



Sustainable Rivers Program

In Progress Review

FY 2020



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of Engineers®

The Nature
Conservancy 

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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 (Corps) 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 Program was formally established in 2002 and involved 8 river systems. At the end of FY 2019, SRP involved work on 66 Corps reservoirs in 16 river systems affecting 5,083 river miles (Figure 1). It is the largest scale and most comprehensive program for implementing environmental flows below Corps reservoirs and is growing. Eight new rivers were engaged in FY 2020.

Environmental flows (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 that manipulate water and land-water interactions to achieve ecological or environmental goals.

SRP process for e-flows has three phases: “advance, implement and incorporate”. 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 environmental flow strategies in reservoir operations policy such as water control manuals. Environmental flows were the founding objective of SRP and remain the key focus. In recent years, the Program began exploring other reservoir-oriented actions with potential to produce environmental benefits.

As in previous years, SRP funds will be used to accomplish a combination of programmatic and site work in accordance with the following principles: 1) build capacity within the water management community to implement environmental strategies with little or no direct involvement of SRP resources; 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 and 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. Individual pieces of programmatic and location-based work are characterized by the leads for those efforts per the task categories described above for organizational and communications purposes.

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 teams are all important sources. Ideas are refined by staff involved with SRP programmatic support and initiated as Program capacity allows.



Figure 1. Status of rivers engaged in the Sustainable Rivers Program at end of 2019.

This document details SRP programmatic and location-based status and provides short backgrounds, FY 2020 progress, proposed FY 2021 work, and future visions of active SRP projects. These updates were compiled through meetings with District SRP Teams in November 2020 and supporting information can be found in the Deliverables and Milestones Spreadsheet (Appendix A) and SRP Tasks and Status Spreadsheet (publicly available; “Sustainable Rivers - Tasks - 2020-10-02.xlsx”). Appendix B provides a summary of funding and expenditures for FY 2020.

Programmatic

Programmatic work planned for 2021-2024 is comprised mainly of program support, technologies, and validation of environmental strategies. Between 4 and 5 new or continuations of ongoing programmatic efforts per year are expected, 2021-2024 (e.g., national informational resources, regional meetings, national meetings, technologies, and validation.)

Program Support – Program support includes costs to administer the Program, engage partners, 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 undertaken in support of the different types of structures, includes organizing regional Operations and Water Management Meetings as well as the following type-specific activities (see pages 6-7 in PMP). Recently SRP helped to organize three regional meetings to support Corps Districts in identifying potential environmental opportunities that could be pursued through SRP, the Corps Planning and Environmental Program, or another federal program. The first regional meeting was proposed by Rock Island District (MVR) and the Iowa Chapter of

TNC. It was called the Upper Midwest Operations and Water Management Meeting and was held in September 2019 with the Des Moines River Stakeholder Meeting. Since then, two additional regional Operations and Water Management meetings have been held, the South in September 2020 and Northwest in October 2020 resulting in over 50 actionable ideas. In FY 2020, 65 tasks totaling \$4.7M were proposed. Of those, 43 tasks for 17 rivers and \$2.4M were scoped and funded.

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 (technology and innovation).

Validation (Science) - Validation of environmental strategies includes science-based efforts designed to justify and communicate benefits of infrastructure reoperations (science and innovation).

SRP Location-based Work

With increasing success of individual SRP projects and expanded awareness of the Program, SRP funding grew from \$500K to \$5M in FY 2020 and has been maintained at \$5M in FY 2021. In FY 2021, three SRP Request for Proposals (RFPs) were announced; General SRP projects, Locks and Dams, and Dry Dams.

SRP identifies and executes location-based work via the following process: 1) evaluate program objectives and topics of interest to determine if adjustments are needed, 2) highlight objectives and topics as part of a request for proposals (RFP), 3) compile and prioritize responses, 4) scope priority tasks, 5) arrange funding and other logistics, and 6) perform work. In FY 2020, 65 tasks totaling \$4.7M were proposed. Of those, 43 tasks for 17 rivers and \$2.4M were scoped and funded. This report summarizes status, including work completed in FY 2020 and anticipated work in FY 2021 and beyond. This section is organized alphabetically by river as shown in Table 1.

Table 1. FY 2020 Sustainable Rivers Program Supported Tasks

SRP Supported Rivers (Structures) - FY 2020	District Name
Atchafalaya River (Old River Control Complex)	New Orleans District (MVN)
Big Cypress Bayou - Caddo Lake (Lake O' the Pines)	Fort Worth District (SWF)
Bill Williams River (Alamo Dam)	Los Angeles District (SPL)
Cape Fear River (Jordan Dam)	Wilmington District (SAW)
Cossatot River (Gillham Lake)	Little Rock District (SWL)
Des Moines River (Saylorville and Lake Red Rock)	Rock Island District (MVR)
Farm Creek (Farmdale Reservoir)	Rock Island District (MVR)
Iowa River (Coralville Lake)	Rock Island District (MVR)
Kansas River (multiple)	Kansas District (NWK)
Kaskaskia River (Carlyle, Shelbyville and Kaskaskia Lock and Dam)	St. Louis District (MVS)
Kiamichi River (Sardis Lake)	Tulsa District (SWT)
Osage River (multiple)	Kansas District (NWK)
Pecos River (Santa Rosa, Sumner, and Brantley)	Albuquerque District (SPA)
Roanoke River (John H. Kerr Dam)	Wilmington District (SAW)
Upper Mississippi River (multiple locks and dams)	St. Paul District (MVP)
	Rock Island District (MVR)
	St. Louis District (MVS)
Upper Ohio River (multiple)	Pittsburgh District (LRP)
Willamette River (multiple)	Portland District (NWP)

Atchafalaya River (Old River Control Complex), Louisiana – MVN

The Atchafalaya River Basin is the nation's largest river swamp, containing almost 750,000 acres of bottomland hardwoods, cypress swamps, bayous and backwater lakes plus a quarter million acres of similar habitats disconnected by levees and other structures. The basin stretches 140 miles southward to the Gulf of Mexico and is currently bound by natural ridges and levees formed by the Mississippi River. Historically, the Mississippi and Red Rivers migrated across the floodplain periodically intersecting. Through this intersection, a distributary channel formed from the Red River, named the Atchafalaya River. By the mid 1900's concern grew that the Mississippi River would change course to the Atchafalaya River channel, leaving the ports of the lower Mississippi River inaccessible. The Old River Control Complex (ORCC) was constructed in 1963 in order to maintain a 70/30 flow split where 30% of the combined flows at latitude of the structure goes to the Atchafalaya and 70% goes to the Mississippi River.

Cypress swamps and aquatic species historically evolved to seasonal variability of river flows and water levels but managing flows through ORCC shifted that seasonal dynamic. Through SRP, river scientists and the Corps are attempting to identify and evaluate options for managing the 70/30 split to restore some seasonal variability and support cypress swamp regeneration.

Status of 2020 work

In 2020, MVN proposed a science-based process of developing alternatives and understanding operational flexibility for the Atchafalaya River Basin. This process has been initiated through preliminary identification of stakeholders, evaluating a sound process for stakeholder engagement, and identifying hydrology models and other tools that could be utilized for preliminary evaluation of ecological

opportunities. The MVN team is working with local and state government to ensure buy-in before moving forward with stakeholder engagement. The team is also collaborating with ERDC to establish the hydrologic model that will be used to evaluate e-flows. FY 2020 was focused on advancing development of the scope, budget, and schedule for an Atchafalaya SRP effort, including creation The Core Team, the Science Team and the Stakeholder Team. Any activities in this region and on the Mississippi River and related Atchafalaya Basin have the potential for controversy and political involvement so the SRP team has been systematic in their approach to forwarding the project. The State of Louisiana has issued a press release and the Stakeholder Team is ready to begin outreach in 2021.

Anticipated Work in 2021

The MVN team will continue initial efforts from the previous year to advance development of the scope, budget, and schedule for an Atchafalaya SRP effort. This will include continued collaboration with ERDC and creation of an Independent External Expert Panel to review issues and resolutions within the Atchafalaya Basin. The first step in 2021 is to educate stakeholders on the SRP and possible support for environmentally beneficial projects that do not change support for competing interests. The core science team will begin the scientific outreach process that will proceed throughout the year and will aim to complete the scientific/operations review, set flow objectives, and learn about hydrology needs for meeting flow objectives.

Future Vision

The SRP team would like to strategically build a coalition of scientists, stakeholders, local and state government support for identifying, implementing and monitoring environmental beneficial actions for the Atchafalaya River over the long-term.

Big Cypress Bayou – Caddo Lake (Lake O' the Pines), Texas – SWF

The Caddo Big Cypress SRP is focused around Caddo Lake, located in North East Texas on the border of Texas and Louisiana, its tributaries and associated wetlands. The watershed is approximately 2,970 square miles, about a third of which is regulated by Lake o' the Pines and other upstream reservoirs. Lake O' the Pines is a Corps Reservoir administrated by the Fort Worth District (SWF), for the primary purpose of flood control and secondary purposes of water supply, recreation, and fish and wildlife conservation.

Flow recommendations developed through the SRP process have been implemented since 2012 on a voluntary basis. The water control manual has been updated with language for several flow components and, in cooperation of the North East Texas Municipal Water District, has allowed for waters held temporarily in the pool to be released as prescribed pulses to meet the average and dry base environmental flow recommendations. There is still limited operational flexibility for the management of the flood control pool and uncommitted water in the reservoir conservation pool. Considering increasing water demands, new strategies will be needed to continue e-flows over the long-term. The most promising strategy to date is to maintain storage in the lake at the current summer pool level (rather than drawing down in the winter). The technical challenge is to weigh the cost (potential reduced flood protection) with the environmental benefits.

Status of 2020 work

The SWF team has proposed a stepwise approach to address the challenge (weighing the risk of potential reduced flood protection) with the environmental benefits of maintaining storage in the lake at summer pool (rather than drawing down in the winter). In addition to the legal constraints on the operation of the conservation pool, this yield analysis may also consider operation constraints including the location of intake structures to better inform the regional water supplier (NETMWD) and the customer how reservoir operation decisions may affect water supply. The team proposes to update the district's RiverWare model including updating the period of record and incorporating the guidance for management of e-flow releases. The team would conduct water yield analysis under current and future conditions with and without e-flows to determine potential e-flow prescriptions. Using the RiverWare model, water demands would be iterated upward to determine firm yield of the Lake O' the Pines. This work was unable to be accomplished in FY 2020 due to staff availability.

Anticipated Work in 2021

Work at Caddo Big Cypress Bayou focuses on completing work initiated in 2020.

Future Vision

The SWF team and SRP would seek to update the RiverWare model, identify e-flows to maintain the summer pool level, update the water control manual, develop a monitoring and adaptive management plan and maximize long-term environmental benefits considering strict anthropogenic constraints.

Bill Williams River (Alamo Dam), Arizona – SPL

The Bill Williams River flows through the southwest central Arizona desert and includes Alamo Dam, a Corps reservoir constructed in 1968. The alteration of natural river flows resulting from the dam has resulted in substantial changes to downstream aquatic and bottomland ecosystems. The Water Resources Development Act (WRDA) of 1996 added fish and wildlife benefits as an authorized purpose to Alamo Dam, provided that those benefits did not reduce existing flood control or recreation benefits (Public Law 104-303). The SRP Team is looking at ways to reverse some of the adverse impacts of the dam to support the long-term health of native species and communities and realize additional benefits for fish and wildlife.

The Bill Williams River is one of the original eight SRP rivers. Initially the Corps, TNC and numerous partner organizations worked together to better understand the connections between water and nature as part of an ongoing and collective effort to promote science-based stewardship of this unique resource. They have been examining ways to manage reservoir releases to produce flow regimes that simultaneously meet human needs while maintaining the health and sustainability of downstream biota.

A new Water Control Manual was issued in December of 2003 through a collaborative effort that brought stakeholders together to endorse a new approach to managing Alamo Dam. Through modeling and demonstrations of reservoir operations, a comprehensive adaptive management and monitoring plan was developed in 2013. This plan includes a framework to assess dam operations and expand the understanding of the unique arid waterway to improve riparian vegetation outcomes for associated biota. The goal is not to create optimal conditions for all species each year; rather, water managers, scientists, and other stakeholders work together to create adequate conditions for all native species enough of the time to support their life cycles.

Status of FY 2020 Work

The proposal for 2020 included update of a programmatic monitoring plan for the Bill Williams River corridor in order to assess the responses of physical and biological systems of Alamo Dam operations. This effort expands the 2013 draft monitoring plan and supports adaptive management decisions by the Bill Williams River Corridor Steering Committee. Also proposed was mapping vegetation along the Bill Williams River, based on Worldview Imagery from late May 2018. These mapping efforts will provide a key update to conditions along the river, particularly in areas that experienced severe forest dieback and mortality from 2015-2017. These maps will provide important benchmarks for assessing changes to riparian vegetation resulting from Alamo Dam operations. Methods and cover types used will be the same as previously applied to several sets of imagery from 1953-2009, allowing for comparisons over time. Unfortunately, the 2020 work was delayed due to review and processing but was initiated in October 2020 and is on-going.

Anticipated Work in FY 2021

The anticipated work is a continuation of the programmatic monitoring plan update and completion of aerial photography analysis and vegetation mapping effort. In addition, the team is also interested in exploring groundwater level monitoring at the National Wildlife Refuge.

Future Vision

The long-term vision for management of water and ecological resources in the Bill Williams River includes implementation and regular updates to the programmatic monitoring document. Implementation of the monitoring program, and the importance of the programmatic document may transcend the water control plan update because of its programmatic nature.

Cape Fear River (Jordan Dam), North Carolina – SAW

In North Carolina, the Cape Fear River serves people and wildlife, making its water quality and water quantity of utmost importance to the region. The Corps' management on the Cape Fear River includes B. Everett Jordan Dam and Lake, three locks and dams and dredging operations. These facilities are collectively managed for a diverse set of purposes including water supply, flood risk management, water quality, navigation, recreation and fish and wildlife conservation. These same structures are barriers to diadromous fish; and NOAA estimates that commercial fish landings have decreased 87% in two centuries.

SRP work on the Cape Fear River began in FY 2017 by engaging and convening stakeholder groups to develop a conceptual framework of environmental opportunities to improve habitat for diadromous fish and potentially managing water quality issues. Eager partners worked together to develop the State of the Science Report on the ecology and hydrology of the Cape Fear system in preparation of the e-flows workshop held in Fall 2019. Together the Corps and regional river experts developed flow regimes for consideration at Cape Fear River dams to improve conditions for diadromous fishes and potentially diffuse algal blooms before they become hazardous. Summer flow demonstrations began in 2020 and will provide the initial glimpse into the value of changes for fish and water quality. These demonstrations and extensive monitoring will continue for all the seasonal flow components to refine the e-flow prescriptions for the Cape Fear River.

Status of 2020 work

The Cape Fear SRP team successfully hosted a technical stakeholder e-flows workshop in October 2019 and produced flow prescriptions for the river. Within the prescriptions, there are flow pulses that would help both fish and water quality that may fall within the Corps current operational flexibility. SAW and TNC ran CWMS models from December to March to determine the spring hydrological conditions that enable pulses of 20k at the downstream Lock and Dams, with the goal to better support spawning by shad, sturgeon and other diadromous fish. SAW and TNC analyzed the enabling hydrological conditions for late summer flow pulses that will help reduce algal blooms. Concurrently, TNC will convene researchers from January to March to form a technical monitoring team. This team includes traditional fish tracking experts from UNC-W and the Wildlife Resources Commission, eDNA experts for tracking rare fish from North Carolina Museum of Natural Sciences and several universities, and water quality experts from Gybe.

The team developed a draft monitoring plan that was implemented from March to September 2020 during several test pulses for both fish and water quality. Innovative monitoring techniques were used to evaluate these pulses, including satellite imagery, an autonomous underwater vehicle, and continuous thermistors throughout the water column. Yet, it was one of the wettest years on record. The results of flow pulse enabling conditions, the pulse hydrology, and the biological/ water quality have been summarized and the work will be continued in 2021.

Anticipated Work in 2021

The Cape Fear team would continue to build upon the monitoring for an additional water year to gain more information about the influence of flow pulses on the desired ecology. This is especially important for the water quality findings, as algal blooms are most likely to occur in drier water years. The proposal is to continue the water quality monitoring conducted by UNC Chapel Hill, TNC and USGS. In addition, the team's proposal includes organizing a fisheries monitoring team to include Wildlife Resources Commission, Clemson University, USFWS and NOAA expand the fish sampling to include eDNA and telemetry field reconnaissance.

Future Vision

The Corps operates four dams in the system where they will continue to implement the components of the Cape Fear environmental flow prescription. Assessment and adaption of these flows will focus on the movement of diadromous fish, connection of river flows with off channel floodplain habitat, and summer flow conditions that support juvenile fish movement and potential dispersal of algal blooms. Additional environmental actions will be based on outcomes associated with testing of e-flows implementation.

Cossatot River (Gillham Lake), Arkansas – SWL

The Cossatot River is a 90 square mile basin in the Ouachita Mountains of western Arkansas. The river flows into the Little River and then to the Red River (of the South). Vegetation is dominated by southeastern mixed forest with shortleaf and some loblolly pine plus hardwood species of oak and hickory. Floodplain species are dominated by alder, sycamore, and river birch. The basin is 99.5% forested and primarily managed by the US Forest Service for timber harvest and recreation. The Caney Creek Wilderness Area was established within the basin in 1975 and the river is designated a Wild and Scenic River.

This is a new river for SRP in 2020. Natural resources stakeholders are interested in a multi-year study to establish e-flows for the river below the Gillham Dam to benefit one of the southernmost populations of smallmouth bass, 10 mussel and 3 fish species of greatest conservation need, 3 federally listed threatened or endangered mussel species, and could eventually lead to future repatriation of the federally threatened Leopard Darter into a portion of its former range. These e-flows could also increase recreational boating and fishing opportunities in the lower Cossatot River. Additional connections are being made between other connected watersheds between the Little Rock and Tulsa Districts to consider systemic river needs.

Status of 2020 work

This multi-year study was kicked off in FY 2020 by establishing a steering committee with experts from Arkansas agencies, U.S. Army Corps of Engineers (Corps), U.S. Geological Survey, U.S. Fish and Wildlife Service, The Nature Conservancy and academia. A series of facilitated meetings were conducted to review scientific information and draft a State of the Science Report will be completed in FY 21. This information is critical to understanding the potential e-flows needs and interests from the scientific community for the Cossatot River. The facilitator of these meetings was the Arkansas Game and Fish Commission. TNC coordinated the meetings with stakeholders and experts. Sponsors that contributed to the report also includes the AR Heritage Commission.

Anticipated Work in 2021

The draft State of the Science Report will be circulated for review and comments by SRP and stakeholders and finalized. An e-flow workshop will be coordinated and executed.

Future Vision

Long-term implementation of e-flows from Gillham Dam to benefit flora and fauna of the River and repatriation of the federally threatened Leopard Darter into a portion of its former range.

Des Moines River (Saylorville and Lake Red Rock), Iowa – MVR

The Des Moines River watershed drains about 1,350 square miles (3,496 km²) of agricultural land that once was glaciated prairies in Minnesota and Iowa. Along the river, Saylorville Dam and Reservoir operationalized in 1977 is located upstream from the City of Des Moines and Lake Red Rock Reservoir operationalized in 1969 is located approximately 50 miles downstream of the City of Des Moines. The Corps dams are operated for flood risk management as well as recreation, water supply, drought management, and fish and wildlife.

Des Moines River dam operations altered 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, the MVR began the process of updating the Water Control Manual (WCM) at both dams, which provided the opportunity to evaluate and add environmental considerations. SRP helped support the Corps and stakeholders include improved e-flows in the WCM update. The manual now includes seasonal conservation bands for the reservoir that will support aspects of the natural flow regime to benefit several ancient river fishes, such as paddlefish, shovelnose and lake sturgeon, as well as floodplain plant communities and terrestrial wildlife.

Since SRP partnered with MVR, the team completed the Agricultural Conservation Planning Framework for all 33 HUC 12 watersheds surrounding Saylorville Lake and Lake Red Rock. In addition, an e-flows workshop was held in 2016 resulting in a summary report that identified several suggested river flows and reservoir level management practices to improve conditions for aquatic biota, terrestrial habitats, and water quality. In 2019, measures were incorporated into the Des Moines River Water Control Plan (WCP) that introduced flexibilities to allow implementation of e-flows and water level management practices to maximize the environmental benefits.

Status of 2020 work

MVR partnered with NRCS to develop a four-part series of Story Map tools that progresses the user through four broad categories: 1) Des Moines River Resource Concerns; 2) Case Study; 3) Soil Health Principles; 4) Soil and Nutrient Reduction Measures. The series introduces the problem, moves on to an example of a landowner that addressed soil and nutrient issues, then provides soil health education and finally, allows the user to explore options within their area of interest. The tool can be used to inform lands managed by the Corps, neighboring flowage easement owners and additional landowners within the watershed. The NRCS collaboration has cultivated and leveraged connections between two federal agency missions to manage and improve the health of the Des Moines River watershed. Improvements in these areas strive to alleviate eutrophication, lake sedimentation and habitat concerns within the Des Moines River.

In partnership with other resource agencies, MVR developed an Adaptive Management and Monitoring Plan (AMMP) for the Des Moines River based on a workshop in May 2020 that reviewed recommendations from the 2016 e-flows workshop and the 2018 WCP. The PDT developed a suite of implementable strategies for executing e-flows and reservoir water level management within the Des Moines River. The AMMP also highlights ongoing and anticipated monitoring efforts and measures success of management actions. The document will be utilized by Corps and agency partners at bi-annual water meetings. The meetings take place in late summer and late winter where plans are developed for the upcoming water season. The Des Moines River AMMP is intended to be a living document with annual updates as new information is obtained through monitoring and other scientific studies.

MVR procured and installed four time-lapse camera systems at four locations: 1) Saylorville delta; 2) Saylorville oxbow; 3) Red Rock high delta; and 4) Red Rock low delta. Cameras were positioned in mid-July 2020 in order to capture ensuing water level management strategies at Saylorville and Red Rock. Saylorville oxbow camera was set to capture wildlife response to changing water level conditions within the oxbows. Unfortunately, Iowa experienced drought conditions all summer long that prevented water pooling within the floodplain. Supplemental filling with well water was not feasible due to low ground water conditions. The Red Rock low delta camera was set in a location to observe the lake during a slow and gradual drawdown to expose mudflats for migrating shorebirds. This effort was successful due to the reservoir not needing to impound flood waters.

The regional workshop in 2019 identified opportunities to implement summer ecological levels (ELs) at Shelbyville Lake, within approved operating bands and without need of a deviation. Although planned for implementation in 2020, this work was delayed due to high water levels and will resume in 2021 as described below if conditions permit. The MVR team did host a stakeholder meeting on September 30

and is in the process of acquiring satellite imagery from DigitalGlobe to quantify acres when lake is at winter pool levels later in this 2020/2021 season.

Anticipated Work in 2021

The MVR team continues to collect time-lapse footage of the fall pool raise condition and time-lapse began in September 2020 of water level rise for waterfowl at Saylorville delta and Red Rock high delta. Data already collected is being processed and should be available in early 2021. MVR also plans to host a workshop among agency partners that manage land at Saylorville Lake and Lake Red Rock to utilize the Story Map tools to evaluate land management practices on Corps lands and develop a list of conservation actions that promote water quality improvement. Development of activities during the workshop will also serve as a demonstration for future workshops that can be hosted by NRCS with local landowners within the scope of area for the tool outputs.

In 2021, ELs will begin as conditions permit during spring and summer (April through May) to slowly raise water levels at Shelbyville Lake from winter levels to improve migratory shorebird habitat and allow early establishment of emergent aquatic vegetation along banks of the lake. ELs will be maintained during the growing season (April through August) to maximize vegetation growth and then slowly raised to normal levels to inundate vegetation during the fall for migratory waterfowl. ELs are anticipated to improve habitat for migratory waterfowl and shorebirds, provide habitat for juvenile fish, help reduce streambank erosion, reduce nutrient inputs into the lake through vegetation uptake, and improve recreation conditions for waterfowl hunting. This effort also includes public outreach and hydrologic and vegetation monitoring.

Future Vision

The Des Moines River SRP project has multiple aspects to implementation of environmental flows. MVR will continue to implement and evaluate summer water levels in Red Rock Lake to determine shorebird use, vegetation response and nutrient processing. They will also assess floodplain oxbows reconnections from flow augmentation and the need to physically restore additional depth to create connection more often and for longer duration. As Des Moines River hydrology allows, continue to implement and assess the flow prescriptions for both the Saylorville and Red Rock dams to assure optimum outcomes from environmental flow changes.

Farm Creek (Farmdale Reservoir), Illinois – MVR

Farm Creek has two impoundments within the Rock Island District (MVR); Fondulac Reservoir completed in 1949 and Farmdale Reservoir completed in 1951. Farmdale Reservoir is a dry reservoir where normally the land behind the impoundment is empty of standing water. When the flow in the creek exceeds the capacity of the culvert, water is retained in the reservoir area owned by the Corps. The stored water naturally releases at a rate dependent on the size of the culvert without the use of gates. The Corps owns a total of 973 acres of land in the Farm Creek Projects, most of which is available for low-impact recreation use by the public.

In 2020, Farmdale Reservoir became the first dry dam in the SRP. Since the land is owned by the Corps, resource managers determined that improvements may be possible including constructing intermittent

wetlands, conducting invasive species management, restructuring Farm Creek to the original channel and encouraging more ephemeral ponds across the landscape. MVR proposed to collaborate with state and federal partners and stakeholders including technical experts from Illinois DNR, USFWS, and TNC to develop specific guidance for implementing physical habitat improvements for a range of hydrologic conditions. The team had access to data sources and tools that to support this initiative including LiDAR imagery and HEC-RAS 2D modeling.

Status of 2020 work

The original plan was to host a planning visit with multiple federal, state, and local partners; however, due to the COVID-19, some experts were unable to come but site visits with local and regional TNC staff and Illinois Department of Natural Resources (DNR) biologist were completed. As a result of these site visits, the Farmdale team implemented several habitat improvements that included wetland creation, saddle dam installation, creek reroute, and vernal pool creation within the flood control reservoir. These projects focused on a goal of attracting reptiles and amphibians. The team is in the process of developing a status report to detail the progress and planned future work.

Anticipated Work in 2021

In FY 2021, the Farmdale team would continue efforts by focusing on monitoring the new restoration projects and incorporating lessons learned. In addition, the team would continue to evaluate whether other habitat enhancement projects are feasible within the reservoir. Implementation efforts in 2020 have proven helpful in generating interest for environmental enhancements at other Corps dry dams.

Future Vision

The Farmdale team would like to maximize the use of seasonal water to support ecological resources and continue to study the effectiveness of projects within the limitations of the land owned in fee title by the Corps of Engineers within the dry reservoir.

Iowa River (Coralville Lake), Iowa – MVR

The Iowa River originates in north-central Iowa and flows 323 river miles until joining the Cedar River and ultimately the Mississippi River. Coralville Lake is a multi-purpose project providing primary benefits in flood control and low flow augmentation, and secondary benefits in recreation, fish and wildlife management, and forest management.

The Iowa River and management of Coralville Dam is a new project to SRP in 2020. Patterned after the work on the Des Moines River, the Corps and River stakeholders are considering e-flows and reservoir management during the update of the Water Control Plan to incorporate flexibilities that accommodate future adaptive management strategies.

Status of 2020 work

The Iowa River team conducted twelve expert stakeholder meetings that were divided by expertise and discipline. Each stakeholder meeting was similar to a short workshop that allowed participants to become educated on SRP goals and objectives and provide input on suggested actions. Stakeholder input proved valuable in determining the greatest resource concerns and needs related to the Iowa River. The

information provided context and direction for development of a literature and scientific review conducted by ERDC, which has been completed. The scientific report will be provided to the expert stakeholders and others identified to attend a future e-flows workshop, tentatively scheduled for April 2021. In addition, an MVR hydrologist prepared the data necessary for HEC-RPT to be used at the e-flows workshop.

Anticipated Work in 2021

The Iowa River was a new river and "general" reservoir system to SRP in 2020. The work initiated in 2020 will continue in 2021 with an e-flows workshop, evaluation of possible e-flow prescriptions, workshop summary report detail outcomes and recommendations.

Future Vision

As stated, the Iowa River SRP project is modeled after the extensive work completed and on-going on the Des Moines River. If as successful, this project will expand to include flow prescriptions, implementation and monitoring, and adaptive management.

Kansas River, Kansas – NWK

The Kansas River begins at the confluence of the Republican and Smoky Hill Rivers near Junction City, Kansas, and flows 173 miles where it joins the Missouri River at Kansas City, Kansas. The Kansas River drains 53,000 square miles, almost the entire northern half of Kansas and parts of Nebraska and Colorado. Stakeholders include irrigators, municipalities, industry, navigators and recreators. Eighteen federal reservoir projects affect 85 percent of the Kansas River drainage area.

In 2017, the Kansas District (NWK) and TNC established a steering committee made up of experts from state and federal agencies, academia, and stakeholders. USGS gage data was compiled to define post-dam conditions and prepared a literature review on historic flow conditions. This SRP effort was expanded between 2018 to 2020 to include an IPA with Kansas State to synthesize ecological data on native fish guilds, freshwater mussels, sandbar-nesting birds and other fauna and riparian habitat of the lower portion of the river. In addition, the team completed a literature review of sediment trapping by dams and sediment restoration activities to help inform ongoing efforts in the basin and a turbidity workshop.

There have been initial discussions regarding potential e-flow evaluations for Kanopolis, Wilson, and Harlan County Reservoirs and outreach to Section 7 dam owners within the basin.

Status of 2020 work

Since the SRP involvement with river management began, the ecological and hydrologic sciences of the system have been documented in a state of the science report, a draft literature review on sediment trapping has been prepared, a virtual turbidity needs workshop was conducted in August 2020, and an e-flows workshop was held in September 2020. These workshops were successful and included River stakeholders from state and federal agencies responsible for permitting and natural resources conservation. ERDC provided a presentation of the draft literature review and stakeholders were able to provide input on environmental opportunities and constraints of the river.

Anticipated Work in 2021

NWK is in the process of finalizing the literature review and report from the stakeholder workshop in September 2020 on sediment trapping and e-flow components and prescriptions for the river. Further, NWK is preparing a coordination letter for the Bureau of Reclamation and will schedule a webinar to introduce them to SRP and the efforts they are undertaking in the upper basins. If amenable, NWK will host a second e-flows workshop to identify additional recommendations for the upper basin.

NWK will capitalize on the first e-flows workshop and the proposals to begin discussion with the appropriate water managers and stakeholders to develop an implementation plan and explore monitoring opportunities. This task will kick-off the design of the implementation and monitoring phase of the Kansas River provisional e-flow recommendations (2020) by conducting coordination meetings with Corps operations and water management staff and performing outreach with interested stakeholders. It's anticipated that these efforts will culminate in the preparation of an Implementation Plan with recommendations from both e-flow workshops and advance implementation and monitoring.

Future Vision

NWK would like to expand the reach of SRP efforts to include the Section 7 reservoirs in the upper tributary basins operated by the Bureau to maximize environmental benefits related to e-flows within the river basin.

Kaskaskia River (Carlyle, Shelbyville, and Kaskaskia Lock and Dam), Iowa – MVS

The Kaskaskia River Basin covers 10% of 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, and flows southwesterly across the state for approximately 325 miles to its confluence with the Mississippi River about eight miles north of Chester at river mile 117.

Carlyle Lake Dam was completed 1967 and Lake Shelbyville Dam was completed in 1970; both were built primarily for flood risk management. Kaskaskia Lock and Dam (RM 28) 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.

All three dams on the Kaskaskia River were proposed for SRP by the St. Louis District (MVS) during the 2020 program expansion. The flexibility of dam operations was recognized as having potential to manage water levels slightly lower during the summer growing season to enhance aquatic plant growth.

Status of 2020 work

The Kaskaskia River was identified as a high priority future work area for SRP action at the 2019 Upper Midwest Regional Meeting and was authorized for SRP funding in 2020. In FY 2020, the MVS team analyzed daily release and water surface elevations to determine feasible flows to implement water level management at Carlyle Lake. Because Carlyle Lake has a very large public interest platform, the district advanced coordination with public interest groups and state agencies prior to hosting a stakeholder meeting in September 2020.

The team analyzed daily flows for the previous 10 years at Kaskaskia River Lock and Dam and upstream releases at Carlyle Lake to determine feasibility of implementing water level management to expose shoreline substrate upstream of Kaskaskia Lock and Dam. Water control managers and other stakeholders held meetings with a small group of stakeholders to propose a 0.5' 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. Desirable aquatic plants also process nutrients in the water column, which should help suppress the frequent algal blooms that have been more abundant in recent years. Initial demonstrations are planned to begin during the summer of 2021.

Anticipated Work in 2021

The Kaskaskia River was identified as a high priority future work area for SRP action at the 2019 Upper Midwest Regional Meeting and work was initiated in FY 2020 as described above. The MVS team will be continuing public outreach and meetings necessary to inform and educate public of 2021 plans for water level management implementation at these three locations (two reservoirs and one lock and dam). Vegetation monitoring during implementation will occur to showcase success and/or to inform adaptive management actions. The photo monitoring and videos are beneficial for future public outreach.

Satellite imagery will be acquired through DigitalGlobe with separate funds for Lake Shelbyville and Carlyle Lake while water levels are at specific elevations. Plans for zone of influence for Kaskaskia River are in place for this spring and summer 2021. These images will be processed and spatially delineated in order to determine acres exposed during future implementation.

Future Vision

During the summer of 2021 MVS expects to manage the Kaskaskia River similarly to the Environmental Pool Management (EPM) practice on the Mississippi River. Dam flexibility will provide for half foot reduction at each of the three dams. They expect exposed river sediment will regenerate the aquatic plants along the lake edge and areas of extensive mudflats. If implementation is successful, the practice of EPM will likely become routine operations at these dams as basin hydrology allows. These management practices could eventually become a part of a Water Control Plan update.

Kiamichi River (Sardis Lake), Oklahoma – SWT

The Kiamichi River starts in LeFlore County and flows 177 miles southwest to its confluence with the Red River. Its headwaters are in the Ouachita Mountains near the Arkansas border. The Kiamichi drainage area is 1,830 square miles and flows through six Oklahoma counties. This is an arid river system that has been the subject of many water rights battles between the US, American Indian Tribes, and for ecological services.

The Kiamichi River was new to SRP in 2020. The primary goal of the effort is to further collaboration between the Corps and other stakeholders in identifying and evaluating alternatives based on future projected water demands and changes to the water control plan for Sardis Reservoir. Alternatives must allow for all authorized project purposes, ensure water supply contract requirements are met, and meet downstream needs of aquatic resources within the Kiamichi River from the headwaters to the upper flood pool reaches of Hugo Reservoir.

Status of 2020 work

The Tulsa District (SWT) kicked off the SRP project late in the FY due to funding and the COVID-19 pandemic. Nonetheless, the team was able to collaborate with TNC and stakeholders across the Kiamichi River including key local, state, federal and tribal and NGOs. This initiated the identification of opinions about the opportunities and constraints within the basin, data availability including available flow analyses, and formation of an e-flow advisory group. Even with travel constraints, the team conducted 5 small-group virtual stakeholder meetings from July to November, including with Choctaw and Chickasaw Tribes in July 2020.

Biological data for the Kiamichi River basin was compiled in Feb 2020 and compilation of government reports, data, and peer reviewed literature is on-going. Preparation of an IPA with the University Oklahoma was also initiated for work to complete the state of the science report.

Anticipated Work in 2021

Tulsa District intends to continue the effort initiated in FY 2020 and begin advancing planning and implementation of an e-flow workshop. FY 2021 activities would include: 1) basin stakeholder meeting to present critical components of the State of the Science Report; 2) a workshop with subject matter experts to refine life history components for critical fauna, including hydrologic needs within the constraints of the Tribal/State water sharing agreement; 3) host an e-flow workshop to identify achievable prescriptions; 4) continue to refine the Corps RiverWare model for the Kiamichi River Basin to simulate e-flow and climate resiliency alternatives; 5) share e-flow workshop basin stakeholder meeting results with the public. The Corps would also fund an IPA with Oklahoma TNC Watershed Director to participate in SRP and work with SWT water management staff on HMS, RAS, and RiverWare refinement.

At the time of this report, the SWT team had already held additional small group virtual stakeholder meetings in November 2020 and broader in-person public and private stakeholder meetings with breakout rooms are planned for later in FY 2021. One of these completed meetings was a climate adaptation workshop targeting the Kiamichi Basin and was instrumental in identifying additional data needs and potential data gaps related to Phase III modeling efforts. The hydrology and hydraulics team members are working with the Oklahoma Water Resources Board to obtain water rights and diversion point data to include in the SWT RiverWare model. The model will initially be used for developing a water budget for the basin, necessary to test e-flow prescriptions.

The IPA for the State of the Science Report was fully executed in October 2020 with Dr. Caryn Vaughn, University of Oklahoma. Literature search has begun and will be completed in FY 21.

Future Vision

Environmental flow considerations and implementation have the potential of adding to the benefits these dams can provide for fish, wildlife and plants of the Kiamichi River for citizens of Oklahoma and the Chickasaw Nation. These discussions must be interwoven into other agreements already underway for the basin.

Osage River, Kansas – NWK

The Osage River was identified as a potential SRP project at the 2019 Upper Midwest Regional Meeting as a logical expansion of efforts on the Kansas River. The 2020 proposal included evaluation of three geographic areas: 1) headwaters of the Osage River, extending from Kansas to Truman Reservoir in Missouri; 2) the Sac River from Stockton Reservoir to the Osage River; and 3) the Pomme De Terre River from Pomme De Terre Reservoir to the Osage River. Initial work was slated to explore current and historic operating conditions and identification of both regulated and unregulated flow to the Osage.

Status of 2020 work

In 2020, the Team executed an IPA with Oklahoma State and held a project kick-off meeting. Oklahoma State will develop an ecological report to include species groups/ecological components they will investigate and include in a draft ecological report. KS TNC is reaching out to MO TNC and then will begin planning of coordination/outreach meetings.

Anticipated Work in 2021

The team is continuing stakeholder outreach and coordination with Oklahoma State to identify and quantify ecological resources and basin characteristics that will be documented in an Ecological Report anticipated in March 2021. Following completion of the draft report, the team will coordinate an e-flows workshop for regional scientists and prepare summary report of findings.

Concurrently, NWK Water Control staff will compile hydrological data for the three river reaches included in the Osage River SRP. This research is expected to identify ecological resources and provide background to define e-flows requirements to serve as catalysts for future outreach, science, and implementation and an e-flow workshop.

Future Vision

The current vision of the project is to implement meaningful long-term e-flow prescriptions within the 3 river reaches included in the Osage River SRP.

Pecos River (Santa Rosa, Sumner and Brantley), New Mexico – SPA

The Pecos River runs through New Mexico and Texas and empties into the Rio Grande near Del Rio, Texas. The basin is approximately 38,300 square miles and flows 926 miles from the headwaters. A total of 20.5 miles is designated a Wild and Scenic River (13.5 is Wild and 7.0 is recreational) from the headwater to the townsite of Terro. At origin the elevation is over 12,000 feet and it drops through canyons, plateaus and broad valleys.

The Pecos River was a new SRP project in 2020 to initiate evaluation of e-flows and prepare a literature review and state of the science report.

Status of 2020 work

The Pecos River was a new SRP project in 2020. The Albuquerque District (SPA) investigations proposed to begin with Santa Rosa, Sumner, and Brantley dams to explore options for e-flows, host stakeholder

meetings, and complete a literature review. The Pecos SRP Team (SPA, USBR and SRP staff) hosted meetings with key stakeholders beginning in April 2020 and continuing to date with several meetings a month. The team developed objectives, goals, and a Table of Contents for the literature search and state-of-the-science report. In August 2020, team members were assigned responsibilities for topics to complete the report and the draft report is anticipated in March 2021.

Anticipated Work in 2021

The draft state-of-the-science report and e-flow workshop and report will be completed in FY 2021. The team will resume regular meetings in March to begin planning for the e-flows workshop.

Future Vision

Although the Pecos River is an arid western river, the vision for this river is to allow for some of the natural seasonal variability return to the river. Sensitivities around water rights and allocations will supersede environmental flows but with science-supported considerations based on SRP recommendations, there is greater likelihood of finding options to improve the hydrology through improved dam operations.

Roanoke River (John H. Kerr Dam), North Carolina – SAW

The Roanoke River flows over 400 miles from the Blue Ridge Mountains to the Albemarle Sound, encompassing a drainage area of about 9,600 square miles. The Upper and Middle Roanoke Basins are highly regulated, with multiple private and Corps-owned reservoirs. The Corps owns and manages two reservoirs in the Roanoke Basin: Philpott Reservoir on the Smith River and John H. Kerr Reservoir on the Roanoke River. Both are multi-purpose reservoirs, with flood risk management and hydropower as primary operational purposes.

The lower Roanoke River flows through a floodplain of national significance, containing “the largest intact and least disturbed bottomland hardwood cypress / tupelo ecosystems on the Atlantic Coast of America”. USFWS and TNC own over 95,000 acres in the lower 134 miles of the Roanoke River. This critical floodplain forest habitat was the impetus to identify a management alternative to restore flows that more closely resemble natural river flows. The alternative chosen is called Quasi-Run-of-River (QRR) that shifts the flood control operations defined in the Water Control Plan to release outflows that more closely mimic inflows. This change provides the flow that benefits the habitat while still supporting flood control and hydropower missions. QRR was officially implemented in June 2016. SRP supports the monitoring of the revised releases to assess if ecological outcomes meet intended results or require adaptive management changes.

Status of 2020 work

The Roanoke River is considered one of the most important riverine systems for diadromous fish reproduction on the Atlantic seaboard. Beginning in 2016, the Corps implemented a more naturally variable flow regime (QRR). Intensive monitoring of diadromous fish recruitment has occurred on the Roanoke both pre and post QRR, yet limited work had been completed for juvenile alosines (blueback herring, alewife, hickory shad) with river flow events. TNC compiled a synthesis and statistical analysis of the existing data of juvenile fish and flow relationships for the Roanoke, compiling partner data on river

fisheries from the NC Wildlife Resources Commission, juvenile abundance records in the downstream estuary from the NC Division of Marine Fisheries, and the Corps water release data from Kerr reservoir.

Additionally, from January to March 2020, TNC and the Corps convened fish monitoring experts that utilize the eDNA technique, as well as experts who use nets, electroshocking, and transmitters. The team developed a monitoring plan for juvenile alosines that includes how, when, and who will sample the river.

From approximately April-June 2020, researchers collected samples with spatial and temporal variability to gather more information about where the juveniles were congregating, the condition of that habitat, and the flow regimes associated with the presence of the fish. This information has already led to areas of potential restoration. For example, TNC has a 2-year grant with NOAA to conduct barrier removals in the basin to increase diadromous fish habitat and was able to remove several culvert barriers in 2020. Understanding flow effects on juveniles provided insight into a critical missing element of fisheries knowledge.

The products of this work include a literature synthesis of flow-ecology information for juvenile alosines, a written monitoring plan, and a draft of the initial field findings. Using a combination of regression and ordination analyses, in general, the alosine diadromous fish species did better in years with high flows in March followed by moderate to slightly above average flows in April, May and June. Yet, there were many factors that influenced fish abundance and data was sparse. This work will be continued in 2021 to help fill these gaps.

Anticipated Work in 2021

The Corps and TNC are launching an eDNA effort to sample multiple locations in the river for juvenile alosines in relation to flow and habitat. Since it is hard to predict weather years and there are multiple factors that influence fish abundance, 2021 work will include a second year of eDNA sampling to yield more information about both eDNA and fish and targeted surveys of the juvenile diadromous fish, especially blueback herring and sturgeon. Currently, juvenile surveys are only conducted in the Albemarle Sound and adult surveys are conducted within the Roanoke River. Additional sampling for juveniles would help ground-truth the eDNA efforts and provide more information that connects populations of juveniles from the river to the sound.

Future Vision

With the additional information from monitoring, scientists will be able to fully evaluate the Quasi-Run-of-the-River (QRR) impact to the river's geomorphology, floodplain forests and diadromous fishes movement. Assessments will allow informed decisions about maintaining current operational changes or adapting these changes to better support the ecological outcomes that were defined for ecological health of the Roanoke River.

Upper Mississippi River, Illinois and Missouri – MVP, MVR and MVS

The Upper Mississippi River has been modified for navigation and other purposes for over 100 years through a series of locks and dams constructed in the 1930s and 1940s. The primary purpose of these

projects was to construct the Nine-Foot Channel Navigation Project. Each lock and dam creates a navigation pool to provide relatively stable water levels during non-flood periods.

The high and relatively stable water levels created by the locks and dams subjected islands in the lower portion of the pools to wave erosion. Many islands disappeared along with the aquatic plant beds adapted to the shallow water. A river restoration program was secured through Congressional action and although critical river restoration has occurred, seasonal variability in flow and water levels has not.

The 3 Districts of the Upper Mississippi River have experimented with modifying operations of the locks and dams to restore some seasonal variability. The districts have reduced water levels during the growing season in some pools to expose mudflats and prompt native seed germination. The St. Louis District (MVS) has been successful in using operational flexibility to keep water levels slightly lower in the summer while maintaining the navigation channel. Between 2015 and 2018, SRP supported MVS in monitoring adaptive management activities to demonstrate responses to these lower water levels at specific locations. Today, SRP is supporting improving the management of the entire system, including more than 30 locks and dams on the Upper Mississippi and Illinois Rivers.

Status of 2020 work

The Upper Mississippi River team continued developing an implementation strategy for operationalizing water level management within the system. They acquired hourly flow and gage data from locks and dams for years 2016-2018 during the growing season and performed analysis of data to determine operational capability for small-scale water level management. The focus was to identify specific operating bands for each lock and dam on the Upper Mississippi River totaling over 500 river miles.

The team quantified acres exposed through implementing pool by pool operations in 14 pools in Rock Island District (MVR) and 9 pools in St. Paul District (MVP) with additional success rate calculations for water level management. This effort included defining the base scenario, hydrology and hydraulics (H&H) model setup, model runs for each scenario and pool, and comparing water surface data to updated bathymetric data. Scenarios quantified included 0.5 ft, 1.0 ft, 1.5 ft, and 2.0 ft. Outputs were acreage estimates of exposed shoreline in these 23 pools. This effort is outside of, but cumulative to, a Planning Assistance to States (PAS) effort with the Upper Mississippi River Basin Association (UMRBA) representing the states of MN, WI, IA, IL, and MO. The objective of the PAS is to implement systemic water level management on the Upper Mississippi River. Deriving the acreage benefitted is a remaining critical missing piece to operationalizing a pool by pool implementation strategy for the Upper Mississippi River.

The team acquired and installed remote cameras to evaluate vegetation response to water level management in Pools 26, 25, and 24 on the Upper Mississippi River. There were 8 photo stations deployed successfully; however, two had substantial tree growth that rendered the photos unusable. The remaining six photo stations worked successfully, collecting two photos per day through late August of the growing season. Videos of the photography data were created for these six stations.

Vegetation surveys were performed for arrowhead (*Sagittaria latifolia*) in Pool 26 at all previously documented locations. Unfortunately, arrowhead was not observed in the previous locations and tubers were not collected and the proposed evaluation of species resilience by relating tuber sizes to

growth rates was not accomplished. This effort will be revisited next year as understanding energetics for long-term viability is important information that could help direct water level operations.

Anticipated Work in 2021

The Upper Mississippi River SRP team will complete a report of FY 2020 accomplishments and expand work by holding a regional operational workshop for Water Control Managers. This effort will also complement the independent effort to host a Structured Decision-Making workshop for natural resource stakeholders which seeks to further ecological goals and objectives as well as refine risk/benefits of water level management to identify and define practical strategies. The workshop will also showcase past success of water level management for other districts.

The team will expand FY 2020 work on vegetation resilience as it relates to implementation of water level management. Phase 1 surveyed known locations of arrowhead and developed a survey protocol for assessing tuber bioenergetics and abundancies with assistance from ERDC. Phase 2 will complete the surveys and develop a report of findings. The effort includes ground-truthing the predictive vegetation patterns developed by HEC in order to refine the vegetation input criteria based on 2021 implementation of management strategies. Refining the criteria based on real-time observations will allow for more accurate predictions of hydrology/vegetative dynamics by existing hydrologic and hydraulic models used in the Corps Water Management System.

Future Vision

The Upper Mississippi River SRP team includes three Corps Districts, over 30 locks and dams and 500 river miles. The teams overriding goal is to maintain collaboration across the districts to manage operations that maximize ecosystems benefits while maintaining navigational requirements. This effort will surely act as a case study for other SRP projects, demonstrating collaboration in synchronizing operations of locks and dams across multiple facilities on a single system to meet common ecological and anthropogenic needs.

Upper Ohio River, West Virginia – LRP

Originating upstream of Pittsburgh are the Wild and Scenic Allegheny and Youghiogheny headwater rivers of the Ohio River Basin. With headwaters in Pennsylvania's only national forest, the Allegheny has the highest diversity of freshwater mussels in the state and provides drinking water to Pittsburgh. The Youghiogheny flows north for over 130 miles through a series of steep drops where exposed bedrock and boulders support unique floodplain ecosystems. Major dams managed by the Corps Pittsburgh District (LRP) have changed how the flows of these two rivers for over a century.

Since 2014, LRP and the Pennsylvania Chapter of TNC have explored opportunities to translate basin-wide e-flow recommendations into operating recommendations at reservoirs within the district. Work was also done at a sub-basin level to assess the current influence on hydrologic alteration at 8 specific dams and prioritized development of the reservoir-specific recommendations for those projects with structural capacity and operational flexibility. The SRP team has developed reservoir release recommendations for 3 systems with the potential to affect more than 260 river miles of native habitat and select endangered species.

Status of 2020 work

The SRP team [Corps, TNC, and Pennsylvania Natural Heritage Program] held the Kinzua Dam provisional ecosystem flow recommendations (PEFRs) workshop in September 2020 that was attended by forty river scientists and Corps staff. Participants included federal, regional, and state agency personnel, consultants, and academics. Major themes were: "do no harm" - avoid unintended impacts to downstream ecosystems by restoring natural flows, including to federally listed mussel species; "natural flow regime" - understanding trade-offs between current conditions and anticipated response to flow restoration; climate change - possible benefits of reservoir operations to minimize impacts of climate change; explore spring pulse flows - consider upstream and downstream effects related to PEFRs implementation; continue collaboration; and focus on operational challenges and constraints.

Products developed for the workshop included: 1) a summary of ecosystem flows research for the Allegheny River; 2) preliminary assessments of possible effects of the current flow schedule on target species; 3) conceptual ecological models that identify major anthropogenic and natural drivers and stressors to target species; 4) maps showing the extent of ecosystem flows inundation; and 5) model outputs that illustrate hydrologic and biological conditions for the Allegheny River.

In addition, flow-sensitive target species, including freshwater mussel, submerged aquatic vegetation (SAV), and flood scour vegetation, were surveyed in a reach of the Allegheny River downstream of the Dam near West Hickory and Tidioute, PA. Workshop input is being used to outline an Adaptive Management and Monitoring Plan (AMMP) for implementation of PEFRs at Kinzua Dam.

Anticipated Work in 2021

During the workshop, two groups of experts defined optimum environmental flows for *Floodplains, Channel Maintenance, and Herptiles and Freshwater Mussels and Host Fish, Other Fish*. These environmental flow prescriptions were combined to create unified prescriptions that include the needs of both groups. The SRP team would continue the FY 2020 effort and prepare an Adaptive Management and Monitoring Plan (AMMP) for implementation of PEFRs at Kinzua Dam. Summaries of the biological surveys conducted in the Allegheny will be included.

Future Vision

Continue to refine the environmental prescriptions on the Allegheny and transfer lessons learned to Mahoning River and Little Beaver Creek within the Upper Ohio River system. Additionally, LRP will investigate the impacts of climate change on the system and how it may influence the ability to implement environmental flow changes at the Allegheny and other basins in the Upper Ohio.

Willamette River, Oregon – NWP

The mainstem Willamette flows 187 miles north from the confluence of the Middle and Coast Fork Willamette Rivers, to its confluence with the Columbia River. Between the Cascade Mountain and Coast Ranges, the Willamette Basin is the largest watershed entirely contained within the state, draining about 12% of Oregon or 11,487 square miles. This river is easily accessible to 70% of Oregon's population.

The Corps Portland District (NWP) operates 13 dams in the Willamette Basin that provide a range of human benefits, including flood risk management, hydropower, irrigation, and recreation. However,

operation of these dams has changed the volume and timing of water flow in the river, resulting in reduced peak flows, lower spring flows, increased summer low flows, and infrequent bankfull events. Through SRP, the Corps and TNC have worked together to determine e-flow requirements downstream of the dams and identified opportunities to restore key aspects of the flow regime. The work began in 2006 and reached a pivotal milestone in 2015 when a Memorandum for the Record was signed and recognized the Implementation of Environmental Flows in the Willamette Valley.

Status of 2020 work

A series of science-oriented tasks designed to strengthen and organize monitoring efforts related to Willamette reoperation were proposed and partially completed in FY 2020. The SRP team streamlined flow objectives across river reaches to identified priority reaches for data collection. The team focused on flow objectives that support recovery of Upper Willamette spring Chinook and winter steelhead.

The Corps and USGS developed a simple, streamlined process for annually reporting SRP implementation, describing which targets were met, the context for those targets, ecological benefits of those targets, lessons learned and recommendations for future monitoring and adaptive management. This will become a template for reporting products (simple report, website, presentation) that could be easily leveraged for other sites.

Anticipated Work in 2021

In FY 2021, the NWP team has proposed field-based hydrogeomorphic monitoring to create river-scale inundation maps and provide the basic science foundation for the system. These maps would be used to understand the effects of different e-flow recommendations and enhance the stakeholders' ability to adaptively refine recommendations. Maps will focus on low to moderate flows that coincide with the majority of the current 63 Willamette e-flow recommendations.

Collecting hydrogeomorphic data includes continuous monitoring of gravel transport through hydrophones to determine flows needed to scour and transport coarse sediment and/or continuous monitoring of water levels through installation of water level loggers to refine hydraulic models and understand when critical habitats are inundated. Also proposed is evaluation of flow-ecology relationships through monitoring benthic macroinvertebrates in different hydrogeomorphic settings and in response to varying e-flows. All maps and data would be used in workshops and published in USGS Flood Inundation Mapper (or a similar publicly available platform) so stakeholders can easily access inundation patterns, macroinvertebrate responses, and changing flow recommendations.

Future Vision

The thorough monitoring plan is in place to assess the current environmental prescriptions to help evaluate if flow actions are providing the expected outcomes. If actions need to be modified to achieve desired outcomes, the Corps and stakeholders will undergo a full reexamination of what is necessary and what is possible to improve the environmental outcomes for the systemwide flow changes on the Willamette.

APPENDIX A: Deliverables and Milestones - Status and Schedule - 2020

Project: Sustainable Rivers Program (2020)

Baselining Date: 04/03/2020

Note Numbering below refers to SRP tasks and 1-6 are program- level tasks including reparation of RFPs, website development, assistance to location-based efforts, leading SRP meetings, etc. and are not included in this table. Location-based efforts begin at task no. 7 with MVR – Des Moines River and continue through no. 24 with MVN - Atchafalaya River and are provided here along with initial work of adding new infrastructure types - dry dams and locks and dams, training support, and executing regional meetings. Team** refers to the date the team completed the milestone.*

7.* MVR - Des Moines River

10.2 % of budget

		Planned	Revised	Estimated	Team**	Comments
Milestone 1:	Effort Started	2/19/2020		2/19/2020		
Milestone 2:	ACPF - Nutrient management	9/30/2020		9/30/2020	11/20/2020	Completing final revisions after review.
Milestone 3:	Adaptive management and monitoring plan	9/30/2020		9/30/2020	11/1/2020	Plan Complete with Operations Project Manager review ongoing.
Milestone 4:	Oxbow - Survey	9/30/2020		9/30/2020	9/30/2020	Completed
Milestone 5:	Oxbow - Education options	9/30/2020		9/30/2020	11/21/2020	Draft report completed. Out for review
Milestone 6:	Oxbow - Modeling	11/30/2020			12/31/2020	This effort was part of FY21 request for funding. There is enough funding left over from survey to complete a portion of the work.
Milestone 7:	Oxbow - Modeling	11/30/2020				
Milestone 8:	Oxbow - Geotech	11/30/2020				This effort was part of FY21 request and has not been funded
Milestone 9:	Videography	12/31/2020			12/31/2020	Cameras still deployed and capturing footage. Post processing may extend date into early 2021
Milestone 10:	Oxbow - Report	1/31/2021				This effort was part of FY21 request and has not been funded
Milestone 11:	Delta nitrate reduction (P1)	3/31/2021				CESU with ERDC contracting - Anticipate advertising on Grants.gov November 2020
Milestone 12:	Veg and waterbirds (P1)	12/31/2021				CESU advertised on Grants.gov - Responses due 2 December 2020
Milestone 13:	Effort Finished	3/31/2022				

8. NWK - Kansas River*2.7 % of budget*

		Planned	Revised	Estimated	Team	Comments
Milestone 1:	Effort Started	3/6/2020		3/6/2020		
Milestone 2:	Turbidity review and memo	8/31/2020		8/31/2020		Email to John Shelley
Milestone 3:	E-flows workshop and report	9/30/2020	12/31/2020		2/19/2021	Workshop complete. Working on draft report and expect to have complete mid-February. Water control taking use or lose in December. Email to John Shelley
Milestone 4:	Turbidity workshop report	9/30/2020		9/30/2020		
Milestone 5:	Geographic expansion ecological report	9/30/2020	12/31/2020		1/29/2021	Staff started this at the beginning of the FY as working to complete sampling in FY20. Expect to have a draft by end of January 2021.
Milestone 6:	Section 7 outreach report	9/30/2020	12/31/2020		2/26/2021	Currently preparing a coordination letter to send to USBR and then will follow up with a conference call. Planning to schedule call mid-January and follow up with an MFR.
Milestone 7:	Effort Finished	9/30/2020	12/31/2020			

9. NWK - Osage River*1.3 % of budget*

		Planned	Revised	Estimated	Team	Comments
Milestone 1:	Effort Started	3/6/2020		3/6/2020		
Milestone 2:	Stakeholder outreach and kickoff meeting	6/30/2020	12/31/2020		1/29/2021	Heidi Mehl to coordinate with MO TNC and develop list of stakeholders.
Milestone 3:	Draft ecological resources and operations report	9/30/2020	3/31/2021		3/31/2021	IPA started and kickoff meeting held. OK State is currently working on an outline for the ecological report. Water control on use or lose in December and expect to start operations portion in January.
Milestone 4:	Effort Finished	9/30/2020	3/31/2021			

10. MVS - Kaskaskia River*1.9 % of budget*

		Planned	Revised	Estimated	Team	Comments
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Sustainable Rivers Program (SRP) - In Progress Review

FY 2020

Milestone 1:	Effort Started	3/6/2020	3/6/2020	5/1/2020	Started later than expected due to scheduling conflicts. Still concluded and expended funds before end of FY
Milestone 2:	Outreach and coordination	8/31/2020	8/31/2020	9/30/2020	Public meeting delay due to COVID logistics
Milestone 3:	Operational band analysis	9/15/2020	9/15/2020	9/15/2020	
Milestone 4:	Pool level management report	9/30/2020	9/30/2020	12/31/2020	Report writing and summary in progress
Milestone 5:	Release and elevation data analysis	9/30/2020	9/30/2020	9/15/2020	
Milestone 6:	Effort Finished	9/30/2020	9/30/2020	12/31/2020	Report writing and summary in progress

11. SAW - Cape Fear and Roanoke Rivers*6.7 % of budget*

		Planned	Revised	Estimated	Team	Comments
Milestone 1:	Effort Started	3/6/2020		3/6/2020		
Milestone 2:	Floodplain inundation analysis	9/30/2020		9/30/2020	3/31/2021	This effort requires water management and H&H staff availability. 2-D RAS models are built. Imagery has been collected and analysis is almost 100%. Lining up time series gage data with the hydraulic model still needs to happen.
Milestone 3:	Floodplain vegetation analysis	9/30/2020	12/31/2020		6/30/2021	Vegetation analysis done by TNC. Once models are refined and validated, then the vegetation and hydraulic correlations can begin.
Milestone 4:	Climate Analysis	9/30/2020	3/31/2021			Not sure when the climate group can begin work.
Milestone 5:	E-flows implementation and monitoring	9/30/2021			9/30/2021	
Milestone 6:	Juvenile fish monitoring	9/30/2021			9/30/2021	
Milestone 7:	Effort Finished	9/30/2021			9/30/2021	

12. LRP - Allegheny River*2.1 % of budget*

		Planned	Revised	Estimated	Team	Comments
Milestone 1:	Effort Started	3/6/2020		3/6/2020	3/6/2020	

Milestone 2:	Stakeholder workshop and monitoring report	9/30/2020		9/30/2020	3/31/2021	Interim report is complete. Final invoice received on 11/30/20. Final report and AMMP outline complete before 3/31/21
Milestone 3:	Effort Finished	9/30/2020	12/31/2020		3/31/2021	
13. LRP - Youghiogheny River						
<i>1.3 % of budget</i>		Planned	Revised	Estimated	Team	Comments
Milestone 1:	Effort Started	4/8/2020		4/8/2020	4/8/2020	
Milestone 2:	Evaluation of scour habitats	12/31/2020			12/31/2020	Interim report is complete. Final invoice received on 11/30/20. Final report will be complete before 12/31/21
Milestone 3:	Effort Finished	12/31/2020			12/31/2020	
14. LRP - Mahoning River						
<i>0.4 % of budget</i>		Planned	Revised	Estimated	Team	Comments
Milestone 1:	Effort Started	4/8/2020		4/8/2020	4/8/2020	
Milestone 2:	IHA and CWMS modeling	9/30/2020		9/30/2020	9/30/2020	Final Report is complete.
Milestone 3:	Effort Finished	9/30/2020	12/31/2020		9/30/2020	
15. MVR - Iowa River						
<i>1.7 % of budget</i>		Planned	Revised	Estimated	Team	Comments
Milestone 1:	Effort Started	4/13/2020		4/28/2020		
Milestone 2:	HEC-RPT modeling	6/30/2020	7/31/2020	7/31/2020	9/30/2020	Complete
Milestone 3:	Outreach for e-flows process	7/31/2020		7/31/2020	9/1/2020	Complete
Milestone 4:	State of science report	9/30/2020		9/30/2020	9/30/2020	Complete
Milestone 5:	Effort Finished	9/30/2020		9/30/2020	9/30/2020	Complete
16. MVR - Farmdale Reservoir						
<i>0.7 % of budget</i>		Planned	Revised	Estimated	Team	Comments
Milestone 1:	Effort Started	4/30/2020		5/8/2020		
Milestone 2:	Goal setting and site visits	7/31/2020		7/31/2020	7/31/2020	Completed but hampered by COVID-19
Milestone 3:	Habitat improvements	9/30/2020		9/30/2020	9/1/2020	Completed
Milestone 4:	Effort Finished	9/30/2020		9/30/2020	9/1/2020	Completed and status report is forthcoming.
17. SPA - Pecos River						
<i>1.5 % of budget</i>		Planned	Revised	Estimated	Team	Comments

Sustainable Rivers Program (SRP) - In Progress Review

FY 2020

Milestone 1:	Effort Started	5/7/2020		5/27/2020	6/24/2020	Date SPA team received labor codes.
Milestone 2:	Scoping, coordination, and outreach	9/15/2020		9/15/2020	8/14/2020	Date write-ups were assigned to team.
Milestone 3:	State of science report	9/30/2020	12/31/2020		3/1/2021	This date includes delays in some write-ups. This date also includes reviews of the draft.
Milestone 4:	E-flows workshop and report	9/30/2021			6/1/2021	This date reflects having a final literature search/state-of-the science report in March and time to plan for a workshop. E-flows workshop report would be completed several a month or two after the workshop. This activity is dependent on receiving funds.
Milestone 5:	Effort Finished	9/30/2021			9/30/2021	E-flows workshop and finalized report would be completed by this date.

18. MVS/MVR/MVP - Upper Mississippi River

<i>3.2 % of budget</i>		Planned	Revised	Estimated	Team	Comments
Milestone 1:	Effort Started	5/7/2020		5/18/2020	5/18/2020	
Milestone 2:	Pool level data analysis	9/15/2020		9/15/2020	9/30/2020	Difficult to hold other District's disciplines accountable
Milestone 3:	Quantification of acres	9/15/2020		9/15/2020	9/30/2020	Difficult to hold other District's disciplines accountable
Milestone 4:	Photo monitoring	9/15/2020		9/15/2020	9/30/2020	Videos had to be made on personal computer because free software not available to the Corps
Milestone 5:	Vegetation resilience	9/15/2020		9/15/2020	9/30/2020	Delays in field surveys due to personnel availability and COVID restrictions
Milestone 6:	Effort Finished	9/30/2020	12/31/2020		3/31/2021	Report writing and summary in progress

19. SPL - Bill Williams River

<i>1.3 % of budget</i>		Planned	Revised	Estimated	Team	Comments
Milestone 1:	Effort Started	5/14/2020		8/20/2020	8/20/2020	
Milestone 2:	Vegetation mapping	2/28/2021			4/30/2021	Start delayed 3 months due to review and processing. Milestones revised accordingly.

Milestone 3:	Monitoring plan update	3/31/2021			5/20/2021	Start delayed 3 months due to review and processing. Milestones revised accordingly.
Milestone 4:	Effort Finished	3/31/2021			5/20/2021	Start delayed 3 months due to review and processing. Milestones revised accordingly.

20. SWL/SWF - Cossatot River*1.7 % of budget*

		Planned	Revised	Estimated	Team	Comments
Milestone 1:	Effort Started	5/15/2020		5/27/2020	5/27/2020	RMH
Milestone 2:	Stakeholder and issue ID	11/30/2020			11/30/2020	RMH
Milestone 3:	Effort Finished	9/30/2021				

21. MVP - Multiple Rivers*3.2 % of budget*

		Planned	Revised	Estimated	Team	Comments
Milestone 1:	Effort Started	6/12/2020		6/22/2020		These efforts had originally been planned run such that the public outreach would be used in the workshops, but it was decided to step back and use the outreach effort to begin gaining public support, rather than ask for input. Therefore, the efforts schedules were separated and modified.
Milestone 2:	Reservoir operations summaries	7/2/2020	7/24/2020		7/24/2020	This was a piece of both tasks.
Milestone 3:	Materials disseminated to public	7/24/2020			2/28/2021	Would have been info about ops alternatives. Now more informational about current ops for each reservoir as foundation for future reops ideas
Milestone 4:	Agency input to workshop teams	8/14/2020			8/14/2020	Coordination with WI and MN Nat Resources and ND Game and Fish. Solicited input from tribes but no immediate response.
Milestone 5:	Public meetings complete	8/21/2020			3/31/2021	Hold public outreach meetings with shared info as foundation. Likely one per reservoir (6). Headwaters.
Milestone 6:	Review operating plans	9/11/2020			9/11/2020	

Milestone 7:	MVP workshops complete	9/30/2020	9/30/2020	~10 folks per reservoir. Local ops, water control, Jon H RTS, Steve, other biologists, Megan...brainstorming, ideas
Milestone 8:	Public meetings report	10/9/2020	5/31/2021	Compile all the information developed for the public outreach effort, public feedback/etc. offered, and compile it into a report for the 6 headwater reservoirs.
Milestone 9:	MVP workshops report	11/25/2020	12/18/2020	Completed final report.
Milestone 10:	Report-proposal crosscheck	12/18/2020	12/18/2020	
Milestone 11:	Effort Finished	12/18/2020	5/31/2021	

22. SWF - Big Cypress Bayou

<i>2.5 % of budget</i>		Planned	Revised	Estimated	Team	Comments
Milestone 1:	Effort Started	7/7/2020		7/22/2020		
Milestone 2:	Kickoff meetings	7/31/2020		7/31/2020		
Milestone 3:	HEC-RAS model updates	9/15/2020		9/15/2020		
Milestone 4:	RiverWare analyses	9/15/2020		9/15/2020		
Milestone 5:	Ecohydrological relationships	9/30/2020		9/30/2020		
Milestone 6:	Yield analysis	9/30/2020		9/30/2020		
Milestone 7:	EFM/RAS simulations	11/30/2020				
Milestone 8:	Alternative strategies	11/30/2020				
Milestone 9:	Complete reports	12/31/2020				
Milestone 10:	Effort Finished	12/31/2020				

23. SWT - Kiamichi River

<i>2.0 % of budget</i>		Planned	Revised	Estimated	Team	Comments
Milestone 1:	Effort Started	7/9/2020		7/22/2020	7/27/2020	Late start due to novel Covid-19 impacts on meetings and developing path forward to address Covid-19 impacts.

Milestone 2:	Stakeholder meetings	8/31/2020	8/31/2020	8/31/2020	Stakeholder meetings delayed due to novel Covid-19 impacts. Conducted 5 small group stakeholder meetings via Zoom on 4 Nov 2020 (2), 5 Nov 2020 (1), 17 Nov 2020 (1), and 18 Nov 2020 (1). Currently planning additional meetings to invite all stakeholders to a final larger meeting with breakout rooms to be held in early Dec 2020 and early Jan 2021. (notes added 11/17: Actual dates of meetings, 5 held, 6 planned, 11/4,5,17th + resource agencies OK Dep Wildlife Conservation and USFWS). OK-TNC; SWT; Oklahoma Center for Non-Profits
Milestone 3:	Hydrologic and yield analyses	11/30/2020		12/31/2020	Draft H&H and yield analyses by 15 Dec 2020? H&H will include incorporating recent water years into the POR for HEC-RAS and RiverWare models. Will also be gathering water diversion permit data from the Oklahoma Water Resources Board to incorporate into the RiverWare model in preparation for evaluation of water diversions throughout the basin for e-flow evaluations. SWT H&H; Oklahoma Water Resources Board
Milestone 4:	State of science report	1/31/2021		3/31/2021	Draft biological components completed by end of Feb 2020. Currently compiling government reports, data, and peer reviewed literature. IPA for this effort executed on 15 Oct 2020. SWT/TNC PDT; stakeholders

Milestone 5:	Effort Finished	1/31/2021			3/31/2021	Incorporation of all state of science report information into a draft, DQC of draft report, and final report completed by 31 Mar 2021. Report will be included in read ahead information for the e-flow workshop. Finish date pushed back as a result of IPA negotiations. SWT/TNC PDT
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24. MVN - Atchafalaya River

<i>0.4 % of budget</i>		Planned	Revised	Estimated	Team	Comments
Milestone 1:	Effort Started	7/11/2020		7/22/2020		
Milestone 2:	Initial outreach and formulation planning	9/30/2020		9/30/2020		
Milestone 3:	Effort Finished	9/30/2020		9/30/2020		

25. SRP - Dry Dams

<i>0.4 % of budget</i>		Planned	Revised	Estimated	Team	Comments
Milestone 1:	Effort Started	7/2/2020		7/22/2020		
Milestone 2:	Inventory and GIS mapping	9/30/2020		9/30/2020		
Milestone 3:	Effort Finished	9/30/2020		9/30/2020		

26. SRP - Locks and Dams

<i>0.4 % of budget</i>		Planned	Revised	Estimated	Team	Comments
Milestone 1:	Effort Started	7/15/2020		7/22/2020		
Milestone 2:	Inventory and GIS mapping	9/30/2020		9/30/2020		
Milestone 3:	Effort Finished	9/30/2020		9/30/2020		

27. SRP - RPT training support (MVR)

<i>0.1 % of budget</i>		Planned	Revised	Estimated	Team	Comments
Milestone 1:	Effort Started	7/1/2020		7/22/2020		
Milestone 2:	Train the trainer	9/30/2020		9/30/2020		
Milestone 3:	Effort Finished	9/30/2020		9/30/2020		

28. SRP - Regional Meetings

<i>2.2 % of budget</i>		Planned	Revised	Estimated	Team	Comments
Milestone 1:	Effort Started	8/6/2020		8/11/2020		
Milestone 2:	Southwest - Dry dams	9/14/2020		9/14/2020		
Milestone 3:	South	9/22/2020		9/22/2020		
Milestone 4:	Northwest	11/30/2020				
Milestone 5:	Effort Finished	12/31/2020				

APPENDIX B: Funding and Execution - Fiscal Year 2020 (as of 10/1/20)

In FY 2020, SRP was in the President's Budget \$500k and received \$5M through appropriations. Funds in excess of the President's Budget became available to SRP on 25 Feb 2020, which means the Program received 90% of the budget with 60% of the fiscal year remaining. Dates of location-based teams first receiving FY 2020 funds to support their efforts are listed as the "Estimated" dates in Appendix A. Some of the location-based carryover was planned as execution schedules for that work had tails in FY 2021.

Table B1. Allocations and carryover per major program components, FY 2020 (\$, millions).

Component	FY 2020:	Budgeted	Carryover
Programmatic		2.9	0.6
- Program support		0.8	0.1
- Technologies		1.3	0.5
- Validation		0.7	0.0
Location-based		2.1	0.5
- General		1.9	0.5
- Locks and dams		0.16	0.0
- Dry dams		0.04	0.0
Total		5.0	1.1

Table B2. Allocations and carryover per detailed program components, FY 2020 (\$, thousands).

	Budgeted	Obligated	Carryover
Programmatic	2,868	2,278	590
- Program support	834	754	80
- Capacity building	36	36	0
- HEC	325	316	9
- HEC (web)	20	20	0
- IPA	182	182	0
- IWR/NWD	137	109	28
- GIS Support	40	37	3
- Regional meetings	94	53	41
- Tech	1,312	802	510
- Contracting	20	14	6
- Habitat mapping	615	615	0
- Time series analysis	503	0	503
- Alternatives formulation	174	174	0
- Validation (SRP-Science)	722	722	0
- Des Moines River	172	172	0
- North Carolina Rivers	200	200	0
- Upper Ohio River	175	175	0
- Willamette River	175	175	0

Location-based	2,082	1,555	527
- LRP	190	188	2
- MVN	19	13	6
- MVP	158	95	63
- MVR**	510	375	135
- MVS	254	231	23
- NWK	212	99	113
- SAW	330	304	26
- SPA	75	48	27
- SPL	63	63	0
- SWF	126	87	39
- SWL	45	44	1
- SWT	100	8	92
Total	4,950	3,833	1,117

**MVR carryover included \$125k related to unawarded Cooperative Ecosystem Services Units tasks.