

# Going with the Flow

Improving the health and life of rivers through water management, operations, and planning

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The Sustainable Rivers Program (SRP) is a formal 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 and infrastructure operations to restore and protect ecosystems, while maintaining or enhancing authorized uses like navigation, hydropower or flood risk management.

Flow is the master variable in river systems. By design, dams often change the natural variability of river flow, which can prevent water from reaching floodplains, inhibit fish passage, and alter sediment and temperature regimes. The premise of SRP is that, if flow is the most important factor in the health of aquatic ecosystems; and if science and stakeholder input can help devise flow patterns

that improve environmental conditions and maintain other benefits; then management of dams and reservoirs can be used as a tool to help reestablish ecosystems.

SRP began in the 1990s when the USACE Louisville District and TNC's Kentucky Chapter collaborated on a new management plan for the Green River Dam. The Green River is a trove of biodiversity, with more than 150 species of fish, 70 species of mussels and 42 endemic species found nowhere else in the world. Based on input from stakeholders, USACE determined that it could adjust outflows from the dam in ways that improve flow and temperature regimes for fish and mussels, while retaining downstream flood risk management benefits. The new flow plan also delays autumn drawdown of the reservoir, extending the fishing and boating season.

Success at the Green River Dam led to a nationwide Sustainable Rivers partnership that has grown to 45 rivers and more than 90 USACE reservoirs.

Each of these sites is unique, of course, but at each site USACE districts and partners apply a similar approach to engaging stakeholders, evaluating opportunities, and testing and incorporating environmental strategies.

### SRP's Three-Step Process

SRP has developed a three-step process for sites to follow as they progress through the program. The first step, "Advance," involves engaging in a science-based process to define potentially beneficial environmental strategies. USACE districts convene in-person meetings where USACE staff and other experts from state, federal and local groups discuss historic conditions and evaluate environmental opportunities such as enhancing fish and mussel habitat, restoring wetlands and improving water quality. Scientists and other stakeholders play important roles in helping teams understand flow components needed by certain species or natural communities.

USACE's Hydrologic Engineering Center has developed a suite of tools and software that can help location-based SRP teams understand both how flow patterns have changed and how to graphically depict opportunities. These tools include the HEC-Regime

Prescription Tool and HEC-Ecosystem Functions Model, among others.

Using this information, USACE facilitators brainstorm ways that infrastructure operations might be changed, while still accounting for a dam's congressionally authorized purposes.

One of the hallmarks of SRP in the Advance phase is its ability to bring together USACE functions from across a district — Operations, Water Management, Engineering, Planning, etc. — to jointly evaluate proposals for new flow patterns.

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## Advance Phase Case Study: Cossatot River

A great example of how a site progressed through the Advance phase is the Cossatot River in the Little Rock District. The Great Flood of 1927 on the Mississippi River prompted a wave of dam building by the U.S. government, including several dams on rivers draining the Ouachita Mountains in Arkansas and Oklahoma. These dams allow USACE to hold back water in the event of potential flooding on the Lower Mississippi. While these dams have helped reduce flooding on cities and farmland, they also have had unintended impacts on the region's aquatic systems.

The Cossatot is home to one of these dams, Gillham Dam. The Cossatot once harbored abundant populations of darters. Small, colorful fish species about the size of your finger, darters are highly sensitive to water pollution. To spawn, they need clean, cool, flowing water and gravel substrate.

The Cossatot completed its Advance phase SRP e-flows workshop in June 2022, with participation from a diverse group of USACE staff, TNC, the Arkansas Game and Fish Commission, Arkansas Natural Heritage Commission and the U.S. Fish and Wildlife Service. Stakeholders broke out into three groups — fish, mussels and floodplains — and identified species of concern, as well as their flow and habitat needs.

Shortly after the workshop, USACE released a full report documenting the results. That report is the basis for testing new flow regimes at the Cossatot.

"We know we can't replicate the flashiness of this system because a narrow tunnel constrains how much water can be released," said Rheannon Hart, who oversees the Cossatot SRP project for the Little Rock District. "But we hope we can manage the flow differently during lower flows in a way that restores some of these species and doesn't jeopardize flood risk management benefits."



Through the SRP, the USACE Little Rock District engaged stakeholders from the Arkansas Game and Fish Commission, U.S. Fish and Wildlife Service, and other agencies to help understand environmental flow components needed by certain species and natural communities. (Photo by Jim Howe)

The second step in the SRP process is “Implement.” Armed with the ideas generated from the Advance phase, SRP teams comprising USACE staff from Operations, Engineering, Environmental and Water Management, together with stakeholders, test the effectiveness of the most promising strategies. For example, a spring pulse might be released from a dam if ample water supplies exist in

the system. Designed to mimic a spring high-water event, such a pulse can serve as a cue for fish migration, provide an influx of water to riparian floodplains, or improve spawning conditions by flushing sediment from gravel bars.

A key to the Implement phase is monitoring the effectiveness and feasibility of the new flows. USACE biologists often team up with academic institutions, state

fish and wildlife agencies, and The Nature Conservancy to evaluate environmental performance. USACE also monitors effects on other users of the watershed so that teams can understand the tradeoffs, if any, in a new flow pattern.

The final phase of SRP is “Incorporate.” In this step, USACE adopts strategies tested during implementation as part of the official policies that guide USACE operations.

## Implement Phase Case Study: Kaskaskia River

An example of a river in the Implement phase is the Kaskaskia, one of Illinois’ major tributaries to the Mississippi. It begins near Champaign and flows south and west to the Mississippi, joining the river downstream of St. Louis. This is farm country, but the Kaskaskia watershed still has some of the most intact forests remaining in Illinois.

There are two USACE reservoirs on the lower Kaskaskia, or Kasky as it’s commonly called: one in Shelbyville and the other in Carlyle. They provide drinking water and are also used to hold back flows to the Mississippi during periods of flood risk. The reservoirs have become highly popular recreation areas for boating, water skiing, hunting and fishing.

In 2021, SRP support enabled the USACE St. Louis District team to host public meetings and solicit ideas about management options on the Kasky. A hunting group proposed a summer drawdown of the reservoir to improve habitat for waterfowl. After determining that water control manuals allowed flexibility for lowering the level of the pool, USACE experimented with a 6-inch drawdown of both the Carlyle

Reservoir and Kaskaskia Lock and Dam.

The 30-day 6-inch drawdown in early summer 2021 exposed mudflats that were quickly colonized by wetland vegetation.

“It was a dense carpet of green,” said Lane Richter, a wildlife biologist with USACE St. Louis District.

Later in the summer when USACE raised the water level, the response was immediate. The carpet of vegetation buffered wave action, which lessened erosion and improved water clarity throughout the reservoir. Based on GIS assessments, USACE estimates that the drawdown helped enhance 1,482 acres of wetlands.

The wetland vegetation also provided habitat and structure for fish and wildlife. Ducks are one of the chief beneficiaries. At one of the drawdown sites, wetland plants valued as food sources by waterfowl — sedges and grasses, for example — produced more than 900 pounds of seed per acre, enough to feed 3,450 ducks for a single day. Importantly, the drawdown also was accomplished with little impact to other users.



Photo by Stephen Dinsmore, Iowa State University

## Incorporate Phase Case Study: Des Moines River

USACE operates two dams on the Des Moines River: Saylorville Dam and Reservoir is located directly upstream from the city of Des Moines, while Lake Red Rock Dam and Reservoir is approximately 60 miles downstream. Both dams are managed in tandem for flood risk management, as well as for recreation and fish and wildlife. Saylorville also provides drinking water for the city of Des Moines, Iowa.

In 2016, USACE Rock Island District enrolled the Des Moines River in SRP. The flow regime of the river had been altered by increased summer flows, lower spring flows and reduced peak flows, which had substantially reduced floodplain inundation. Altered flows to the river had impacted fish, mussels and other wildlife that depend on the river’s aquatic, riparian and floodplain habitats.

During the Advance phase of SRP, USACE and The Nature Conservancy collaborated with scientific and environmental experts to identify environmental flow and lake pool requirements for the Des Moines River and Lake Red Rock. Some of the key stakeholders included the city of Des Moines, U.S. Fish & Wildlife Service, academic institutions and Iowa Department of Natural Resources.

Restoring aspects of the natural flow regime is expected to benefit numerous species, including freshwater mussels and ancient river fishes like paddlefish and

shovelnose sturgeon. Spring pulses are being implemented to benefit fish reproduction and migration, as sturgeon and other fishes rely on spring flows to signal the advent of spawning and oxygenate eggs.

For the last five years, USACE has also implemented a gradual 6-inch summer drawdown of Red Rock Reservoir, which has created hundreds of acres of delta habitat that provide feeding areas for migratory shorebirds like sandpipers, dowitchers and plovers.

“Shorebirds just love it,” said Perry Thostenson, who serves on the Operations team at USACE Rock Island District. “They’re resting and feeding — fueling up — in this refuge that we’re creating.”

Recent SRP funding has helped the USACE team with Iowa State University to use satellite tracking to understand the daily movements and migration patterns of shorebirds, some of whom migrate as far as South America each winter.

In 2019, USACE updated the water control manual for the Des Moines River Basin, and the Rock Island District added new guidance that includes several of the considerations that emerged from the SRP process.

“Flood risk management prevails,” said Thostenson, “but when we’re not operating in flood risk management mode, we can operate the dams for multiple benefits that weren’t thought about when the dam was built.”

For more information about Sustainable Rivers, please email [sustainableivers@usace.army.mil](mailto:sustainableivers@usace.army.mil) or visit [www.hec.usace.army.mil/sustainableivers/](http://www.hec.usace.army.mil/sustainableivers/).