows and inform them of the team's intent to carry out e-flows again in spring when the water temperatures were approaching the spawning window. SRP funds acquired new acoustic receivers to monitor the presence of tagged fish as they moved up the Salt River system. MDC placed the array of receivers along the stream bank at multiple downstream points starting immediately below the reregulation dam and extending multiple river miles.

In April 2024, when water temperatures began to increase and the spawning window neared, it was clear that the pool level in MTL was below the required 606 feet the workgroup agreed to as the minimum for requesting discharges of e-flows for sturgeon. At this level, water priority shifts to power distribution, and cannot sustain the extended flows for sturgeon. By the time the local area received enough rain to bring the MTL pool up to a sufficient level, it was already approaching May, and the workgroup agreed the window for implementing e-flows to trigger a successful spawn had likely already passed. Some minimal monitoring efforts had been conducted by MDC and USACE, however no evidence of lake sturgeon was found, nor anticipated without the implementation of e-flows below the reregulation dam.

Anticipated Work in Fiscal Year 2025

Building upon the FY 2023 flow test efforts and the improved monitoring equipment array of FY 2024, the SRP team plans to host focused meetings with the state and SWPA to discuss a more formalized draft operational plan: continue advancing the pilot project in spring 2025 if conditions are suitable, increase collaborative monitoring efforts of lake sturgeon activity/response in the area, continue agency coordination and public outreach, and complete a yearly summary report.

Future Vision

Several years of assessing modifications to flow management coupled with lake sturgeon monitoring is anticipated to refine operations. If the project is successful, lessons learned from the Salt River and the Melvin Price L&D lake sturgeon project could be used to help other districts implement similar projects in their district for sturgeon or other fish species with similar spawning requirements.

Wetland enhancements

This SRP effort evaluates what can be done to improve the connection between waters in the re-regulation pool and adjacent wetlands on USACE property. The wetlands are under the management of the MTL Project Office. Over time, the adjacent wetlands have become degraded. Because USACE, working in concert with SWPA, controls the outflows of both MTL and the Clarence Cannon Re-regulation Dam, there may be an opportunity for a seasonal e-flow/water raise/flood pulse to recharge and reconnect the floodplain and the Salt River.

Status of Fiscal Year 2024 Work

A workshop to gather information about the ecological condition of the wetlands and to evaluate the potential for wetland enhancements through operational changes was conducted in FY 2024 with the various resource agencies and a draft report was completed.

Anticipated Work in Fiscal Year 2025

Final draft report from the FY 2024 workshop will be submitted in first quarter FY 2025.

The team complete critical data collection to enhance e-flow between the project and the wetland project.

Future Vision

The project will continue into FY 2026 in the final phase of the project before implementation. FY 2025 is for data collection and FY 2026 will be to develop a better e-flow regime to enhance the wetlands.

Stones and Cumberland rivers (Old Hickory and J. Percy Priest), TN - LRN (Gen)

J. Percy Priest Dam is located on the Stones River, 6.8 miles upstream of the confluence with the Cumberland River. Old Hickory Dam is located on the Cumberland River 10.3 miles upstream of the Stones confluence. As a result, the tailwaters of J. Percy Priest Dam and Old Hickory are closely linked both hydrologically and ecologically. J. Percy Priest Dam tailwater has been the subject of environmental interest in the recent past, which resulted in the installation of a cone valve to increase flow and DO in the tailwater of the reservoir.

Current dam operating procedures alter hydrology by storing water, which lowers flood peaks downstream and extends moderate high flows over longer durations. Average and minimum flows are higher than natural conditions as floodwaters are released over longer periods. Downstream geomorphic, WQ, and habitat functions are also impacted by reservoir operations.

The SRP team will conduct a literature review of the relevant biological and ecological studies in the tailwater of the J. Percy Priest and Old Hickory dams prior to the upcoming WCM updates for each reservoir. This literature review includes examining recent and historical biological, WQ, and hydraulic data to assess the existing conditions and opportunities for operational improvement. This literature review also identifies data gaps and ecological targets for each of reservoir. Defined and implemented flows would then be considered for the coming WCM updates. In addition, the literature review helps define the purpose and scope of a future SRP proposal to fully inform operational decisions. Resource management stakeholders and research institutions will be engaged to share knowledge and objectives prior to each dam's WCM update.

Status of Fiscal Year 2024 Work

Work in FY 2024 focused on collecting pertinent project data and readily available environmental data, reaching out to the state wildlife resource agency, and developing the existing conditions section of J. Percy Priest Dam.

Anticipated Work in Fiscal Year 2025

Report development continues and includes more detailed information gained from the state wildlife resource agency - an analysis on the impacts of historical flow conditions on the biology and ecology. The report also develops potential guidelines to benefit downstream and in-pool needs. Report completion anticipated before the end of FY 2025.

Future Vision

The report synthesizes existing literature on the watershed and serves as a basis for drafting the environmental documentation for upcoming WCM updates for Old Hickory Dam and J. Percy Priest Dam. This report may also lead to more directed future SRP proposals for these projects.

Tombigbee River (multiple reservoirs), AL and MS - SAM (Gen)

The Tombigbee River Watershed drains roughly 1,800 square miles of northeastern Mississippi and western Alabama. High river flows carry large amounts of silt and other sediments, which affect aquatic and terrestrial habitats along the system. These heavy sediment loads reduce water quality throughout the Tombigbee River Watershed. Large sand bars that have developed because of sediment deposition impact flow regimes and the natural course of the Tombigbee River headwaters.

Species found along the Tombigbee River Watershed are in critical habitat areas that have been impacted by the creation of the Tennessee-Tombigbee Waterway. Minimum flow structures maintain, and support mitigation of minimum flow returns to the Tombigbee River. The East Fork reach of the Tombigbee River includes critical habitat area of the Southern clubshell and the orange-nacre mucket and is within the historic range of the Alabama moccasinshell and ovate clubshell mussel species. High stormwater runoff inputs and erosion from regional farmlands into the Tombigbee River have contributed to population decline in these species.

The Old Tombigbee River (Old River) lies adjacent to the Jamie L. Whitten, G.V. "Sonny" Montgomery, John Rankin, Fulton, Glover Wilkins, Thad Cochran, and Aberdeen locks and dams of the TennesseeTombigbee Waterway. There are flow structures within the G.V. "Sonny" Montgomery Lock and Dam pool that provide base inflows to Old River. In addition, G.V. "Sonny" Montgomery and Glover Wilkins locks and dams have off-channel spillways that can move water from the main waterway to Old River. This occurs when minimum flow structures and local inflows cannot meet inflow requirements.

During periods of low local inflows, more water is released through the spillway structures to meet minimum flow requirements. This results in backwater effects and out of bank flow conditions which impact native hardwood species growth based on observations from range management personnel and a current flow study conducted by SAM.

SRP support would be used to engage an interdisciplinary team comprised of USACE personnel and other federal, state, and non-governmental entities. SAM seeks to improve operations using existing infrastructure by changing operations at the minimum flow structures and spillways. The goal of this project is to reduce flooding and sedimentation due to backwater effects from current operations. Alternate operations would allow for reduced backwater flooding while still maintaining the minimum flow requirements during periods of low natural inflows.

The upper Tennessee-Tombigbee Waterway was enrolled in SRP in 2023. The team has identified three phases of data collection work to inform pilot project scenarios for implementation if they are effective at improving hydrological and water quality conditions for aquatic resources and bottomland hardwood species. In FY 2023, the team gathered and assessed baseline data on operations and ecological conditions and developing operational alternative recommendations to meet ecological objectives and minimum flow requirements. In FY 2024, SAM began implementing and evaluating a range of water management scenarios, including ramping rates to minimize mussels stranding and increased baseflow to allow for greater lateral connectivity to mussel habitat. The team anticipates that an implementation plan will be developed as early as FY 2025 to FY 2026.

Status of Fiscal Year 2024 Work

The team continued to collect WQ and flow data at the Bigbee Gage. The engineering and planning division, in coordination with the operations division, drafted planned e-flow releases for FY 2025 and continued monitoring the slug flows for habitat clearing.

Anticipated Work in Fiscal Year 2025

The SRP team will conduct additional e-flow experimentation and continue data collection. SAM will begin the process of incorporating e-flow operations into normal operations. The SAM engineering division is providing real time data to the project personal to allow for easier e-flow operations.

Future Vision

Project efforts will continue into FY 2026 to finalize e-flows being part of the operations on the Tennessee-Tombigbee Waterway.

Tule River (Lake Success), CA - SPK (Gen)

The USACE Tribal Nations Technical Center of Expertise (TNTCX) was created to support USACE work with federally recognized Tribes across the enterprise. The goal of this 18-month (FY 2024 to FY 2025) project is for TNTCX, SPK Operations, SPK Water Management, SPK Tribal Liaisons, Tribal partners, and other Tule Restoration Alliance members to conduct a tule restoration literature review, identify potential site-specific restoration opportunities and constraints, identify potential water management considerations, and identify future funding options for Tule River restoration, operations, and maintenance. Tule Restoration Alliance members, including Tribal representatives, will collaborate in the study and provide valuable knowledge, science, and insight into Tule River restoration. Ideally, this study process and methodology will be applicable and transferable to other USACE projects within the species range. This project is specific to Lake Success near Porterville, California.

Status of Fiscal Year 2024 Work

During the fourth quarter of FY 2024, the PDT was formed, the Tule literature review was initiated, and a kickoff meeting was held. The PDT includes members of the Tule Restoration Alliance, Tribal Nations Technical Center of Expertise (TNTCX), SPK Operations, SPK Tribal Liaison, and representatives from the Tule River Tribe of California. During the kickoff meeting the PDT initiated planning for the FY 2025 site visit and meeting at Lake Success.

Anticipated Work in Fiscal Year 2025

In FY 2025, the PDT will meet at Lake Success and the Tule River Tribe Reservation to begin discussing opportunities and constraints related to tule restoration at Lake Success. The two-day meeting will include field visits to potential restoration sites, discussion of restoration techniques, water management operations, and a site specific conceptual ecological model. On the second day of the meeting, the team will meet at the Tule River Tribe offices on the reservation near Lake Success to continue discussions.

Future Vision

This project will be completed by the end of FY 2025. Anticipated deliverables include a site-specific conceptual ecological model, documentation of tule restoration opportunities or constraints preventing them, identification of potential funding for a restoration project (if applicable), Tule education and outreach activities, and a draft access/harvesting agreement (if applicable).

Upper Ohio River (multiple reservoirs), MD, NY, PA, and WV - LRP (LD)

Dams can cause connectivity issues by preventing species movement up and down stream and impacting life cycles of aquatic species. This effort is focused on identifying specific actions to increase river connectivity and/ or aquatic habitat between navigation pools defined by the three uppermost L&Ds on the Ohio River - Emsworth (RM 6.2), Dashields (RM 13.3), and Montgomery (RM 31.7) - and developing an implementation plan to enact the proposed environmental flows for conservation lockages. This effort builds on Habitat Improvement and Connectivity goals identified during FY 2021

and FY 2022 SRP efforts, during which workgroup participants came to a consensus that the potential benefits of conservation lockages on the Ohio mainstem were worth further investigation.

Status of Fiscal Year 2024 Work

Through the winter of FY 2024, the team focused on reaching out to potential stakeholders—including stage agencies, local universities, and ERDC—to gather information and invite participation in a fish passage task force. The task force kickoff meeting was held Aug 26, 2024. The resulting discussion focused on gathering known information and identifying knowledge gaps, and an overall discussion of what the objectives of a fish passage program might be. The group noted that the current body of knowledge does not document how many fish might be moving between pools and identified a monitoring program as a top priority. In particular, the task force recommended building a monitoring effort in conjunction with the Pennsylvania Fish and Boat Commission and other downstream agencies to increase fish tagging efforts and install sensors on the L&Ds.

Anticipated Work in Fiscal Year 2025

The working group will have several follow-up meetings to continue the conversation in FY 2025. Based on Task Force consensus and feasibility of concept, the group will select a lock along the first 30 miles of upper steam on the Ohio River and develop a conservation lockage schedule based on previous implementation on the Allegheny River, including the selection of target species. Additionally, the group will work with stakeholders to build and increase monitoring efforts at current L&Ds, develop best practices, and create a data collection methodology to quantify results.

Future Vision

The project is anticipated to continue into future years as the task force develops and implements the envisioned monitoring protocol on the upper Ohio River locks and dams. In particular, the task force aims to provide data to support efficient, effective implementation and increase understanding of fish movement between pools on the mainstem of the Ohio River.

Wabash River (multiple reservoirs), IA - LRC (Gen)

The upper Wabash Flood Control System includes the reservoirs of the Mississinewa, J. Edward Roush, and Salamonie Dams. These operate cohesively to reduce flood damages in the upper Wabash River Basin, and with other facilities downstream reducing the impact of floods in the lower Wabash and Ohio River. Authorized missions include flood risk management, environmental stewardship, and recreation. Chicago District (LRC) is currently updating the Master Plans and WCMs for all three facilities. The upper Wabash River is in its third year with the SRP after basin-wide planning by LRC for Wabash environmental flows (e-flows) started in FY 2022.

This effort involves collecting baseline data in three key areas identified in the 2023 e-flows workshop: mussels, fishes and aquatic habitats, and water quality. It also includes data management activities, documentation of results, and dissemination of findings to the project's subject matter expert (SME) group and the public. If conditions allow, the team may also attempt to implement a trial pulse release to collect pre- and post-data as well.

Status of Fiscal Year 2024 Work

In August 2024, the team procured water quality monitoring devices and developed a fish and aquatic habitat sampling plan. In September, the team conducted a reconnaissance trip to determine sampling locations and identify viable water quality monitoring locations. Monitoring devices were deployed at the end of September in the tailwaters of the Roush, Salamonie, and Mississinewa dams. In addition, H&H modeling and analysis was conducted to provide details on implementation of a modified fall drawdown at Salamonie Lake allowing for a modified spring fill and seasonal flood pulses. Work then began on the deviation request to implement fall drawdown and spring fill operational changes.

Anticipated Work in Fiscal Year 2025

The deviation request for the modified fall drawdown and spring fill will be completed in fall 2025. The fall fish and habitat sampling trip will occur during the first week of November. Water quality monitoring devices will be retrieved before winter and the data will be retrieved and analyzed. The devices will be deployed again in spring prior to the modified spring fill operations. The first newsletter will be disseminated in January 2025. Gravid pocketbook mussel females will be collected during winter and glochidia will be raised by a hatchery. Mussel silos will be deployed in June 2025 and juvenile mussels will be placed in the silos. Mussels in the silos will be monitored throughout the growing season and will be retrieved in October 2025. Fish and habitat sampling trips will be conducted in early June and mid-August 2025. A report of data collection and implementation actions will be developed and finalized by December 2025.

Future Vision

Future efforts after 2025 will include further implementation of e-flows and continued fish, habitat, and mussel monitoring to determine effects of modified operations at Roush, Salamonie, and Mississinewa lakes.

Other Sustainable River Program Accomplishments

In addition to FY 2024 location-based work, SRP also accomplished tasks from past years as described in previous IPR reports, https://www.hec.usace.army.mil/sustainablerivers/publications/. The following are other location-based SRP advancements occurring in FY 2024:

- Black River - The State of the Science report was drafted. The report details scientific literature related to the Black River, identifying flow-dependent fish, mussels, and other species in the Black River; examining changes in these species over time; and investigating alterations in the flow regime that may have contributed to ecological change.
- Cape Fear River - Two fish passage pulses were implemented during the spring 2024 spawning period. Monitoring included broad- and fine-scale telemetry, electrofishing, and eDNA. Fisheries experts on the Cape Fear River team are analyzing 2024 results. They provided periodic progress reports of 2022 monitoring and 2023 data analyses, as well as a draft publication that is currently in review for publication.
- Cape Fear River - Results of another successful year of e-flows for fish passage and water quality have been added to a growing implementation summary report. The HEC-RAS model developed for Cape Fear River L&D 2 to support analysis of fish passage alternatives was shared with partnering agencies for additional analysis.

- Cossatot River - A draft implementation document was developed and is planned for completion in FY 2025. Document identifies implementation opportunities and constraints related to previously defined e-flows.
- Des Moines River - A report entitled “Waterbird & Vegetation Response to Reservoir Management in Central Iowa,” was received and is being processed for publication.
- Des Moines River - An interactive web interface was created to share data about shorebird tracking in response to SRP e-flows. An annual field season report was also completed for this effort.
- Farm Creek - All efforts for this project were finished and the final report submitted. There is a Science, Technology, Engineering, the Arts, and Mathematics (STEAM) event for local schools planned for early October to recruit students for ongoing monitoring efforts.
- Kaskaskia River - Environmental Pool Management (EPM) implementation results were documented and published, including responses by emergent wetland plants and associated seed production to managed pool drawdowns.
- Lake Washington Ship Canal - USGS findings related to environmental conditions in the Lake Washington Ship Canal were reviewed by NWS senior leadership. The finalized review memo is an interim product that will be made publicly available.
- Mississippi River (Pool 26) - Sampling and documentation was completed for implementation of environmental operations related to lake sturgeon spawning and provision of shorebird habitat.
- Mississippi River (Pool 26) - Implementation and modeling of pool management for emergent wetland vegetation in response to managed pool drawdowns was completed and documented.
- Osage River - Science team meetings and input from management agencies culminated into a thorough state of the science report for Osage River Basin, which has been published to the SRP website.
- Osage River - The science report was presented and e-flow recommendations were developed during a two-day workshop attended by 28 participants from a variety of state, federal, university, and non-governmental organizations.
- Rivercane Restoration - A meeting and site visit to a potential rivercane restoration site with USACE, USFWS, and Tribes was held in January 2024, which included collection of materials for genome sequencing, greenhouse cloning, and assessment.
- Roanoke and Cape Fear Rivers - Roanoke River models were developed, and teams ran hindcast simulations to assess potential ecological responses to revised operations. The same teams modeled future climate scenarios to understand effects of climate change on reservoir performance and ecosystem functions. A workshop was held to demonstrate model results and identify ecosystem measures to focus on for climate response. The HEC-EFM model was updated to support this effort.
- Roanoke River - A presentation was prepared for ongoing eDNA work. A final HEC-EFM summary report is planned for completion in FY 2025.
- Salt River – Environmental flows for lake sturgeon were modeling, assessed, and documented in a report now available at the SRP website.
- Upper Ohio River - Updates to the HEC-RAS model for a reach of the Allegheny River were completed. Support was provided during a successful mussel sampling field effort. The field report will be submitted in FY 2025.

APPENDIX A: Sustainable Rivers Program Metrics Summary - 2023

This report on metrics is for tracking outreach and ecological impacts of SRP for calendar year 2023. Additional information on SRP metrics and methodology can be retrieved from https://www.hec.usace.army.mil/sustainablerivers/publications/.

Definitions

Four environmental actions (e-flows, e-pools, physical habitat, and conservation locking) and their associated outreach and environmental action purpose are tracked per calendar year.

- Outreach and stakeholder engagement metrics are measured for sites in the advance, implement, and incorporate phases of SRP. Outreach is tracked by counting organizations contacted (i.e., organizations that received information via any form of active communication, including email), and organizations engaged (i.e., organizations that participated a workshop or contributed to project deliverables). Outreach is also tallied for organizations performing monitoring or analyses for a respective action purpose (i.e., sites may have multiple action purposes with separate engagement respective to the action purpose). Media pieces - comprising public information sources such as news reels, videos, public radio broadcasting, and articles - are also recorded. Media pieces do not include tracking or posting of SRP highlights in social media outlets (e.g., Twitter, Facebook, LinkedIn, etc.).
- Sites having progressed to the implement and/or incorporate phases of SRP are linked to one or more action purpose. Action purposes may change throughout a site's involvement with SRP as environmental strategies evolve. Project teams in the implementation or incorporate phases report on river miles or acres for their targeted action purposes. Values reported include river miles or acres actively being monitored or the ecological benefit realized through routine implementation of an Adaptive Management Monitoring Plan and/or changed operations (i.e., pool level drawdowns as part of the WCM for a site).

2023 Summary

In 2023, 14 sites in the advance stage reported outreach metrics for stakeholder meetings or workshops. Table A1 details what the sites reported. More than 200 separate organizations were contacted regarding SRP efforts and nearly 100 of those organizations actively participated in meetings and workshops. Six media pieces were generated from SRP-related advance efforts. Table A2 tracks the action purposes across all sites in the implement and/or incorporate phases. Table A3 summarizes the ecological benefits of action purposes including the following:

- Geomorphic Process
- Water Temperature Management
- Fisheries (Life History Support)
- Fish Passage
- Harmful/Nuisance Algal Blooms
- Vegetation–Riparian
- Mussels (Life History Support)
- Vegetation–Wetlands
- Herptiles (Life History Support)
- Floodplain Connectivity
- Shorebirds, Gulls, Other Water Birds (Life History Support)

Table A4 summarizes the totals of unique outreach, RMs, and acres overall for the sites in the implement and/or incorporate phases.

Table A1. Advance sites, outreach metrics, 2023 (sheet 1 of 5).

District	Site	Type	Action	# of Organizations Contacted	# of Organizations Engaged	List Engaged	# of Media Pieces
LRC	Wabash River	General Reservoirs	E-Flows	12	6	• Ball State University • Indiana DNR • Ball State University • The Nature Conservancy • Samshine Foundation • USACE	0
LRP	Upper Ohio River (Allegheny R./ Kinzua Dam)	General Reservoirs	E-Flows	22	12	• Armstrong Trails • Armstrong Co. • Pennsylvania Department of Conservation and Natural Resources • Pennsylvania Fish and Boat Commission • Pittsburgh Collaboratory for Water Research • Southwestern Pennsylvania Commission • The Nature Conservancy • US Environmental Protection Agency • US Fish and Wildlife Service • USGS • USACE • Western Pennsylvania Conservancy	0

Table A1. Advance sites, outreach metrics, 2023 (sheet 2 of 5).

District	Site	Type	Action	# of Organizations Contacted	# of Organizations Engaged	List Engaged	# of Media Pieces
MVP	Minnesota River	General Reservoirs	E-Pools	2	2	• USACE • USFWS	0
MVR	Iowa River	General Reservoirs	E-Flows	25	8	• City of Coralville • City of Iowa City • Iowa Soybean Association • Johnson County Conservation Board • Univ. of Iowa–Iowa Flood Center • USGS • TNC • USACE	0
NWS	Ballard Locks	Locks and Dams	Conservation Locking	2	2	• USACE • USGS	0
NWK	Kansas River	General Reservoirs	E-Pools	9	9	• The Crane Trust • Ducks Unlimited • KPWD–Fisheries • KDWP–Public Lands • KDWP–Migratory Birds • Nebraska Game and Parks–Fisheries • Nebraska Game and Parks–Wetlands • TNC • USACE	0
NWK	Osage River	General Reservoirs	E-Flows	11	3	• Oklahoma State • TNC • USACE	0

Table A1. Advance sites, outreach metrics, 2023 (sheet 3 of 5).

District	Site	Type	Action	# of Organizations Contacted	# of Organizations Engaged	List Engaged	# of Media Pieces
SWF	Brazos River	General Reservoirs	E-Flows	42	11	• Brazos River Authority • Dow Chemical • GDS Associates • Lower Brazos Riverwatch • Natural Resources Conservation Service • TNC • SWPA • Texas Parks and Wildlife Department • Texas Water Development Board • University of Texas Arlington • USACE	0
SWF	Trinity River	General Reservoirs	E-Flows	29	13	• City of Fort Worth • Dallas Water Utility • North Central Texas Council of Governments • North Texas Municipal Water District • Tarrant Regional Water District • Texas A&M Agrilife • Texas Advanced Computing Center • University of Texas • TNC • Texas Parks and Wildlife Department • Texas Water Development Board • University of Texas • USACE	0

Table A1. Advance sites, outreach metrics, 2023 (sheet 4 of 5).

District	Site	Type	Action	# of Organizations Contacted	# of Organizations Engaged	List Engaged	# of Media Pieces
SWF	Neches River	General Reservoirs	E-Flows	29	12	• Angelina and Neches River Authority • Lower Neches Valley Authority • National Park Service • Simfero Consultants • SWPA • TNC • Texas Parks and Wildlife Department • Texas Water Development Board • Texas A&M University • Texas Clean Air and Water • TTG Forestry • USACE	0
SWL	Black River	General Reservoirs	E-Flows	13	12	• Arkansas Game and Fish Commission • Arkansas State University • Arkansas Natural Heritage Commission • Arkansas Department of Agriculture–Natural Resource Division • Ducks Unlimited • EnSafe • MDNR • MDC • TNC • USACE • USDA • USFWS	0

Table A1. Advance sites, outreach metrics, 2023 (sheet 5 of 5).

District	Site	Type	Action	# of Organizations Contacted	# of Organizations Engaged	List Engaged	# of Media Pieces
SAM	Chattahoochee River	General Reservoirs	E-Flows	17	9	• NPS • GADNR • GADNR Environmental Protection Division • GADNR Wildlife Resources Division • GADNR Buford Hatchery • Gwinnett County Department of Water Resources • Chattahoochee Riverkeeper • River Through Atlanta • USACE	0
SAM	Alabama River	Locks and Dams	Conservation Locking	10	5	• Geological Survey of Alabama • TNC • Alabama Department of Environmental Management • USACE • USFWS	1
SAM	Tombigbee	Locks and Dams	E-Flows	5	4	• Mississippi Department of Wildlife, Fisheries, and Park • Mississippi Museum of Natural History • USACE • USFWS	5
Total	14 Sites			228	108		6

Table A2. Implement and incorporate sites, metrics reporting, 2023 (sheet 1 of 11).

District	Site	Type	Action	# Orgs. Contacted	# Orgs. Engaged	# Media Pieces	Action-Purpose	Amount	Organizations Engaged
LRL	Green River	General Reservoirs	E-Flows	N/A	12	0	• Workshop to re-engage basin stakeholders on SRP in the Green River Basin • Fisheries (Life History Support) • Mussels (Life History Support)	310 miles	• Campbellsville University • Crawford Hydrology Lab–Western Kentucky University • Kentucky Department of Fish and Wildlife Resources • Kentucky Division of Water • Kentucky Rural Water Association • NPS–Mammoth Cave National Park • Office of Kentucky Nature Preserves • TNC • USACE: IWR, LRL, LRN, MVP • USFWS • Western Kentucky University

Table A2. Implement and incorporate sites, metrics reporting, 2023 (sheet 2 of 11).

District	Site	Type	Action	# Orgs. Contacted	# Orgs. Engaged	# Media Pieces	Action-Purpose	Amount	Organizations Engaged
LRP	Upper Ohio River (Allegheny R./Kinzua Dam)	General Reservoirs	E-Flows	10+ (several local water intake companies)	3	0	• Geomorphic Process • Fisheries (Life History Support) • Mussels (Life History Support) • Herptiles (Life History Support) • Floodplain Connectivity	126 miles	• University of Pittsburgh • USACE • USGS

Table A2. Implement and incorporate sites, metrics reporting, 2023 (sheet 3 of 11).

District	Site	Type	Action	# Orgs. Contacted	# Orgs. Engaged	# Media Pieces	Action-Purpose	Amount	Organizations Engaged
MVP	Bois de Sioux River[1]	General Reservoirs	E-Pools	24	11	0	• Shorebirds, Gulls, and Other Water Birds (Life History Support)	6,000 acres	• Minnesota DNR • South Dakota Game, Fish, and Parks • Traverse Soil and Water Conservation District • City of Fargo–Water Utility • City of Moorhead–Water Plant • City of Wahpeton–Water Treatment Plant • City of Breckenridge–Public Works • Bios de Sioux Watershed District • Minnesota Pollution Control Agency • North Dakota Department of Environmental Quality • USACE

Table A2. Implement and incorporate sites, metrics reporting, 2023 (sheet 4 of 11).

District	Site	Type	Action	# Orgs. Contacted	# Orgs. Engaged	# Media Pieces	Action-Purpose	Amount	Organizations Engaged
MVR	Iowa River	General Reservoirs	E-Flows	25	8	0	• Fisheries (Life History Support) • Mussels (Life History Support) • Water Temperature Management	57 miles	• City of Coralville • City of Iowa City • Iowa Soybean Association • Johnson County Conservation Board • University of Iowa–Iowa Flood Center • USGS • TNC • USACE
MVR	Iowa River	General Reservoirs	E-Pools	25	8	0	• Fisheries (Life History Support) • Shorebirds, Gulls, and Other Water Birds (Life History Support) • Herptiles (Life History Support)	2,623 acres	• City of Coralville • City of Iowa City • Iowa Soybean Association • Johnson County Conservation Board • University of Iowa–Iowa Flood Center • USGS • TNC • USACE

Table A2. Implement and incorporate sites, metrics reporting, 2023 (sheet 5 of 11).

District	Site	Type	Action	# Orgs. Contacted	# Orgs. Engaged	# Media Pieces	Action-Purpose	Amount	Organizations Engaged
MVR	Des Moines River	General Reservoirs	E-Pools	5	4	0	• Shorebirds, Gulls, and Other Water Birds (Life History Support) • Vegetation–Riparian • Fisheries (Life History Support)	20,000 acres	• Iowa State University • Iowa DNR • TNC • USACE
MVR	Des Moines River	General Reservoir	E-Flows	6	5	0	• Fisheries (Life History Support) • Mussels (Life History Support)	142 miles	• Iowa State University • Iowa DNR • TNC • USACE
MVS	Mississippi River	Locks and Dams	E-Pools	10	3	0	• Vegetation–Wetlands	879 acres	• Illinois DNR • USACE • USFWS
MVS	Mississippi River	Locks and Dams	E-Flows	10	3	3	• Fisheries (Life History Support)	5 miles	• Missouri Department of Conservation • USACE • USFWS

Table A2. Implement and incorporate sites, metrics reporting, 2023 (sheet 6 of 11).

District	Site	Type	Action	# Orgs. Contacted	# Orgs. Engaged	# Media Pieces	Action-Purpose	Amount	Organizations Engaged
MVS	Kaskaskia River	Locks and Dams	E-Pools	10	4	1	• Vegetation-Wetlands • Low Flow Prevented Implementa-tion	0 acres	• Illinois DNR • Missouri Department of Conservation • Southern Illinois Waterfowl, Inc. • USACE
MVS	Salt River[1]	Locks and Dams	E-Flows	10	3	0	• Fisheries (Life History Support)	64 miles	• SWPA • Missouri Department of Conservation • USACE
NWP	Willamette River	General Reservoirs	E-Flows	2	2	0	• Fisheries (Life History Support) • Vegetation–Riparian • Geomorphic Process • Floodplain Connectivity	449 miles	• USACE • USGS

Table A2. Implement and incorporate sites, metrics reporting, 2023 (sheet 7 of 11).

District	Site	Type	Action	# Orgs. Contacted	# Orgs. Engaged	# Media Pieces	Action-Purpose	Amount	Organizations Engaged
SAM	Chattahoochee River[1]	General Reservoirs	E-Flows	17	10	0	• Water Quality (Temperature, Nutrients, Dissolved Gases, and Turbidity)	151 miles	• NPS • GADNR • GADNR Environmental Protection Division • GADNR Wildlife Resources Division • GADNR Buford Hatchery • Gwinnett County Department of Water Resources • Chattahoochee Riverkeeper • River Through Atlanta • USACE
SAW	Cape Fear River	General Reservoirs	E-Flows	23	8	0	• Fish Passage	202 miles	• Clemson University • NCWRC • North Carolina Department of Marine Fisheries • TNC • University of NC - Wilmington • USACE • USFWS • USGS

Table A2. Implement and incorporate sites, metrics reporting, 2023 (sheet 8 of 11).

District	Site	Type	Action	# Orgs. Contacted	# Orgs. Engaged	# Media Pieces	Action-Purpose	Amount	Organizations Engaged
SAW	Cape Fear River	General Reservoirs	E-Flows	23	8	0	• Fisheries (Life History Support)	135 miles	• Clemson University • North Carolina Wildlife Resources Commission • North Carolina Department of Maine Fisheries • TNC • University of North Carolina–Wilmington • USACE • USFWS • USGS

Table A2. Implement and incorporate sites, metrics reporting, 2023 (sheet 9 of 11).

District	Site	Type	Action	# Orgs. Contacted	# Orgs. Engaged	# Media Pieces	Action-Purpose	Amount	Organizations Engaged
SAW	Cape Fear River	General Reservoirs	E-Flows	23	11	0	• Harmful/ Nuisance Algal Blooms (Disrupt/ Disperse)	202 miles	• Meritech Inc. • North Carolina Department of Environmental Quality • Brunswick County Public Utilities • Fayetteville Public Works Commission • Cape Fear Public Utility Authority, City of Sanford • Harnett Regional Water • TNC • University of North Carolina–Chapel Hill • USACE • USGS

Table A2. Implement and incorporate sites, metrics reporting, 2023 (sheet 10 of 11).

District	Site	Type	Action	# Orgs. Contacted	# Orgs. Engaged	# Media Pieces	Action-Purpose	Amount	Organizations Engaged
SAW	Roanoke River	General Reservoirs	E-Flows	17	5	1	• Floodplain Connectivity	132,860 acres	• Duke University • North Carolina Wildlife Resources Commission • TNC • USACE • USFWS
SAW	Roanoke River	General Reservoirs	E-Flows	17	4	1	• Geomorphic Process	179 miles	• TNC • USACE • USFWS • USGS
SAW	Roanoke River	General Reservoirs	E-Flows	18	3	2	• Fisheries (Life History Support)	179 miles	• Eastern Carolina University • North Carolina Wildlife Resources Commission • TNC

Table A2. Implement and incorporate sites, metrics reporting, 2023 (sheet 11 of 11).

District	Site	Type	Action	# Orgs. Contacted	# Orgs. Engaged	# Media Pieces	Action-Purpose	Amount	Organizations Engaged
SWF	Big Cypress Bayou	General Reservoirs	E-Flows	12	5	0	• Fisheries (Life History Support) • Floodplain Connectivity	30 miles 2,000 acres	• Caddo Lake Institute • Northeast Texas Municipal Water District • TNC • Texas Parks and Wildlife Department • Texas Water Development Board
SWL	Cossatot River[1]	General Reservoirs	E-Flows	0	0	0	• Fisheries (Life History Support) • Mussels (Life History Support)	171 miles	• N/A

[1] Site moved to Implement or Incorporate phase or implementation was initiated in the 2024 calendar year.

Notes:

1. *Engagement and miles are tracked by Action Purpose. Some sites differ in their engagement per Action Purpose, such as the Cape Fear and Roanoke Rivers.*
2. *Implement/Incorporate sites not included in 2024 metrics reporting include Farm Creek (Dry Dam), Savannah River, Bill Williams River, and the Barren River; sites are dormant or did not report outreach, monitoring, or operationalized actions for targets in 2024.*
3. *Corrections and updates to metrics reported can be requested by contacting the SRP Program Team.*

Table A3. Summary of outreach, river miles, and acres per Action-Purpose for implement and/or incorporate sites.

Action-Purpose	Orgs. Contacted	Orgs. Engaged	River Miles	Acres
E-Flows:				
Fish Passage	23	8	135	N/A
Fisheries (Life History Support)	>80	45	1,678	N/A
Floodplain Connectivity	>43	20	605	134,860
Geomorphic Process	>19	9	754	N/A
Harmful/Nuisance Algal Blooms (Disrupt/Disperse)	23	8	202	N/A
Herptiles (Life History Support)	10	3	126	N/A
Mussels (Life History Support)	>16	20	749	N/A
Vegetation–Riparian	2	2	449	N/A
Water Temperature Management	28	8	57	N/A
Total (sum of all e-flows amounts)	189	105	4,620	134,860
E-Pools:				
Fisheries (Life History Support)	30	12	N/A	22,623
Herptiles (Life History Support)	25	8	N/A	2,623
Shorebirds, Gulls, Other Water Birds (Life History Support)	49	19	N/A	8,623
Vegetation–Riparian	5	4	N/A	20,000
Vegetation–Wetlands	10	3	N/A	879
Total (sum of all e-pools amounts):	119	46	N/A	54,748

Table A4. Summary totals of unique outreach, river miles, and acres overall for E-Flows and E-Pools.

Domain of Implement and Incorporate	Orgs. Contacted	Orgs. Engaged	River Miles	Acres
Total - E-Flows (sum of unique amounts)	122	63	1,886	134,860
Total - E-Pools (sum of unique amounts)	64	26	0	29,502

APPENDIX B: Sustainable Rivers Program Milestones

Thirty-two location-based scopes of work were approved and funded in FY 2024. Table B1 shows milestones for each of those projects. Revised completion dates reflect the schedule at the time of the FY 2024 IPR.

Table B1. Deliverables and milestones status and schedule, Fiscal Year 2024 (sheet 1 of 14).

	Milestone Name	Planned Completion Date	Revised Completion Date	Actual Completion Date
MVR–Des Moines River (Lake Red Rock)–FY 2024				
Milestone 1	Effort started.	11/13/2023	11/13/2023	11/13/2023
Milestone 2	Science–Completion of CESU deliverables for Des Moines River scopes (i.e., waterbird and vegetation final report; response to e-flow on fish final report).	03/31/2024	10/30/2024	04/30/2024
Milestone 3	Science–Field season reports (i.e., 1) e-flow impact on mussels, 2) e-flow response by fishes, and 3) e-pool results for waterbirds and invertebrates).	03/31/2024	11/15/2024	N/A
Milestone 4	Science–Completion of satellite tracking web portal and Final Adaptive Management and Monitoring Plan (AMMP) for Iowa River-Coralville Dam.	03/31/2024	02/15/2024	02/15/2024
Milestone 5	Communications–Educational and marketing materials.	08/31/2024	N/A	08/31/2024
Milestone 6	Sturgeon–Complete 2024 field season report.	09/30/2024	11/30/2024	N/A
Milestone 7	Shorebirds and Invertebrates–2024 field season and annual report for shorebird satellite tracking and e-flow impact on mussels.	10/31/2024	12/30/2024	N/A
Milestone 8	Sturgeon–Annual report for effects of reservoir operations on 1) fish reproduction and movement and 2) sturgeon survival in Des Moines River system.	11/30/2024	11/30/2024	N/A
Milestone 9	Effort finished.	12/31/2024	N/A	N/A
SAM–Alabama River–LD–FY 2024				
Milestone 1	Effort started.	11/30/2023	11/30/2023	11/30/2023
Milestone 2	Initiate planning and methodology meetings with USACE and external agencies.	11/30/2023	11/30/2023	11/30/2023
Milestone 3	Purchase FLOY tags, acoustic tags, nets, fish feed, and feeders.	11/30/2023	11/30/2023	11/30/2023

Table B1. Deliverables and milestones status and schedule, Fiscal Year 2024 (sheet 2 of 14).

	Milestone Name	Planned Completion Date	Revised Completion Date	Actual Completion Date
SAM–Alabama River–LD–FY 2024 (continued)				
Milestone 3	Purchase FLOY tags, acoustic tags, nets, fish feed, and feeders.	11/30/2023	11/30/2023	11/30/2023
Milestone 4	Begin fish attractant feeding.	12/15/2023	12/15/2023	12/15/2023
Milestone 5	Initiate fish sampling.	02/29/2024	02/28/2024	02/28/2024
Milestone 6	Finish fish sampling.	07/30/2024	07/15/2024	07/15/2024
Milestone 7	Completion of summary implementation report.	09/30/2024	11/30/2024	N/A
Milestone 8	Effort finished.	09/30/2024	11/30/2024	N/A
SAM–Tombigbee River (Wilkins Dam) –FY 2024				
Milestone 1	Effort started.	11/30/2023	11/30/2023	11/30/2023
Milestone 2	Gravel bar identification.	11/30/2023	11/30/2023	11/30/2023
Milestone 3	Gravel bar data collection.	02/29/2024	05/24/2024	05/24/2024
Milestone 4	E-Flows begin.	03/31/2024	05/31/2024	05/31/2024
Milestone 5	E-Flows end.	09/30/2024	11/30/2024	N/A
Milestone 6	Complete implementation report and share supplemental gravel bar assessment.	12/01/2024	N/A	N/A
Milestone 7	Effort finished.	12/01/2024	N/A	N/A
MVS–Salt River E-Flows for Lake Sturgeon (Clarence Cannon)–FY 2024				
Milestone 1	Effort started.	12/05/2023	12/05/2023	12/05/2023
Milestone 2	Onsite preseason meeting to outline upcoming tasks (SWPA, MDC, USACE).	03/01/2024	03/01/2024	03/01/2024
Milestone 3	Operational e-flows with onsite fish monitoring sampling.	03/01/2024	05/15/2024	05/15/2024
Milestone 4	Complete modeling and agency coordination and outreach (ongoing through end FY 2024).	11/30/2024	N/A	N/A
Milestone 5	Season-end project report.	12/31/2024	N/A	N/A
Milestone 6	Effort finished.	12/31/2024	N/A	N/A

Table B1. Deliverables and milestones status and schedule, Fiscal Year 2024 (sheet 3 of 14).

	Milestone Name	Planned Completion Date	Revised Completion Date	Actual Completion Date
MVS–Kaskaskia River (Jerry F. Costello L&D)–FY 2024				
Milestone 1	Effort started.	12/05/2023	12/05/2023	12/05/2023
Milestone 2	Shorebirds–Analysis of daily release and water surface elevation.	11/30/2024	N/A	N/A
Milestone 3	Shorebirds–Perform shorebird use surveys.	10/15/2024	N/A	N/A
Milestone 4	Shorebirds–Video/photo station.	10/15/2024	N/A	N/A
Milestone 5	Shorebirds–Sediment moisture and invertebrate sampling.	10/30/2024	N/A	N/A
Milestone 6	Shorebirds–Summary report.	12/31/2024	N/A	N/A
Milestone 7	Shorebirds and WLM–Integration into Kaskaskia Basin operating plans.	12/31/2026	N/A	N/A
Milestone 8	Effort finished.	12/31/2026	N/A	N/A
SAW–Neuse River (Falls Dam)–FY 2024				
Milestone 1	Effort started.	11/30/2023	11/30/2023	11/30/2023
Milestone 2	Concurrent tasks of data gathering data and sharing readily available data.	02/29/2024	06/14/2024	06/14/2024
Milestone 3	Concurrent tasks may overlap with the data collection efforts, including identifying remaining data needs and expanded communications to fill those needs.	05/31/2024	11/30/2024	N/A
Milestone 4	Continue concurrent efforts and prepare draft report.	08/31/2024	11/30/2024	N/A
Milestone 5	Final draft report.	11/30/2024	N/A	N/A
Milestone 6	Effort finished.	11/30/2024	N/A	N/A
LRN–Cumberland River Basin–FY 2024				
Milestone 1	Effort started.	12/5/2023	12/05/2023	12/05/2023
Milestone 2	Complete research, data gathering, and workshop planning.	06/01/2024	06/03/2024	06/03/2024
Milestone 3	Conduct Cumberland River Basin workshop.	06/15/2024	06/26/2024	06/26/2024
Milestone 4	Complete Cumberland River Basin workshop summary report, including ecosystem priorities.	09/15/2024	09/13/2024	09/13/2024
Milestone 5	Effort finished.	09/15/2024	09/13/2024	09/13/2024

Table B1. Deliverables and milestones status and schedule, Fiscal Year 2024 (sheet 4 of 14).

	Milestone Name	Planned Completion Date	Revised Completion Date	Actual Completion Date
SWL–Fourche La Fave River E-Flows–FY 2024				
Milestone 1	Effort started.	12/15/2023	12/15/2023	12/15/2023
Milestone 2	Complete HEC-RAS model update and e-flow scenarios.	05/31/2024	05/24/2024	05/24/2024
Milestone 3	Host e-flows workshop.	07/31/2024	07/10/2024	07/10/2024
Milestone 4	Final report detailing e-flow recommendations.	09/30/2024	N/A	N/A
Milestone 5	Effort Finished.	09/30/2024	N/A	N/A
NWK–Kansas River E-Pools–FY 2024				
Milestone 1	Effort started.	12/13/2023	12/13/2023	12/13/2023
Milestone 2	Complete GIS data models.	02/29/2024	09/30/2024	N/A
Milestone 3	Complete summary report comparing impact of e-pools management strategies on other existing environmental datasets (or a section of the e-pools workshop and e-pools implementation strategy).	07/26/2024	12/30/2024	N/A
Milestone 4	Host e-pools workshop.	08/23/2024	12/30/2024	N/A
Milestone 5	Complete e-pool workshop summary report and implementation strategy.	09/30/2024	12/30/2024	N/A
Milestone 6	Effort finished.	09/30/2024	12/30/2024	N/A
SAM–Chattahoochee River E-Flows (Buford Dam)–FY 2024				
Milestone 1	Effort started.	12/11/2023	12/11/2023	12/11/2023
Milestone 2	Complete data analysis of modified flow regimes conducted between August and December 2023.	02/28/2024	09/30/2024	N/A
Milestone 3	Complete monitoring activities and distribute summary of impacts from 6-month e-flow implementation.	04/30/2024	09/30/2024	N/A
Milestone 4	Conduct 12-month data review analysis with stakeholders (2 days).	09/30/2024	08/22/2024	08/22/2024
Milestone 5	Report of e-flow implementation results.	12/31/2024	N/A	N/A
Milestone 6	Effort finished.	12/31/2024	N/A	N/A

Table B1. Deliverables and milestones status and schedule, Fiscal Year 2024 (sheet 5 of 14).

	Milestone Name	Planned Completion Date	Revised Completion Date	Actual Completion Date
MVS–Mississippi River Lake Sturgeon Spawning-LD–FY 2024				
Milestone 1	Effort started.	12/13/2023	12/13/2023	12/13/2023
Milestone 2	Complete lake sturgeon monitoring at L&D25.	04/30/2024	04/26/2024	04/26/2024
Milestone 3	Complete assessment of Mississippi River L&D's for management of spawning habitat.	09/30/2024	10/30/2024	N/A
Milestone 4	Completion of 2024 summary report.	12/30/2024	N/A	N/A
Milestone 5	Effort finished.	12/30/2024	N/A	N/A
MVS–Mississippi River Environmental Pool Management–FY 2024				
Milestone 1	Effort started.	02/28/2024	02/28/2024	02/28/2024
Milestone 2	Begin collection of existing data, reports, photos, and other ancillary information. Begin interviews with key EPM practitioners and collaborators.	03/31/2024	04/15/2024	04/15/2024
Milestone 3	Complete draft report.	09/15/2024	12/30/2024	N/A
Milestone 4	Complete final report.	11/15/2024	03/31/2025	N/A
Milestone 5	Effort finished.	12/15/2024	09/30/2025	N/A
LRP–Clarion River–East Branch Dam–FY 2024				
Milestone 1	Effort started.	04/02/2024	04/02/2024	04/02/2024
Milestone 2	Complete internal discussions.	06/30/2024	12/30/2024	N/A
Milestone 3	Complete implementation and monitoring plan.	10/31/2024	N/A	N/A
Milestone 4	Implement select flow prescriptions and monitor impacts from March to August.	08/31/2025	N/A	N/A
Milestone 5	Complete summary report.	09/30/2025	N/A	N/A
Milestone 6	Effort finished.	09/30/2025	N/A	N/A

Table B1. Deliverables and milestones status and schedule, Fiscal Year 2024 (sheet 6 of 14).

	Milestone Name	Planned Completion Date	Revised Completion Date	Actual Completion Date
MVP–Mississippi River–Pool 10 Opportunistic Drawdown–FY 2024				
Milestone 1	Effort started.	04/02/2024	04/02/2024	04/02/2024
Milestone 2	Funding of FY 2024 work and kickoff.	04/02/2024	04/02/2024	04/02/2024
Milestone 3	Final EA and memo document completed (task 1&2).	02/28/2025	N/A	N/A
Milestone 4	Anticipated implementation of operating plan (task 3).	05/31/2025	N/A	N/A
Milestone 5	Effort finished.	08/31/2025	N/A	N/A
LRP–Upper Ohio River–FY 2024				
Milestone 1	Effort started.	04/02/2024	04/02/2024	04/02/2024
Milestone 2	Coordinate outreach efforts to regional (Pennsylvania) stakeholders and brief SRP focused efforts to partnering entities.	12/31/2024	N/A	N/A
Milestone 3	Convene workshop to charter task force and outline mission statement, goals, and objectives.	01/31/2025	N/A	N/A
Milestone 4	Finalize implementation plan.	03/31/2025	N/A	N/A
Milestone 5	Conduct conservation lockages and monitor throughout the FY 2024 season.	09/15/2025	N/A	N/A
Milestone 6	Project summary report with conservation lockage/implementation plan.	12/31/2025	N/A	N/A
Milestone 7	Effort finished.	12/31/2025	N/A	N/A
SAM–Chattahoochee River Fish Spawn (Seminole L&D)–FY 2024				
Milestone 1	Effort started.	04/02/2024	04/02/2024	04/02/2024
Milestone 2	Kick off meeting with state resource agencies.	04/02/2024	04/02/2024	04/02/2024
Milestone 3	Operation of pool for critical elevations begins.	04/02/2024	04/02/2024	04/02/2024
Milestone 4	Data collection begins.	05/06/2024	05/01/2024	05/01/2024
Milestone 5	Data collection ends.	06/30/2024	06/06/2024	06/06/2024
Milestone 6	Project report.	07/31/2024	11/30/2024	N/A
Milestone 7	Effort finished.	09/30/2024	11/30/2024	N/A

Table B1. Deliverables and milestones status and schedule, Fiscal Year 2024 (sheet 7 of 14).

	Milestone Name	Planned Completion Date	Revised Completion Date	Actual Completion Date
SAM–Coosawattee River (Carters Dam)–FY 2024				
Milestone 1	Effort started.	04/02/2024	04/02/2024	04/02/2024
Milestone 2	Initiate planning and methodology meetings with USACE and external agencies.	11/30/2023	11/30/2023	04/02/2024
Milestone 3	Acquire side scan sonar.	12/31/2023	12/31/2023	04/02/2024
Milestone 4	Initiate data collection.	06/30/2024	06/17/2024	06/17/2024
Milestone 5	Finish data collection.	06/30/2024	06/28/2024	06/28/2024
Milestone 6	Review findings and collaborate with MVS team to share insights and best practices related to e-flows for lake sturgeon.	07/31/2024	11/30/2024	N/A
Milestone 7	Summary of Findings of E-flow Analysis at Carters Dam, Coosawattee River. Literature review and recommended releases from Carters re-regulation dam that yield best habitat and flow conditions within flexibility of WCM.	09/15/2024	11/30/2024	N/A
Milestone 8	Effort finished.	09/15/2024	11/30/2024	N/A
NWS–Kootenai River (Libby Dam)–FY 2024				
Milestone 1	Effort started.	04/04/2024	04/04/2024	04/04/2024
Milestone 2	Water quality lab contracts finalized.	05/15/2024	05/15/2024	05/15/2024
Milestone 3	Begin water quality sampling.	05/21/2024	05/21/2024	05/21/2024
Milestone 4	Deliver water quality samples to lab.	10/31/2024	N/A	N/A
Milestone 5	Begin water quality data analysis.	12/15/2024	N/A	N/A
Milestone 6	Final report completed.	03/15/2025	N/A	N/A
Milestone 7	Effort finished.	03/15/2025	N/A	N/A

Table B1. Deliverables and milestones status and schedule, Fiscal Year 2024 (sheet 8 of 14).

	Milestone Name	Planned Completion Date	Revised Completion Date	Actual Completion Date
NWO–Cherry Creek (Cherry Creek Dam)–FY 2024				
Milestone 1	Effort started.	04/25/2024	04/25/2024	04/25/2024
Milestone 2	Stakeholder coordination/feedback.	04/25/2024	04/25/2024	04/25/2024
Milestone 3	Stakeholder kick-off meeting.	04/25/2024	04/25/2024	04/25/2024
Milestone 4	Begin monthly water quality sampling at Cherry Creek Reservoir and outflow.	05/31/2024	05/20/2024	05/20/2024
Milestone 5	End monthly water quality sampling at Cherry Creek Reservoir and outflow.	09/30/2024	09/24/2024	09/24/2024
Milestone 6	Stakeholder results meeting.	10/31/2024	N/A	N/A
Milestone 7	Complete and circulate summary report.	10/31/2024	N/A	N/A
Milestone 8	Effort finished.	10/31/2024	N/A	N/A
LRN–Stones and Cumberland River–FY 2024				
Milestone 1	Effort started.	05/28/2024	05/28/2024	05/28/2024
Milestone 2	Complete summary of environmental characteristics.	08/31/2024	10/31/2024	N/A
Milestone 3	Complete identification of environmental opportunities.	01/17/2025	N/A	N/A
Milestone 4	Complete final report and transfer deliverables.	01/31/2025	N/A	N/A
Milestone 5	Effort finished.	02/28/2025	N/A	N/A
LRL–Green River Basin E-Flows–FY 2024				
Milestone 1	Effort started.	05/28/2024	5/28/2024	5/28/2024
Milestone 2	Complete research and data gathering for working meetings.	06/15/2024	10/31/2024	N/A
Milestone 3	Complete working meetings for each facility.	07/30/2024	10/31/2024	N/A
Milestone 4	Complete e-flows workshop.	02/28/2025	N/A	N/A
Milestone 5	Complete workshop summary report and e-flows summary report.	03/31/2025	N/A	N/A
Milestone 6	Effort finished.	03/31/2025	N/A	N/A

Table B1. Deliverables and milestones status and schedule, Fiscal Year 2024 (sheet 9 of 14).

	Milestone Name	Planned Completion Date	Revised Completion Date	Actual Completion Date
NWO–James River (Pipestem Dam)–FY 2024				
Milestone 1	Effort started.	05/28/2024	05/28/2024	05/28/2024
Milestone 2	Meet with partners to discuss concerns and interest in environmental pool management and e-flow strategies.	06/15/2024	09/05/2024	09/5/2024
Milestone 3	Complete “Meeting Comment Summary Report 1.”	07/15/2024	09/24/2024	09/24/2024
Milestone 4	Begin WQ sampling and model update.	08/15/2024	08/15/2024	08/15/2024
Milestone 5	Complete WQ sampling.	10/30/2024	N/A	N/A
Milestone 6	Complete model calibration.	01/15/2025	N/A	N/A
Milestone 7	Complete alternatives analysis.	03/15/2025	N/A	N/A
Milestone 8	Meet with partners to discuss results of model analysis.	04/15/2025	N/A	N/A
Milestone 9	Complete “Meeting Comment Summary Report 2.”	05/15/2025	N/A	N/A
Milestone 10	Final report.	09/30/2025	N/A	N/A
Milestone 11	Effort finished.	09/30/2025	N/A	N/A
SPK–Tule River (Lake Success)–FY 2024				
Milestone 1	Effort started.	05/28/2024	05/28/2024	05/28/2024
Milestone 2	PDT formation and literature review.	06/15/2024	06/25/2024	06/25/2024
Milestone 3	Hold kickoff meeting.	06/30/2024	08/12/2024	08/12/2024
Milestone 4	Workplan development.	07/20/2024	08/22/2024	08/22/2024
Milestone 5	Site visit/opportunities meeting.	09/16/2024	11/30/2024	N/A
Milestone 6	Develop potential restoration options.	10/28/2024	N/A	N/A
Milestone 7	Follow-up site visit/meeting/workshop.	03/10/2025	N/A	N/A
Milestone 8	Refine potential options and opportunities.	06/09/2025	N/A	N/A
Milestone 9	Storymap/tech transfer development.	08/11/2025	N/A	N/A
Milestone 10	Submit final report.	09/30/2025	N/A	N/A
Milestone 11	Effort finished.	09/30/2025	N/A	N/A

Table B1. Deliverables and milestones status and schedule, Fiscal Year 2024 (sheet 10 of 14).

	Milestone Name	Planned Completion Date	Revised Completion Date	Actual Completion Date
MVN–Atchafalaya River (Bayou Courtableau Control Structure)–FY 2024				
Milestone 1	Effort started.	05/28/2024	05/28/2024	05/28/2024
Milestone 2	DRAFT modeling workplan delivered.	07/31/2024	11/15/2024	N/A
Milestone 3	Modeling workplan comments resolved, FINAL modeling workplan delivered.	08/15/2024	11/15/2024	N/A
Milestone 4	Model refinements and model extension completed.	09/15/2024	11/15/2024	N/A
Milestone 5	USACE completes review of model refinements, model extension, and existing conditions. Assessment run operational and/or project alternatives finalized.	10/15/2024	11/29/2024	N/A
Milestone 6	Completion of modeling.	11/15/2024	01/15/2025	N/A
Milestone 7	DRAFT final modeling report delivered.	01/30/2025	01/10/2025	N/A
Milestone 8	All final modeling report comments received.	01/30/2025	01/31/2025	N/A
Milestone 9	All final modeling report comments resolved and final modeling report delivered.	02/28/2025	02/28/2025	N/A
Milestone 10	Implementation and monitoring experimental e-flows.	05/30/2025	01/16/2026	N/A
Milestone 11	Final evaluation of e-flows in the Bayou Courtableau Basin.	09/15/2025	07/09/2027	N/A
Milestone 12	Effort finished.	09/15/2025	07/30/2027	N/A
MVS–Salt River-Wetlands–FY 2024				
Milestone 1	Effort started.	05/28/2024	05/28/2024	05/28/2024
Milestone 2	Onsite workshop with staff and stakeholders (SWPA, USACE, MDC, others).	05/28/2024	05/28/2024	05/28/2024
Milestone 3	Project report.	12/30/2024	N/A	N/A
Milestone 4	Effort finished.	12/30/2024	N/A	N/A

Table B1. Deliverables and milestones status and schedule, Fiscal Year 2024 (sheet 11 of 14).

Milestone Number	Milestone Name	Planned Completion Date	Revised Completion Date	Actual Completion Date
MVR–Des Moines River–Species Inventory in Delta–FY 2024				
Milestone 1	Effort started.	05/28/2024	05/28/2024	05/28/2024
Milestone 2	Begin pilot site set up and data collection.	07/31/2024	07/15/2024	07/15/2024
Milestone 3	Complete pilot data collection.	10/31/2024	N/A	N/A
Milestone 4	Complete pilot data entry.	12/31/2024	N/A	N/A
Milestone 5	Complete the purpose and pilot report.	02/28/2025	N/A	N/A
Milestone 6	Set up locations.	03/31/2025	N/A	N/A
Milestone 7	Begin data collection.	04/30/2025	N/A	N/A
Milestone 8	Complete data collection.	10/31/2025	N/A	N/A
Milestone 9	Complete data entry.	12/31/2025	N/A	N/A
Milestone 10	Submit the findings and field summary report.	02/28/2026	N/A	N/A
Milestone 11	Complete the findings and field summary report.	04/30/2026	N/A	N/A
Milestone 12	Effort finished.	04/30/2026	N/A	N/A
MVR–Des Moines River–Herptiles Movement and Observations–FY 2024				
Milestone 1	Effort started.	05/28/2024	05/28/2024	05/28/2024
Milestone 2	Initiate plan of action and lit review.	10/31/2024	N/A	N/A
Milestone 3	IDNR and ISU staff trap and tag turtles, attaching eight units as pilot.	10/31/2024	N/A	N/A
Milestone 4	Trap turtles and retrieve data loggers.	04/30/2025	N/A	N/A
Milestone 5	Complete the plan and pilot report.	08/31/2025	N/A	N/A
Milestone 6	Conclude weekly summer turtle tracking.	09/30/2025	N/A	N/A
Milestone 7	Trap turtles, attach transmitters and data loggers, and initiate winter tracking (field season 1).	10/31/2025	N/A	N/A
Milestone 8	Conclude winter tracking, trap turtles, and remove and replace data loggers (field season 1).	03/31/2026	N/A	N/A
Milestone 9	Complete annual report, 2025–26 (field season 1).	08/31/2026	N/A	N/A
Milestone 10	Conclude weekly summer turtle tracking.	09/30/2026	N/A	N/A
Milestone 11	Trap turtles, attach transmitters and data loggers, and initiate winter tracking (field season 2).	10/31/2026	N/A	N/A

Table B1. Deliverables and milestones status and schedule, Fiscal Year 2024 (sheet 12 of 14).

Milestone Number	Milestone Name	Planned Completion Date	Revised Completion Date	Actual Completion Date
MVR–Des Moines River–Herptiles Movement and Observations–FY 2024 (continued)				
Milestone 12	Conclude winter tracking, trap turtles, and remove and replace data loggers (field season 2).	03/31/2027	N/A	N/A
Milestone 13	Complete annual report, 2026-27 (field season 2).	08/31/2027	N/A	N/A
Milestone 14	Complete technical report.	09/30/2027	N/A	N/A
Milestone 15	Effort finished.	09/30/2027	N/A	N/A
SWF–Brazos River–E-flows–FY 2024				
Milestone 1	Effort started.	05/28/2024	05/28/2024	05/28/2024
Milestone 2	Riverware modeling complete.	02/15/2025	N/A	N/A
Milestone 3	HEC-RAS modeling complete.	05/15/2025	N/A	N/A
Milestone 4	HEC-EFM modeling complete.	08/15/2025	N/A	N/A
Milestone 5	Report of findings.	09/30/2025	N/A	N/A
Milestone 6	Effort finished.	09/30/2025	N/A	N/A
NWK–Osage–E-flows–FY 2024				
Milestone 1	Effort started.	05/28/2024	05/28/2024	05/28/2024
Milestone 2	Coordination–Meeting notes, presentations, and adaptive management plan shared.	09/30/2024	12/15/2024	N/A
Milestone 3	Monitoring aquatic habitat and hydrographic surveys.	11/30/2025	N/A	N/A
Milestone 4	Monitoring documented mussel beds to evaluate response to e-flows.	12/15/2025	N/A	N/A
Milestone 5	Effort finished.	12/15/2025	N/A	N/A

Table B1. Deliverables and milestones status and schedule, Fiscal Year 2024 (sheet 13 of 14).

	Milestone Name	Planned Completion Date	Revised Completion Date	Actual Completion Date
LRC–Wabash–Implementation and Monitoring–FY 2024				
Milestone 1	Effort started.	05/28/2024	05/28/2024	05/28/2024
Milestone 2	Purchase water quality loggers.	06/30/2024	06/26/2024	06/26/2024
Milestone 3	Develop water quality monitoring plan.	08/30/2024	10/31/2024	N/A
Milestone 4	Complete modeling for modified fall drawdown/spring fill.	08/30/2024	10/31/2024	N/A
Milestone 5	Complete fall fish and aquatic habitat study.	09/30/2024	10/31/2024	N/A
Milestone 6	Collect gravid female Pocketbook mussels.	09/30/2024	10/31/2024	N/A
Milestone 7	Deploy water quality loggers.	09/30/2024	10/31/2024	N/A
Milestone 8	Implement modified fall drawdown.	09/30/2024	10/31/2024	N/A
Milestone 9	Disseminate first newsletter.	01/31/2025	N/A	N/A
Milestone 10	Deploy mussel silos, then measure and place juveniles in silos.	03/31/2025	N/A	N/A
Milestone 11	Implement modified spring fill.	03/31/2025	N/A	N/A
Milestone 12	Complete summer fish and aquatic habitat study.	07/31/2025	N/A	N/A
Milestone 13	Complete mussel silo investigation.	10/31/2025	N/A	N/A
Milestone 14	Disseminate second newsletter.	12/15/2025	N/A	N/A
Milestone 15	Complete implementation activities and monitoring of fish and mussels.	12/15/2025	N/A	N/A
Milestone 16	Effort finished.	12/15/2025	N/A	N/A
SPA–Rio Grande–E-Flows–FY 2024				
Milestone 1	Effort started.	05/31/2024	05/31/2024	05/31/2024
Milestone 2	Pre-workshop activity to prepare participants for workshop discussions and document initial agency constraints/opportunities.	07/25/2024	07/18/2024	07/18/2024
Milestone 3	Environmental flows workshop participation.	08/15/2024	08/7/2024	08/07/2024
Milestone 4	Complete written summary of USACE perspectives/opportunities/constraints.	12/31/2024	N/A	N/A
Milestone 5	Effort finished.	12/31/2024	N/A	N/A

Table B1. Deliverables and milestones status and schedule, Fiscal Year 2024 (sheet 14 of 14).

	Milestone Name	Planned Completion Date	Revised Completion Date	Actual Completion Date
LRL–Licking River E-Flows Workshop–FY 2024				
Milestone 1	Effort started.	07/29/2024	07/29/2024	07/29/2024
Milestone 2	Complete the literature review and share with workshop participants.	02/28/2025	N/A	N/A
Milestone 3	Host workshop for technical specialists to provide information regarding the Licking River and define e-flow recommendations.	04/30/2025	N/A	N/A
Milestone 4	Licking River E-flows and Related Opportunities Report detailing specific recommendations for e-flows, if feasible and other future projects and collaboration.	06/30/2025	N/A	N/A
Milestone 5	Effort finished.	06/30/2025	N/A	N/A

APPENDIX C: Funding and Execution - Fiscal Year 2024 (as of 10/1/24)

In FY 2024, SRP was in the House Budget at $1M and received $5M through appropriations. Funds above the House Budget became available to SRP on 28 May 2024, which means the Program received 80% of its budget with 34% of the fiscal year remaining. Dates of location-based teams first receiving FY 2024 funds to support their efforts are listed as the "Milestone 1 - Team" dates in Appendix A. Carryover to FY 2025 was $2.7M ($1.9M from FY 2024, $0.6M from FY 2023, and $0.1M from FYs 2022 and 2021). Tables C1 to C4 present allocations and carryover of funds per major program component for FY 2021-2024. Table C5 provides FY 2024 administrative costs. Table C6 presents information for detailed program components.

Table C1. Allocations and carryover per major program components, FY 2024 ($, millions).

Component FY 2024:	Budgeted	Carryover to FY 2025
Programmatic	2.0	0.3
- Program support	*0.8*	*0.3*
- Technologies	*0.7*	*0.0*
- Validation	*0.6*	*0.1*
- Program balance	*0.0*	*0.0*
Location-based	3.0	1.5
- Labor	*2.2*	*1.3*
- Repositions, MIPRs, etc.	*0.8*	*0.2*
Total	4.95	1.9

Table C2. Allocations and carryover per major program components, FY 2023 ($, millions).

Component FY 2023:	Budgeted	Carryover to FY 2024	Carryover to FY 2025
Programmatic	2.8	0.5	0.1
- Program support	*1.5*	*0.5*	*0.1*
- Technologies	*0.9*	*0.0*	*0.0*
- Validation	*0.5*	*0.1*	*0.0*
Location-based	4.1	1.4	0.5
- Labor	*2.1*	*1.1*	*0.4*
- Repositions, MIPRs, etc.	*2.0*	*0.3*	*0.1*
Total	6.9	1.9	0.6

Table C3. Allocations and carryover per major program components, FY 2022 ($, millions).

Component FY 2022:	Budgeted	to FY 2023	to FY 2024	to FY 2025
Programmatic	2.5	0.7	0.0	0.0
- Program support	*1.2*	*0.7*	*0.0*	*0.0*
- Technologies	*0.8*	*0.1*	*0.0*	*0.0*
- Validation	*0.5*	*0.0*	*0.0*	*0.0*
Location-based	2.5	1.8	0.4	0.1
- Labor	*2.0*	*1.5*	*0.3*	*0.06*
- Repositions, etc.	*0.5*	*0.3*	*0.0*	*0.03*
Total	5.0	2.5	0.4	0.1

Table C4. Allocations and carryover per major program components, FY 2021 ($, millions).

Component FY 2021:	Budgeted	to FY 2022	to FY 2023	to FY 2024	to FY 2025
Programmatic	1.9	0.3	0.0	0.0	0.0
- Program support	*0.8*	*0.3*	*0.0*	*0.0*	*0.0*
- Technologies	*0.6*	*0.0*	*0.0*	*0.0*	*0.0*
- Validation	*0.5*	*0.0*	*0.0*	*0.0*	*0.0*
Location-based	3.1	1.8	0.8	0.3	0.1
- Labor	*1.9*	*1.1*	*0.5*	*0.2*	*0.04*
- Repositions, etc.	*1.1*	*0.8*	*0.3*	*0.1*	*0.04*
Total	5.0	2.1	0.8	0.3	0.1

Table C5. Program administrative costs, FY 2024 ($, thousands). All SRP components with administrative costs are included in this table. Associated budgeted totals are from Table B6.

	Budgeted	Administrative	Notes (assumptions)
Program support			
- HEC	97	48	50% of budgeted
- IWR	223	111	50% of budgeted
- MVP	158	79	50% of budgeted
- MMC	186	186	100% of budgeted
Validation (SRP-Science)			
- Des Moines River	165	15	CESU fees
- North Carolina Rivers	100	10	CESU fees
Location-based	There were no known administrative fees for location-based work in FY 2024		
Totals (program budget, admin, %)	4,949	449	9.1%

Table C6. Allocations and carryover per detailed program components, FY 2024 ($, thousands).

	Budgeted	Obligated	Carryover (labor)	Carryover (reposition)
Programmatic	1,987	1,645	330	12
- Program support	770	509	254	7
- HEC	97	72	25	0
- IWR	223	144	78	0
- MVP	158	92	58	7
- MMC	186	161	25	0
- Detail	91	34	57	0.005
- Regional meetings (POD)	15	5	10	0
- E-opportunities at locks and dams	1	0	1	0
- Tech	664	664	0	0
- Ecological software development	236	236	0	0
- Engineering software development	427	427	0	0
- Validation (SRP-Science)	553	473	76	4
- Des Moines River	165	150	15	0.003
- North Carolina Rivers	100	93	7	0
- Upper Ohio River	145	120	21	4
- Willamette River	143	110	32	0
- Program balance*	0.4	---	0.4	---
Location-based	2,962	1,431	1,286	245
- LRC - Wabash River	220	54	135	31
- LRL - Green River	90	10	80	0
- LRL - Licking River	120	1	119	0
- LRN - Cumberland River	111	110	2	0.08
- LRN - Stones River	60	15	45	0
- LRP - East Branch Clarion River	50	6	44	0
- LRP - Ohio River	50	6	39	5
- MVN - Bayou Courtableau	50	24	26	0
- MVP - Mississippi River (Pool 10)	101	15	76	10
- MVR - Des Moines River (support)	83	83	0	0
- MVR - Des Moines River (herptiles)	203	203	0	0
- MVR - Des Moines River (inventory)	212	212	0	0
- MVS - Kaskaskia River (shorebirds)	40	26	14	0
- MVS - Mississippi River (sturgeon)	80	45	35	0
- MVS - Mississippi River (EPM)	55	10	45	0
- MVS - Salt River (sturgeon)	60	16	43	1
- MVS - Salt River (wetlands)	25	12	12	2
- NWK - Kansas River (e-pools)	55	28	26	2
- NWK - Osage River	210	17	113	80
- NWO - Cherry Creek	54	26	21	7
- NWO - James River	37	17	10	10
- NWS - Kootenai River	50	37	10	2
- SAM - Alabama River	178	138	16	24
- SAM - Chattahoochee River (Buford)	86	54	32	0.4
- SAM - Chattahoochee River (Seminole)	20	5	14	1
- SAM - Coosawattee River	45	45	0	0
- SAM - Tombigbee River	150	71	72	7
- SAW - Neuse River	45	9	36	0
- SPA - Rio Grande	64	51	12	1
- SWF - Brazos River	150	18	132	0
- SWL - Fourche La Fave River	59	59	0	0
- TNTCX - Tule River	150	6	81	63
Total**	4,949	3,076	1,616	257

* As of 10/1/24, SRP had an available balance of FY 2024 funds of $417.86.

** SRP received $4,949,000.00 in FY 2024 funds.