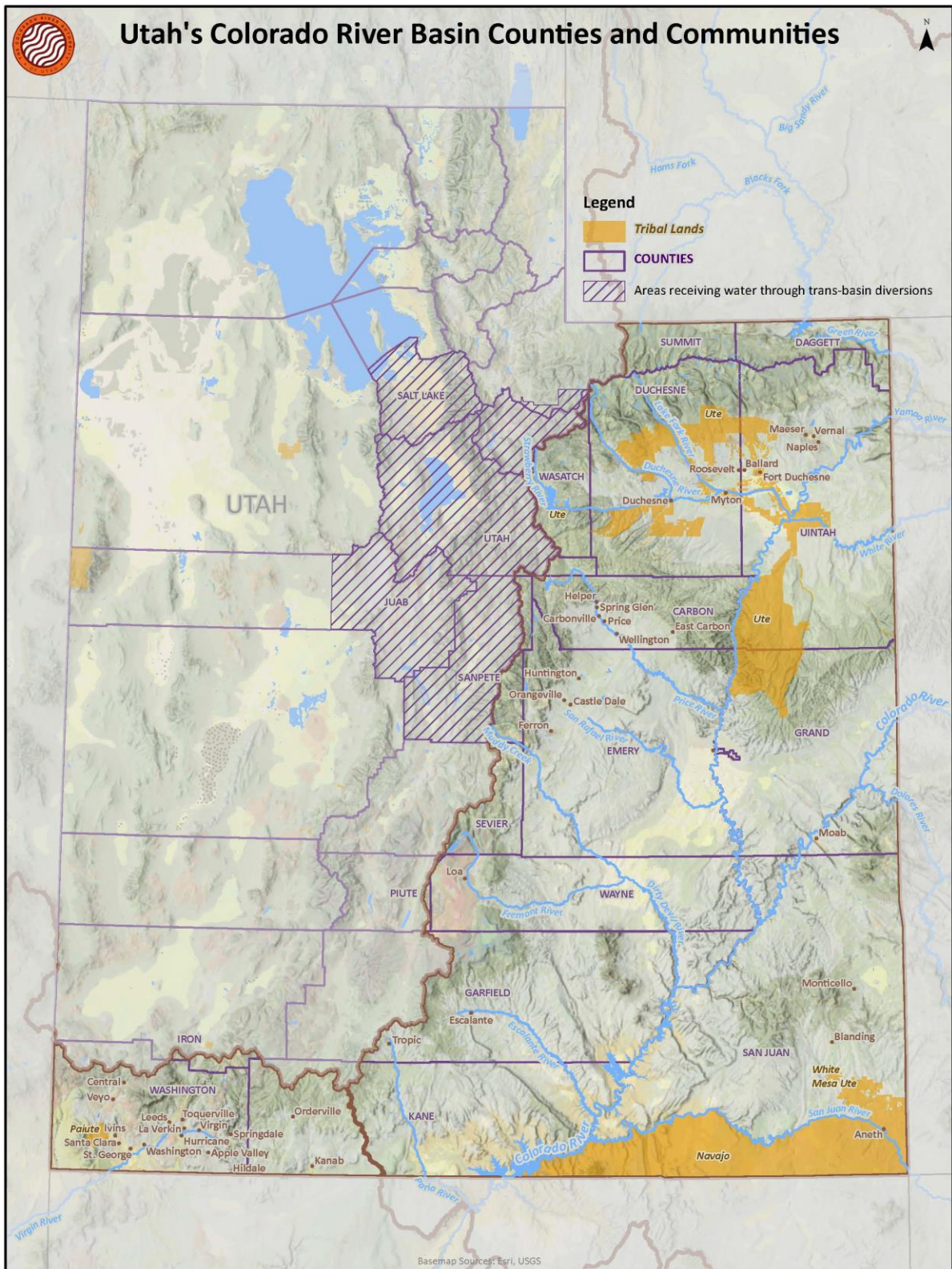




# Fiscal Year 2025 Work Plan

July 1, 2024

THE COLORADO RIVER AUTHORITY OF UTAH



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# 1. Executive Summary

In April 2022, the Colorado River Authority of Utah (Authority) approved a five-year Colorado River Management Plan (Management Plan) to accomplish its statutory mission to “protect, conserve, use, and develop Utah’s waters of the Colorado River system.” 63M-14-102, et seq. The Management Plan began July 1, 2022, and continues through June 30, 2027 (fiscal years 2023 – 2027). The Management Plan was developed with the intention of being dynamic to respond to changing hydrology and conditions in the Colorado River Basin.

In accordance with the Management Plan, annual plans (Work Plans) will be developed and approved by the Authority Board. The Work Plans will include activity details, estimated budgets, and time frames for projects related to the three priority areas of the Management Plan.

This document is the Authority’s Fiscal Year 2025 (FY25, July 1, 2024, to June 30, 2025) annual Work Plan, constituting the Management Plan’s third annual Work Plan. Accordingly, there are both ongoing Colorado River activities that began under the FY23 and FY24 Work Plans, as well as new Colorado River activities being initiated.

This Work Plan includes:

- Participation in intrastate and interstate Colorado River commitments
- Investment in streamflow and diversion measurement
- Installation and maintenance of agricultural consumptive use measurement instrumentation
- Acquisition of consumptive use data using satellite-based remote sensing technology
- Research supporting water supply forecasting improvements
- Research supporting water use optimization and demand reduction
- Participation in federal funding opportunities
- Drought mitigation pilot projects
- Development of the Utah Colorado River Accounting and Forecasting planning model (UCRAF) in the Colorado River system in Utah
- Modeling to evaluate short-, mid-, and long-term Colorado River operating policy
- Oversight of Authority Advisory Councils

## 2. Fiscal Year 2025 Work Plan Overview

This Fiscal Year 2025 Work Plan (FY25 Work Plan) describes Management Plan activities scheduled for FY25. The FY25 Work Plan also includes estimated costs, timeframes, and the relationship of each activity to the three Management Plan priority areas of Measurement (Section 5), Hydrology and Operations (Section 6), and Drought Mitigation (Section 7). Consistent with the mission of the Authority, the purpose of the Management Plan and associated annual Work Plans is to *“ensure that Utah can protect and develop the Colorado River system and work to ensure that Utah can live within the state’s apportionment of the Colorado River system.”*

Activities and FY25 Work Plan elements described herein are supported by funding from several sources as illustrated in Table 1. These include annual ongoing appropriations and one-time appropriations to the Authority from the Utah Legislature, in-kind goods and services provided to the Authority by Utah Colorado River water users, and various federal funding sources. In particular, the FY25 Work Plan leverages a portion of the \$50,000,000 of Bipartisan Infrastructure Law (BIL) funding that was made available to the Upper Division States through the Upper Colorado River Commission to support the implementation of the 2019 Upper Basin Drought Contingency Plans (DCPs).

Certain activities to be performed during FY25 are reflected in the FY25 Work Plan as participation in work groups, teams, and committees, rather than being ascribed to a single focus area in the Work Plan. These activities are described in Section 3.



## 2. Fiscal Year 2025 Work Plan Overview

**Table 1.** FY25 Budget with funding source breakdown. TBD indicates budget is to be determined.

Section	Work Plan Element	Authority Funds	External Contributions	Federal Funds <sup>1</sup>	Total <sup>2</sup>
<b>Interstate &amp; Intrastate Activities</b>					
3	Personnel	\$1,140,000	\$400,000	\$ -	\$1,540,000
3	Travel	\$60,000	\$40,000	\$ -	\$100,000
4	Advisory Councils	\$255,000	\$ -	\$ -	\$255,000
<b>Measurement</b>					
5.2	Coordination & Implementation Planning	TBD	\$ -	TBD	TBD
5.3	USGS Stream Gages	\$ -	\$ -	\$163,000	\$163,000
5.3	Streamflow & Diversion Measurement	TBD	TBD	TBD	TBD
5.4	Utah Flux Network	\$121,000	\$ -	\$331,000	\$452,000
5.5	OpenET	\$535,000	\$ -	\$ -	\$535,000
5.6	Advection Impacts on Evapotranspiration	\$50,000	\$ -	\$50,000	\$100,000
<b>Hydrology &amp; Operations</b>					
6.1	Short- and Mid-term Operations Modeling	\$ -	\$85,000	\$ -	\$85,000
6.2	Long-term Operations Modeling	\$ -	\$490,000	\$ -	\$490,000
6.3	Conveyance Loss Study	\$ -	\$ -	TBD	TBD
6.4	Climate & Hydrology Research	\$20,000	\$ -	\$ -	\$20,000
6.5	Snowpack, Runoff, & Operations Project	\$181,000	\$98,000	\$279,000	\$558,000
<b>Drought Mitigation</b>					
7.2	Emery County Irrigation Efficiency Study	TBD	\$ -	TBD	TBD
7.3-7.4	UCRAF (Duchesne, San Rafael, and Price River Basins)	\$762,000	\$ -	\$ -	\$762,000
7.5	Decision Support Mapping Tool for Drought Mitigation	\$ -	\$5,000	\$ -	\$5,000
7.6	Farm to Flow Pilot Program	\$1,435,000	\$ -	\$ -	\$1,435,000
7.7	AG-DRIP Pilot Program	\$500,000	\$500,000	\$ -	\$1,000,000
<b>Total</b>		<b>\$5,059,000</b>	<b>\$1,618,000</b>	<b>\$823,000</b>	<b>\$7,500,000</b>

<sup>1</sup> Federal funding sources include Bipartisan Infrastructure Law, Inflation Reduction Act, and WaterSMART.

<sup>2</sup> The totals provided for under this Work Plan are estimates for FY25 only. Work Plan budgets are subject to adjustment depending on conditions and activities in the Colorado River Basin that may be unknown when the Work Plan was developed. Projects that are part of the Work Plan but don't have planned expenses in FY25 are not included.

### 3. Interstate Colorado River Engagement

The Authority and partnering state of Utah entities are engaged in numerous intrastate and interstate Colorado River commitments, including but not limited to the Upper Colorado River Commission (UCRC), endangered fish recovery programs (Upper Colorado River Endangered Fish Recovery Program and San Juan Recovery Implementation Program), Glen Canyon Dam Adaptive Management Program, and the Salinity Control Forum. Additionally, there are ongoing intrastate activities that are not formally organized; however, it is appropriate to acknowledge them because of their critical role in successfully representing the interests and obligations embodied in the Authority mission. Table 2 lists interstate work groups, committees, and participating organization[s]. Some of these are permanent groups, and others have been established to address temporary and topical issues.

### 3. Interstate Colorado River Engagement

**Table 2.** List of Colorado River Interstate Activities. Acronyms include Colorado River Authority of Utah (Authority), Office of the Attorney General (OAG), Division of Water Rights (DWRi), Division of Water Resources (DWRe), Division of Wildlife Resources (DWR), and Department of Natural Resources (DNR).

Committee, Work Group	Utah Participating Organization
<b>Standing UCRC Committees</b>	
UCRC Legal Committee	OAG
UCRC Engineering Committee	Authority/DWRi/DWRe/Water Users
<b>Ad Hoc UCRC, Upper Division State and Basinwide Work Groups and Committees</b>	
US-Mexico Minute 323 Binational Work Groups	Authority
Basin States Technical Work Group	Authority
UCRC Technical Team	Authority/DWRe
UCRC Demand Management/Conservation Work Group	Authority/DWRi/OAG
Upper Basin Drought Response Operations Agreement Work Groups	Authority/OAG/DWRi/DWRe
Upper Basin Consumptive Use Work Group	Authority/DWRe
UCRC Depletion Demand Schedule Work Group	Authority/DWRe
Colorado River Basin Climate and Hydrology Work Group	Authority/DWRe
<b>Glen Canyon Dam Adaptive Management Program</b>	
Adaptive Management Work Group (AMWG)	Authority
Technical Work Group (TWG)	Authority/DWRe
Planning and Implementation Team	Authority
<b>Upper Colorado River Fish Recovery Program</b>	
Implementation Committee	DWR
Management Committee	DNR
Biology Committee	DWR
Water Acquisition Committee	Authority/Water Users
<b>San Juan Recovery Implementation Program</b>	
Coordination Committee	DNR
Biology Committee	DWR
<b>Water Quality</b>	
Colorado River Salinity Control Forum	DWRe/Authority



## 4. Advisory Councils

### Description

UCA 63M-14-209 authorized the Authority to create Advisory Councils to provide “data, information, and input... relevant to the mission and objectives of the authority.” Advisory Councils provide a diversity of perspectives to inform the Authority and help meet its mission. Initially, three regional Advisory Councils (Northern, Central, and Southern) were established that are composed of water users, regional experts, topical experts, and engaged citizens who care about the Colorado River. These regional Advisory Councils meet regularly to share information and updates and to discuss and develop ideas related to the challenges facing the Colorado River Basin. The regional Advisory Councils also provide study and analysis and serve as a deliberative forum for diverse points of view. Although the Advisory Councils are not vested with authority to make decisions regarding public business, Council perspectives provide viewpoints and insights that inform Utah’s Colorado River Commissioner, the Authority Board, and elected officials.

### Progress to Date

The three regional Advisory Councils continued to provide regular updates and recommendations to the Authority Board over the course of FY24. In recognition of the vast geographic reach and unique interests of the Southern council, two sub councils (a southeastern and southwestern) were created in May 2023 to minimize travel and allow for more localized discussions. In late 2023 and early 2024 members of the Authority Board recognized that the Board could benefit from additional and deeper engagement with members of Utah’s agriculture community. In close collaboration with the Utah Farm Bureau, a new Agriculture Advisory Council was established in May of 2024. Similar to the regional Advisory Councils, the Agriculture Advisory Council will provide the Authority Board with updates and recommendations specific to the agriculture community.

### FY25 Work Plan

The four Advisory Councils will continue to meet and provide regular updates and recommendations to the Authority Board, Authority Staff, and Utah Colorado River Commissioner in response to evolving conditions and priorities for the Colorado River.

### Project Information

- Funding Source: one-time appropriations
- Budget:
  - FY25: \$255,000
  - Total: \$1,080,000
- Timeline: FY23 – FY27

### Key Partners

- A complete list of Advisory Council members is available at [cra.utah.gov](https://cra.utah.gov).

### 5.1 Metering & Gaging Gap Analysis

#### Description

Investigation and analysis of water supply and use measurement gaps in the Colorado River Basin in Utah is the first step to supporting accurate measurement and distribution of Colorado River water. During FY24, the Authority completed a Metering and Gaging Gap Analysis (Gap Analysis) to assess stream gaging and measurement needs on the Colorado River mainstem and its tributaries in Utah, including an estimation of the cost of installation or reinstallation of stream gages and installation of new or upgrades to existing measurement methods. This Gap Analysis will inform next steps in improving and expanding the metering and gaging system within the Colorado River Basin of Utah, which will facilitate implementation of drought mitigation measures and improve the understanding of water supply and use in Utah.

#### Progress to Date

The Gap Analysis project formally began in November 2022 with a contracted end date of June 30, 2023 (see FY24 Work Plan). The project team accomplished the project deliverables by the end of the contract (June 30, 2023) under budget and had remaining unspent funds within the contract (\$28,000). The project team and the Authority decided to amend the existing contract to allow for the unspent funds to be available through September 30, 2023 to 1) refine Project deliverables consistent with Authority staff feedback and comments, which included further editing of the Final Report; 2) provide training to Authority staff on the Streamflow and Diversion Measurement Geodatabase (Measurement Geodatabase) and associated tools; and 3) allow the project team to attend and present at the Authority All-Contractors and Board meeting in August 2023.

The Gap Analysis deliverables included a Measurement Geodatabase and a Final Report. The Final Report was posted to the Authority's website and transmitted to several interested groups. Additional coordination and transmission of the Measurement Geodatabase occurred with the UCRC, DWRi, and researchers from Utah State University working on the Great Salt Lake Gap Analysis for DWRi.

#### FY25 Work Plan

This project has been completed and no additional efforts are planned for FY25. See Sections 5.2 and 5.3 for future work related to streamflow and diversion measurement, which will be informed by the Gap Analysis.

### Project Information

- Funding Source: one-time appropriations
- Budget:
  - FY25: no additional costs
  - Total: \$300,000
- Services: Competitively procured consultant
- Timeline: FY23 – FY24

### Key Partners

- Bowen, Collins, and Associates (contractor)
- Jones and Demille Engineering (subcontractor)
- Water Manager Interviewees (local knowledge)
- Division of Water Rights (technical collaboration)
- Division of Water Resources (technical collaboration)
- Upper Colorado River Commission (interstate technical collaboration)

## **5.2 Measurement Coordination & Implementation Planning**

### **Description**

Coordination and implementation planning for metering and gaging improvements is the intermediate step between the Gap Analysis and on-the-ground implementation of metering and gaging improvements in the Colorado River Basin in Utah. This effort involves: 1) refining Authority-specific goals and objectives related to measurement, and 2) further planning and coordination between the Authority and other local, state, and federal entities to address the gaps described in the Gap Analysis. Planning will include consideration of state and federal funding mechanisms for both capital costs and operations and maintenance expenses. The goal of this effort is to leverage funding sources available to the state and to identify improvements that are mutually beneficial to the Authority and partner entities.

### **Progress to Date**

In FY24, the Authority undertook several efforts to inform planning and implementation of streamflow and diversion measurement improvements within the Colorado River system in Utah. After the UCRC was awarded the first installment of federal BIL funds in August 2023, the Authority began discussions internally and with partner entities to identify potential locations for United States Geological Survey (USGS) stream gages, which were identified as a priority for year one BIL spending (see Section 5.3). During this time, the Authority coordinated with DWRi regarding their measurement priorities within the Colorado River system, many of which were identified in the Gap Analysis. The Authority also refined Authority-specific priorities, goals, objectives, and criteria related to streamflow and diversion measurement within the Colorado River system. These objectives will be refined in FY25 as other efforts develop. An initial filtering exercise was also completed using the Gap Analysis Measurement Geodatabase to identify a broad list of possible diversion measurement, metering, and telemetry improvements that could be considered with partner entities and pursued with federal BIL funds.

### **FY25 Work Plan**

Efforts under this element of the Work Plan encompass the programmatic aspect of stream and diversion measurement projects, which includes tasks such as identifying projects, working with water users, scoping and planning projects, and producing initial designs and cost estimates. In early FY25, the Authority will continue to refine the Measurement Geodatabase by working with DWRi and DWRe to filter and add any new gaps that have been identified since the completion of the Gap Analysis. Refinements will focus on identifying potential diversion measurement, metering, and telemetry improvements that could be pursued using a combination of one-time Authority appropriations or federal BIL funds. The goal is to develop a comprehensive set of improvements for further consideration and scoping by the Authority and partner entities.

The Authority has identified the following three potential pathways for planning and implementing measurement projects:

- 1 Using one-time appropriations, the Authority could contract for technical support to develop the programmatic element of measurement projects (e.g., scoping and designing projects). The contracting entity would work from the initial list of improvements developed by the Authority and partner entities and consistent with the Gap Analysis. After a set of projects are identified, scoped, and designed, the UCRC could contract directly for project implementation and use BIL funds to cover the cost of equipment, construction, and short-term operation and maintenance (O&M) of projects.
- 2 The Authority assumes administration of federal BIL funds and directly contracts for both the programmatic development and implementation of measurement projects. In this capacity, the Authority would be responsible for ensuring compliance with all federal grant requirements.
- 3 Using one-time appropriations, the Authority directly contracts for both the programmatic development and implementation of projects.

All pathways have various contracting, funding, technical, and legal implications, which will be weighed in early FY25.

### **Project Information**

- Funding Source: one-time appropriations, federal BIL funds, or both
- Budget: To be determined in early FY25
- Services: To be determined in early FY25
- Timeline: FY24 – FY27

### **Key Partners**

- Division of Water Rights (technical collaboration)
- Division of Water Resources (technical collaboration)
- United States Geological Survey (technical collaboration)
- Upper Colorado River Commission (interstate technical collaboration)
- Local Water Entities (technical collaboration)

### 5.3 Instrumentation & Maintenance

#### Description

Under this task, the Authority will pursue on-the-ground improvements to the stream gaging and diversion measurement network within the Colorado River system in Utah. This effort supports the initial design, purchase, and installation of measurement infrastructure (capital costs) as well as limited-duration operations and maintenance costs. This effort is informed by the activities described in Sections 5.1 and 5.2 of the FY25 Work Plan and by agency and local partner coordination.

#### Progress to Date

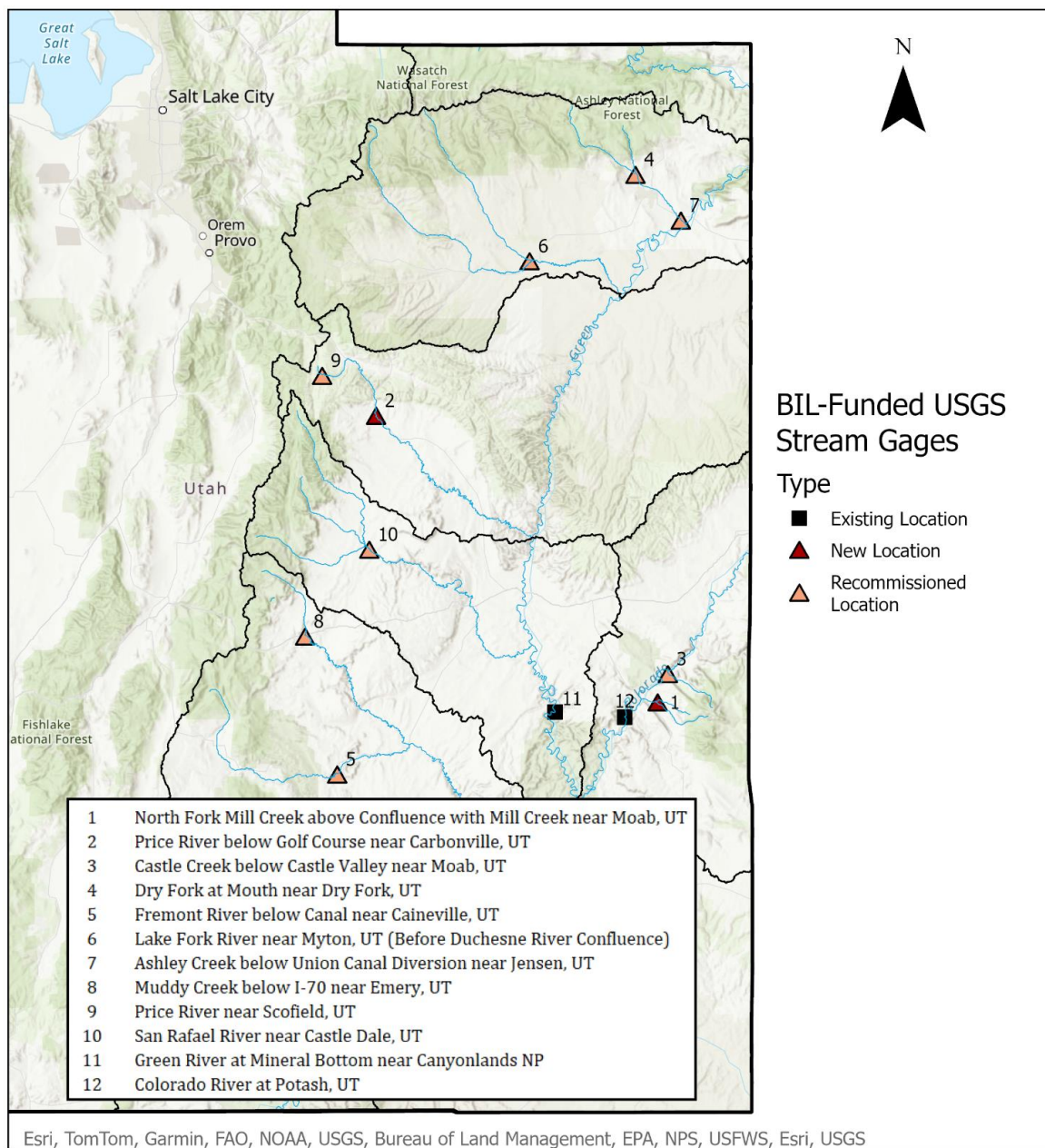
1 Marsing Wash Measuring Device, Price River Basin

The Authority completed a funding agreement with The Nature Conservancy (TNC) to support the installation of a measuring device and telemetry in Marsing Wash within the Price River Basin. The location of this device was supported by Gap Analysis criteria. The objective of the project was to install a new diversion and measuring device to measure water diverted from the Price River through Marsing Wash. These improvements will help implement and test drought mitigation strategies, such as shepherding water from Olsen Reservoir to the Price River, implementing the Carbon Canal Water Bank, testing the application of recent changes to Utah law, or implementing demand management pilot projects.

2 USGS Stream Gages

The Authority, working through the UCRC, secured over \$1,400,000 in federal BIL funds for the installation of ten USGS stream gages within the Colorado River system in Utah (Figure 1). Initial stream gage locations were identified using the Authority's Gap Analysis and further refined in coordination with the USGS and partner entities. In addition to operating the new gages for five years, the contract between the UCRC and USGS will also fund the continued operation of two critical existing gages on the Colorado and Green Rivers through September 2029. The new gages are expected to be installed early to mid-summer following the 2024 runoff season.





**Figure 1.** BIL-Funded USGS stream gages within the Colorado River system in Utah.

### FY25 Work Plan

In FY25, the Authority will work with partner entities on implementing measurement improvements that are identified through the coordination and implementation planning effort (Section 5.2) or through related and ongoing efforts (Drought Mitigation programs in Section 7). While additional stream gages may be contemplated, the Authority anticipates focusing FY25 efforts on the implementation of diversion measurement, metering, and telemetry improvements, which are identified as a priority area for BIL funds. The scope and extent of measurement implementation will be informed by the outcome of activities described in Section 5.2.

### Project Information

- 1 Marsing Wash Measuring Device, Price River Basin
  - Funding Source: one-time appropriations
  - Budget:
    - FY25: no additional costs
    - Total: \$10,000
  - Services: Funding agreement between TNC and the Authority
  - Timeline: FY24
- 2 USGS Stream Gages
  - Funding Source: federal BIL funds with USGS cost share
  - Budget:
    - FY25: \$163,000 (BIL funds)
    - Total: \$1,529,000 (\$1,466,000 BIL funds/ \$62,800 USGS cost share)
  - Services: Funding agreement between the UCRC and USGS
  - Timeline: FY24 - FY30
- 3 FY25
  - Funding source: one-time appropriations, federal BIL funds, or both
  - Budget: To be determined in early FY25
  - Services: To be determined in early FY25
  - Timeline: FY25 – FY27

### Key Partners

- Division of Water Rights (technical collaboration)
- Division of Water Resources (technical collaboration)
- United States Geological Survey (technical collaboration)
- Upper Colorado River Commission (interstate technical collaboration)
- Local Water Entities (technical collaboration)

## **5.4 Utah Flux Network**

### **Description**

The Authority is investing in the Utah Geological Survey's (UGS) Utah Flux Network (UFN) to support measurement of consumptive water use from field to basin scale within the Colorado River system in Utah. UFN is a new and growing assemblage of Eddy Covariance (EC) stations, instruments that provide the best-available measurement of field-scale evapotranspiration, or consumptive water use.

Although EC stations provide accurate evapotranspiration measurements, they are limited to representation of the field in which they are located, and they are expensive to acquire and maintain. Therefore, UFN EC station data is used to ground-truth the larger scale, remotely-sensed evapotranspiration data from OpenET (Section 5.5). UGS will acquire, install, and maintain EC stations in the Colorado River Basin in Utah, and perform data management, analysis, and intercomparison. Data and results from the UFN will support the Authority's objectives of defensible, accurate, and timely measurement that builds trust in decision-making, optimized consumptive water use, and verifiable execution of drought mitigation projects.

### **Progress to Date**

Under a 2022 funding agreement with the Authority, UGS purchased six new EC stations from Campbell Scientific, and agreements were initiated with landowners to locate an EC station on their property. In FY24, the Authority facilitated a funding agreement between the UCRC and UGS to use federal BIL funds to purchase and install another EC station and test a recently developed "alternative" EC station (the LI-710 Evapotranspiration Sensor, a smaller and lower-cost instrument compared to traditional EC stations) through the UFN.

To date, five EC stations have been installed by UGS in the Colorado River system in Utah (Table 3)— three EC stations were installed in FY24 (Myton, Figure 2, Cedar Mesa, and Bluff) and the remaining EC stations are planned to be installed by the end of FY25. UGS has developed code and protocol to streamline management of raw data, data quality assurance and quality control, and post-processing needed to generate reliable flux information. Development of the data management protocol was based on best practices established by academic partners, academic literature, and Campbell Scientific.

UFN data can be found at AmeriFlux ([ameriflux.lbl.gov](http://ameriflux.lbl.gov)), EasyFlux Web ([ugs.easyfluxweb.com](http://ugs.easyfluxweb.com)), Utah Climate Center ([climate.usu.edu](http://climate.usu.edu)), and MesoWest ([mesowest.utah.edu](http://mesowest.utah.edu)).

## 5. Measurement

## Consumptive Use

**Table 3.** EC station summary.

#	Location	Funding Source	New or Pre-existing Instrument	Contract with Landowner	Status & Notes
1	Wellington	CUWCD	Pre-existing	Underway	Maintenance and data QAQC
2	Matheson Wetlands	DWRi, Reclamation	Pre-existing	Underway	Maintenance and data QAQC
3	Dugout Ranch	Authority	New	Underway	Maintenance and data QAQC
4	Myton	Authority	New	Underway	Installed Fall 2023, maintenance and data QAQC
5	Cedar Mesa	Authority	New instruments, pre-existing tower	Underway	Transfer and update completed Fall 2023, on state land, partnership with Northern Arizona University and University of Utah
6	Bluff	Authority	New	Underway	Installed Spring 2024, maintenance and data QAQC
7	Escalante	Authority	New	In Review	Installation Summer 2024
8	Mobile Station	Authority	New	In Development	Installation Summer 2024, a mobile temporary site to support existing locations and other research
9	Green River	BIL	New	In Development	Contracting to be completed Installation to be scheduled
9.5	Mobile Station	BIL	New, LI-710	Not Applicable	“Mini” station to be installed at an existing location that has a center pivot



**Figure 2.** EC station installed in Myton, Utah, Fall 2023. Photo courtesy of UGS.

### **FY25 Work Plan**

In FY25, the UFN will expand upon the efforts of FY23 and FY24. The UFN will complete EC station siting and installation of acquired instruments and data will be collected, post-processed and analyzed. As needed, adjustments to instrument locations will take place. Intercomparison of EC station data with OpenET and other available datasets will proceed in close collaboration with the OpenET team and discipline experts. Staff training within UGS and the Authority will continue to ensure the UFN has adequate personnel support. Finally, UGS will continue to collaborate with local water managers, water users, and EC experts to build trust in UFN's findings.

### **Project Information**

- Funding Source: one-time appropriations and federal BIL funds
- Budget:
  - FY25: \$121,000 (Authority), \$331,000 (BIL funds)
  - Total: \$1,030,000 (Authority), \$581,000 (BIL funds)
- Services: Interagency Funding Agreement with UGS, beginning July 2022
- Timeline: FY25 – FY27

### **Key Partners**

- Utah Geological Survey (contractor)
- OpenET (technical collaboration)
- Trout Unlimited (local knowledge)
- The Nature Conservancy (local knowledge)
- Landowners (host instruments)
- Division of Water Rights (local knowledge and technical collaboration)
- Upper Colorado River Commission (interstate technical collaboration)



### 5.5 OpenET

#### Description

OpenET is supporting measurement of consumptive water use from field to basin scale within the Colorado River system in Utah. OpenET has developed a platform for public, transparent, and reproducible measurement and reporting of evapotranspiration (also referred to as depletion or consumptive water use in agriculture) using remote sensing. Remote sensing uses satellite imagery of the entire surface area of a landscape, enabling consistent analysis of the Colorado River system and aligning the Authority with interstate water management efforts. Remote sensing of consumptive water use is a relatively new method and requires ground-truthing and continued verification research. Therefore, OpenET data will be intercompared with UFN EC station data (Section 5.4) through collaboration between each team and coordination by the Authority.

OpenET will provide (1) administrative support through training, review of reports reliant upon OpenET data, data services and access, (2) data improvement through historic data production (1991-2023), crop type and land use updates, and consumptive use accounting for effective precipitation, and (3) data comparison through correlation of historic OpenET data to crop coefficient methods. Together, these deliverables will provide a longer and higher frequency dataset than is currently publicly available and will streamline the process for incorporating effective precipitation for consumptive use determination, while improving the publicly available data. Ultimately, OpenET's products will support the Authority's objective of establishing confidence in remote sensing methods and their applications to drought mitigation planning, implementation, and verification (Section 7).

#### Progress to Date

Beginning in FY23, OpenET has performed work on the three contracted deliverable areas: administrative support, data improvement, and data comparison. For administrative support, OpenET and the Authority have collaborated on operational data access and management, OpenET completed a technical memorandum regarding Open Data License Recommendations for the Authority, and OpenET hosted the first-ever OpenET Applications Conference with the Authority as a participant. For data improvement, OpenET completed production of the 1991-2023 historical dataset for the Colorado River system in Utah and a report on the dataset (one of the largest deliverables of the project) and has continued work on developing an effective precipitation dataset. For data comparison, OpenET reviewed Jacobs Engineering Group's (Jacobs) draft Agricultural Water Resilience Technical Memorandum and supported ongoing intercomparison work performed by UGS.



In FY24, the Authority partnered with DWRe and other agencies to establish an Enterprise Agreement for Google Cloud Platform. The agreement includes unlimited access to Google Earth Engine, which supports all OpenET data, and will enable the Authority and associated contractors to work with the large OpenET dataset efficiently. To kick off the agreement, the Authority and its partners attended a technical training for Google Earth Engine in April 2024.

Data can be found on OpenET's website ([etdata.org](https://etdata.org)).

### **FY25 Work Plan**

In FY25, OpenET will continue contracted efforts for the Authority. Tasks will focus on producing and providing datasets to Authority contractors and partner agencies, comparison of OpenET results with other datasets including crop coefficient methods, and evaluation of additional ground-truth data needed to understand the reliability of OpenET data in Utah. Close coordination between the Authority, OpenET, partner agencies, other Authority contractors, and local water managers will occur throughout all efforts.

### **Project Information**

- Funding Source: one-time appropriations
- Budget:
  - FY25: \$535,000
  - Total: \$2,541,000
- Services: Sole source contract with OpenET
- Timeline: FY23 – FY26

### **Key Partners**

- OpenET (contractor)
- Utah Geological Survey (technical collaboration)
- Division of Water Rights (technical collaboration)
- Division of Water Resources (technical collaboration)

## **5.6 Advection Impacts on Remote Sensing of Evapotranspiration**

### **Description**

An issue identified by OpenET and other evapotranspiration (ET) experts is that most remote sensing models underestimate evapotranspiration for small agricultural areas in arid environments, which are common across the Colorado River system in Utah. This underestimation can be caused by advection, a physical process where warm, dry air above arid lands flows into areas with cooler air above irrigated lands. The movement and heating of air above irrigated lands can increase evapotranspiration, but the physical process is not captured through remote sensing of evapotranspiration. An underestimation of evapotranspiration could have implications for water users, water managers, and water planners, warranting additional research on the impacts of advection on remotely sensed evapotranspiration data. To support the continued improvement of the OpenET models, the Authority, with potential support from federal BIL funds, will fund a research project that compares EC station data with OpenET data, focusing on advection parameters, to understand which OpenET models perform best when advective conditions are present, and why some models perform better than others.

### **Progress to Date**

The Authority has collaborated with OpenET and Utah State University (USU) specialists in agricultural hydrology to create a common understanding of the knowledge gap and develop a preliminary scope of work for the research project.

### **FY25 Work Plan**

The Authority will conduct a search for an academic team to conduct this research, work with the best-qualified team to finalize a scope of work for research, establish a research grant funding agreement, and initiate work on the project.

### **Project Information**

- Funding Source: one-time appropriations and federal BIL funds
- Budget:
  - FY25: \$100,000
  - Total: \$500,000
- Services: Research Grant Funding Agreement
- Timeline: FY25 – FY27

### Key Partners

- Utah State University (technical collaboration)
- OpenET (technical collaboration)
- Utah Geological Survey (technical collaboration)
- Upper Colorado River Commission (technical collaboration)

DRAFT

### 6.1 Short- & Mid-Term Operations Modeling

#### Description

Evaluating ongoing and proposed coordinated operations of Lake Powell and Lake Mead is necessary to ensure that their management is in accordance with the Law of the River<sup>3</sup> and to inform Authority leadership of potential water supply impacts. Robust evaluation, considering a range of potential hydrologic conditions, is best accomplished using computer simulations and is an important element of the Authority's annual Work Plan.

The Bureau of Reclamation (Reclamation) models short- and mid-term operations of the Colorado River mainstem reservoirs using computer simulation models that approximate system performance based on a variety of input factors and assumptions, including historic operations, maintenance, hydrology, etc. Reclamation uses the Colorado River Mid-term Modeling System (CRMMS), which is implemented in a modeling software called RiverWare, to model the likelihood of different system conditions occurring in the short and mid-term (up to five years). CRMMS provides the ability to evaluate probabilistic system conditions, informing operators and stakeholders of the risk of certain conditions occurring given projected forecasts and initial conditions.

The Authority uses CRMMS to evaluate operating proposals under the 2007 Interim Guidelines (which govern the coordinated operations of Lake Powell and Lake Mead), the effectiveness of proposed operations under the Drought Response Operations Agreement (DROA), and other operations related to the 2019 Drought Contingency Plans (DCPs) and/or emergency actions taken in response to river conditions in the short to mid-term.

#### Progress to Date

The wet hydrologic conditions during the winter of 2022-2023 produced several unique operational conditions for 2023 and 2024. Due to the favorable hydrologic conditions, the 2023 DROA plan focused solely on the recovery of water released under the 2021 and 2022 DROA plans and prior emergency actions. Based on April 2023 elevations, an initial balancing release from Lake Powell of 9.5 million acre-feet (MAF) was forecasted based on Lake Powell operating in the Lower Elevation Balancing Tier for Water Year 2023. However, due to declining inflow observed over the runoff season, the forecasted balancing release declined monthly to an ultimate release from Lake Powell of 8.58 MAF. Throughout FY24, the Authority continually monitored the progress of DROA recovery in Flaming Gorge and Blue Mesa Reservoirs and the impact of balancing releases from Lake Powell, including the mining of Lake Powell storage due to Reclamation's inclusion of DROA water in balancing calculations.

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<sup>3</sup> The Law of the River is a compendium of laws, regulations, agreements, and policy affecting the use, management and allocation of water in the Colorado River system.

Work continued in support of the Supplemental Environmental Impact Statement (SEIS) for the Near-term Colorado River Operations, which govern Colorado River operations through 2026 when the current operational guidelines expire. A Draft SEIS was released in April 2023 but was later withdrawn so Reclamation could evaluate the improved hydrology and analyze the Lower Division States alternative, which was submitted in May 2023. A revised Draft SEIS was issued in October 2023 and a final SEIS was released in March 2024, followed by a Record of Decision in May 2024. Throughout FY24, modeling was performed in CRMMS to support the near-term SEIS process and to evaluate proposals submitted as part of this effort.

#### **FY25 Work Plan**

Short- and mid-term modeling activities are driven by real-time reaction to hydrologic and system storage conditions. Monitoring and evaluation performed in previous years will continue in FY25, including tracking system conditions to inform whether DROA releases or similar actions are required based on forecasted system conditions. Monitoring and evaluation of the actions described in the Final Near-term SEIS will also occur.

#### **Project Information**

- Funding Source: in-kind contributions from CUWCD
- Budget:
  - FY25: \$85,000
- Services: Pre-existing, multi-year contract with Precision Water Resources Engineering established through a competitive procurement process
- Timeline: FY23 – FY26

#### **Key Partners**

- Precision Water Resources Engineering (contractor)
- Upper Colorado River Commission and Upper Division States (interstate technical collaboration)
- Division of Water Rights (technical collaboration)
- Division of Water Resources (technical collaboration)
- Bureau of Reclamation (technical collaboration)
- Lower Division States (interstate technical collaboration)
- Central Utah Water Conservancy District (in-kind contributions)

### 6.2 Long-Term Operations Modeling

#### Description

The 2007 Interim Guidelines, which govern the coordinated operations of Lakes Powell and Mead, will expire December 31, 2025 (through Reclamation's preparation of the 2026 Annual Operating Plan). This operating policy has significant bearing on system conditions, second only to hydrology. Similar to short- and mid-term operational evaluation, long-term planning and operating policy performance evaluation is completed using RiverWare modeling. Reclamation has developed, and made public, its Colorado River Simulation System (CRSS) model to evaluate long-term operating policy. This work includes evaluating system performance under a variety of hydrologic conditions and water use demands when using 2007 Interim Guidelines, variation of the 2007 Interim Guidelines, and other alternative operations of Lake Powell and Lake Mead.

#### Progress to Date

In June 2023, the United States Department of the Interior, acting through the Bureau of Reclamation, issued a Notice of Intent (NOI) to prepare an Environmental Impact Statement for the Post-2026 operational guidelines. Following the release of the NOI, modeling and analysis continued in support of the seven Basin States negotiation process that began in earnest in Fall 2024. The Authority relied on technical insights and tools developed in previous years to inform the development, evaluation, and refinement of scenarios for the Post-2026 process. The Upper and Lower Division states each submitted an alternative to Reclamation in Spring 2024 that will be considered through the formal National Environmental Policy Act (NEPA) process. The Upper Division Alternative focuses on sustainable operations of Lake Powell and Lake Mead that rebuild storage, align with hydrologic conditions, and follow the Law of the River.

#### FY25 Work Plan

Modeling work will continue in FY25 to support the ongoing Basin States negotiating process in parallel with the ongoing NEPA process. The Authority anticipates activities such as refining operational scenarios that were submitted to Reclamation, independently evaluating operating policies that were proposed by other groups, and providing feedback on the NEPA process. A Draft EIS is anticipated in late 2024.

#### Project Information

- Funding source: in-kind contributions by CUWCD
- Budget:
  - FY25: \$490,000
- Services: Pre-existing, multi-year contract with Precision Water Resources Engineering established through a competitive procurement process
- Timeline: FY23 – FY27



### Key Partners

- Precision Water Resources Engineering (contractor)
- Upper Colorado River Commission and Upper Division States (interstate technical collaboration)
- Division of Water Rights (technical collaboration)
- Division of Water Resources (technical collaboration)
- Bureau of Reclamation (technical collaboration)
- Lower Division States (interstate technical collaboration)
- Central Utah Water Conservancy District (in-kind contributions)

### 6.3 Mainstem Conveyance Loss Study

#### Description

The Upper Basin must investigate the feasibility of a Demand Management Program as outlined in the 2019 Upper Basin Drought Contingency Plans (DCPs). Feasibility considerations include, among other program elements, 1) verification of and accounting for the actual volume of conserved consumptive use and 2) conveyance of the conserved consumptive use to appropriate destinations and accounting for associated conveyance losses. Several of the Authority's projects already address intrastate aspects of drought mitigation that could inform a potential Demand Management Program (e.g., Sections 7.3, 7.4, and 7.6); however, there is a need to explore these aspects on a larger interstate scale while leveraging federal BIL funds.

Through the UCRC BIL process, the Authority, together with the other three Upper Division States, anticipates participating in a modeling investigation on select reaches of the Colorado River and key tributaries with the goal of better-defining conveyance losses between upstream Colorado River Storage Project (CRSP) initial units and Lake Powell. The study will focus on the reaches between Fontenelle and Flaming Gorge Reservoir and Flaming Gorge to Lake Powell. The investigation will be coordinated with other ongoing modeling efforts in the Upper Division States to avoid duplication of effort. In addition to informing discussions and modeling at the UCRC level, the Authority may leverage the outcome of this effort to inform future modeling of mainstem reaches in support of ongoing projects.

#### FY25 Work Plan

In FY25, the Authority will work with the UCRC and the other Upper Division States to refine a project scope, define entity roles, pursue a Request for Proposals, and contract for technical services.

#### Project Information

- Funding Source: federal BIL funds
- Budget: To be determined in early in FY25
- Services: Competitive procurement process to engage technical services conducted through the UCRC
- Timeline: To be determined in early FY25

#### Key Partners

- Division of Water Rights (technical collaboration)
- Division of Water Resources (technical collaboration)
- Upper Colorado River Commission and Upper Division States (interstate technical collaboration)
- Additional entities to be identified as the project develops

### 6.4 Climate & Hydrology Research

#### Description

Recognizing hydrologic research is often iterative and responsive to new discoveries and challenges, the Authority has a small and flexible budget item to support emerging research when opportunities arise that directly support the Management Plan. Two research projects are currently supported by this budget:

- 1 The Authority is financially supporting the operation and maintenance of 15 weather stations across the Colorado River Basin by USU's Utah Climate Center (UCC). Research conducted by the UCC using the 15 weather stations will improve our knowledge of variability and predictability of precipitation for forecasting. Precipitation forecasting research increases confidence in water supply and demand forecasts and remotely-sensed evapotranspiration data, supporting better measurement for hydrology and operations planning and drought mitigation implementation.
- 2 The Authority is financially supporting Phase II of an Upper Colorado River Basin consumptive use modeling study by Research Triangle Institute International (RTI). The project is managed by the Colorado River Climate and Hydrology Work Group, with the Authority and several other entities as funding partners. The first phase of the consumptive use modeling effort began in 2021 and compared the State of Colorado's StateCU and StateMod models with Colorado Basin River Forecast Center (CBRFC) models. The second phase began in 2023, runs through 2025, and is expanding this comparison and development of models to New Mexico, Utah, and Wyoming and incorporating remotely-sensed evapotranspiration data. This research initiative will verify similar consumptive use models to improve forecasts and increase consistency between Colorado River Basin states to enable science-based drought mitigation strategies.

#### Progress to Date

For the two existing Climate and Hydrology Research projects, progress was made as follows:

- 1 The funding support continued, and research was synthesized with UFN and OpenET data comparison efforts and other relevant Work Plan projects.
- 2 The project was kicked off, monthly update meetings were held, and modeling efforts began. The RTI team began to coordinate with the Authority's UCRAF team (Section 7.3, 7.4) to share knowledge around consumptive use modeling in Utah.

### **FY25 Work Plan**

The Authority remains committed to tracking and pursuing novel, developing, and best-available science, considering financial support for new research initiatives that support the Management Plan, and pursuing the two existing projects as follows:

- 1 Funding support will continue, and weather station data will be synthesized with UFN and OpenET comparison efforts and other relevant Work Plan projects.
- 2 Early study outcomes will be synthesized with relevant Work Plan projects including UCRAF, UFN, and OpenET.
- 3 Maintain an awareness and understanding of existing and emerging research needs to support Management Plan priorities and explore project and funding options with collaborators.

### **Project Information**

- Funding Source:
  - UCC: one-time appropriations
  - RTI: one-time appropriations, \$50,000 one-time funds allocated to Climate and Hydrology Work Group upfront for two-year project (\$300,000 Total; \$25,000 Authority, \$25,000 CUWCD in-kind contributions, \$75,000 Reclamation, \$60,000 Colorado Water Conservation Board, \$50,000 SNWA, \$25,000 Six Agency Committee of California, \$20,000 Central Arizona Water Conservation District, \$20,000 Denver Water)
  - Future projects: one-time appropriations and federal BIL funds
- Budget:
  - FY25: UCC ongoing: \$20,000
  - FY25: RTI: no additional costs
  - Total: \$150,000
- Services:
  - UCC: Funding agreement with USU executed July 2022
  - RTI: Funding agreement with Southern Nevada Water Authority (SNWA) as the project manager executed June 2023
- Timeline: FY23 – FY27

### Key Partners

- Utah Climate Center, Utah State University (contractor)
- Utah Geological Survey (technical collaboration)
- OpenET (technical collaboration)
- Upper Colorado River Commission (interstate technical collaboration)
- Colorado River Climate and Hydrology Work Group (other funding partners)
- Colorado Basin River Forecast Center (technical collaboration)
- Division of Water Rights (technical collaboration)
- Division of Water Resources (technical collaboration)
- Central Utah Water Conservancy District (in-kind contributions)
- Southern Nevada Water Authority (funding partner and project manager)
- Research Triangle Institute International (contractor)

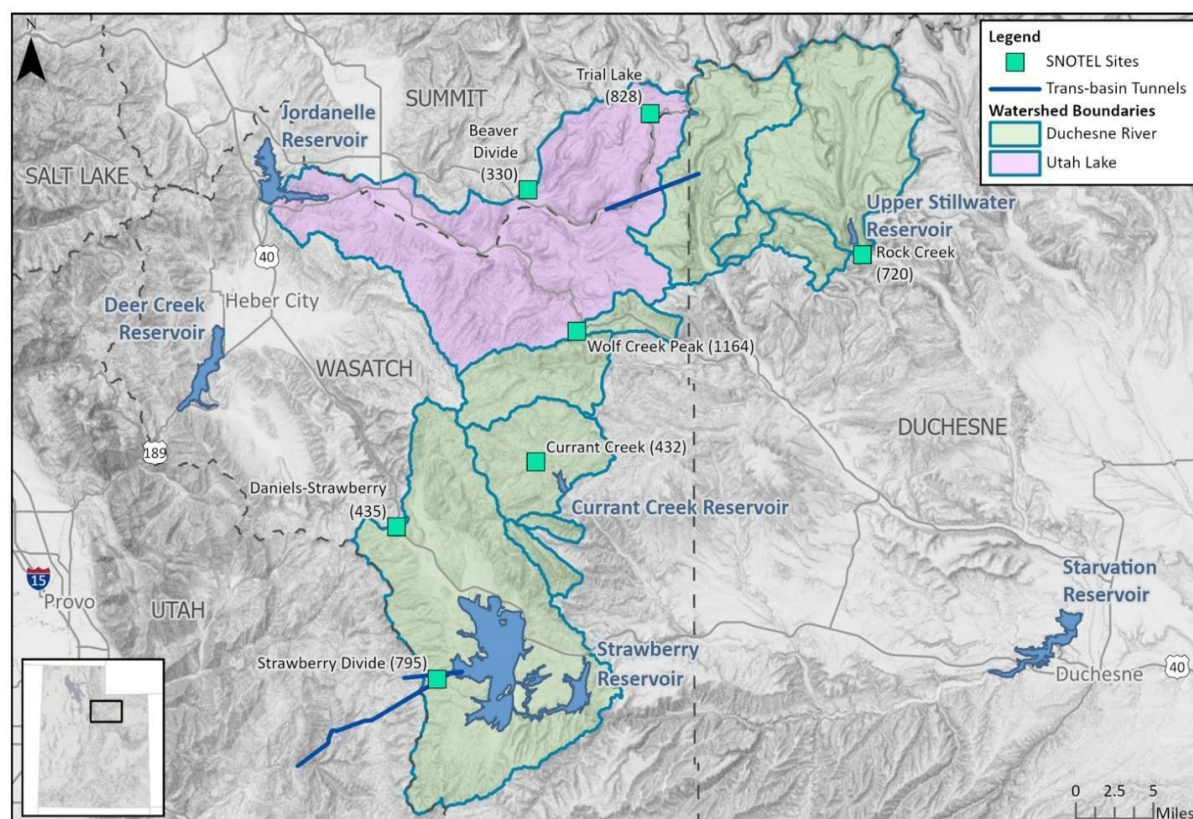
### 6.5 Snowpack, Runoff, & Operations Pilot Project & Research

#### Description

Snowpack contributes 95% of Utah's water supply, making accurate measurement of snowpack necessary for both short-term system operations and long-term planning. Snowpack telemetry (SNOTEL) data from the Natural Resources Conservation Service (NRCS) has been historically used to forecast the amount of water available to water users in the Colorado River system in Utah. SNOTEL sites are consistent through time but only represent the area immediately adjacent to the instruments. In contrast, snowpack data collected by Airborne Snow Observatories, Inc. (ASO) covers a full surface area, capturing heterogeneity in snowpack across mountainous landscapes. ASO is the sole licensee from NASA/JPL/Caltech to commercialize snow surveys with their software suite. ASO products have been tested and operationalized in other Western states but have not yet been tested in Utah.

The Authority is conducting "Flakes, Flights, and Forecasts: Snow Measurement Enhancements in the Uinta Mountain Headwaters" as the first-ever ASO Pilot Project in Utah. The Pilot Project consists of a snow-free survey and three snow-on surveys per year for three years in the Uinta Mountain Headwaters (Figure 3), generating spatially complete maps of snow depth, snow water equivalent, and snow albedo through remotely-sensed data, followed by modeling of snowpack and runoff forecasts, and integration of data into the Strawberry Aqueduct Collection System (SACS) operational model and the UCRAF planning model. This Pilot Project will enable the best-available snow measurement and modeling to provide reliable water supply forecasting to a key watershed in Utah for 1) optimized flood control operations of federal facilities, 2) short- and long-term water management decisions, 3) environmental protection, 4) drought mitigation and resilience, and 5) dissemination of results to other watersheds throughout Utah.





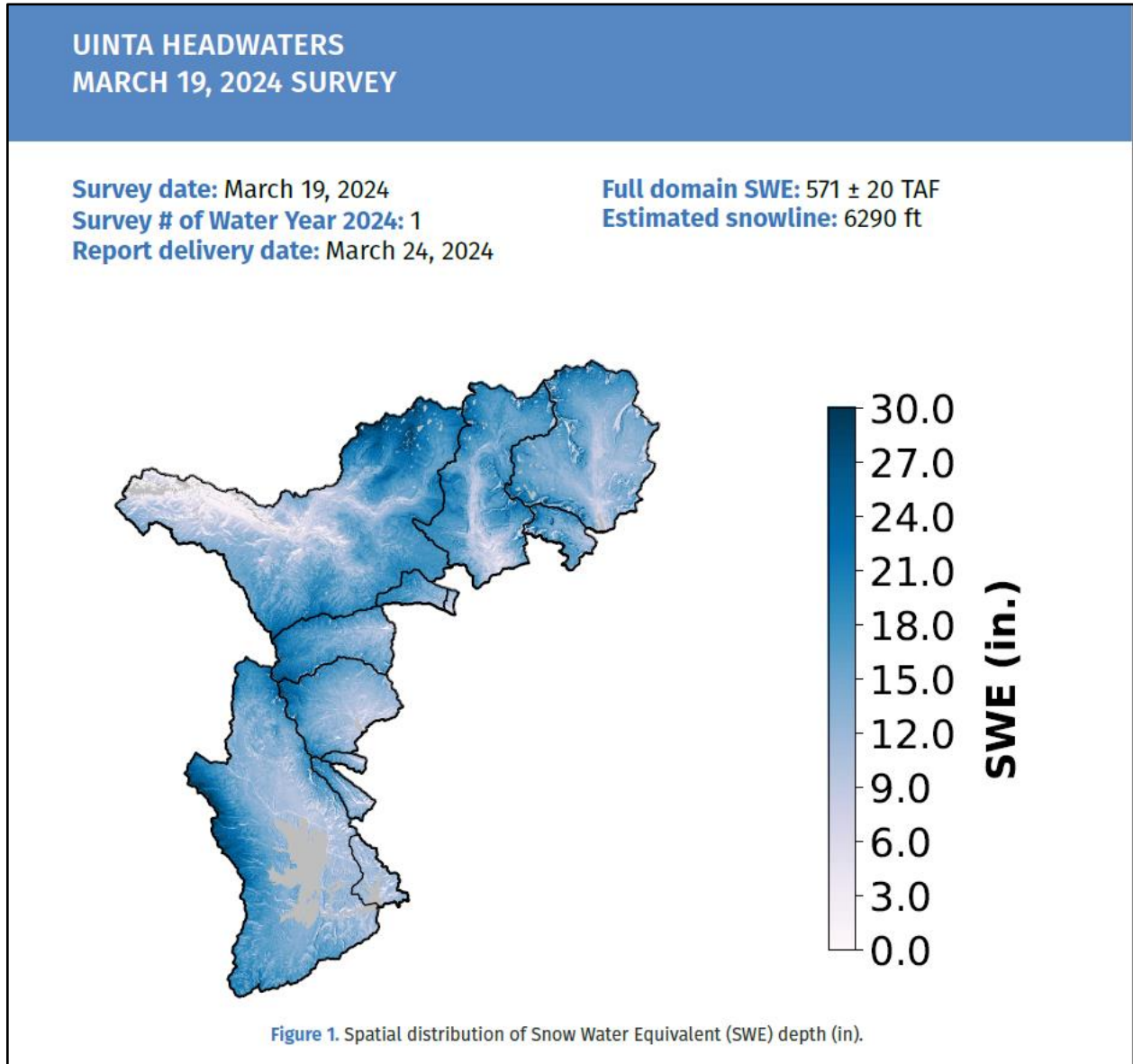
**Figure 3.** ASO Pilot Project study area and key infrastructure.

### Progress to Date

In March 2023, Reclamation announced a funding opportunity through the Snow Water Supply Forecasting Program for emerging snow monitoring technologies. In response to the funding opportunity, the Authority, as the lead applicant, partnered with Central Utah Water Conservancy District (CUWCD) and DWRe to propose and provide matching funds for the Pilot Project to test ASO in Utah. Horrocks Engineering provided grant proposal preparation management, funded by CUWCD. TNC, Jordan Valley Water Conservancy District, Duchesne County Water Conservancy District, and Utah's four members of the United States House of Representatives provided letters of support for the Pilot Project. The proposed Pilot Project received a Notice of Grant Award (NGA) from Reclamation on January 16, 2024.

A snow-free survey of the study area was conducted by ASO in October 2023, with pre-award spending authorization from Reclamation to ensure the project stayed on schedule. During the peak snow and runoff season, ASO conducted the first three snow-on surveys of the Pilot Project (Figure 4), with supporting ground surveys conducted by the NRCS. ASO produced data reports, iSnoBal model reports, and WRF-Hydro model reports for each survey, and updated models in between surveys. The project team began to compare ASO data and models with other snow and runoff models and integrate ASO data into the Strawberry Aqueduct Collection System (SACS) model.

Data and reports can be found at Airborne Snow Observatories ([data.airbornesnowobservatories.com](https://data.airbornesnowobservatories.com)).



**Figure 4.** Map of snow water equivalent distribution in the study area measured during the first snow-on survey of the Pilot Project.

### **FY25 Work Plan**

In FY25, analysis of the first year of data, including comparison with other datasets and integration into SACS and UCRAF models will continue, with an emphasis on developing an understanding of how ASO data can be applied to water management decision-making. In the spring of 2025, three additional snow-on surveys will be conducted and associated data production, modeling, and analysis will follow. Lessons from the first year of data collection will be applied to FY25 efforts. Early results from the project will be communicated to key collaborators, including NRCS and the Colorado Basin River Forecast Center. Along with technical activities, a grant administration technical consultant will be procured by the Authority and funded through the grant budget to support coordination, evaluation, and federal grant reporting of the Pilot Project. Additional research and instrumentation activities to support the project may be contemplated with potential support from federal BIL funds.

### **Project Information**

- Funding Source: one-time appropriations, CUWCD, DWRe, federal WaterSMART funds
- Budget:
  - FY25: \$558,000
  - Total: \$2,000,000 (\$650,000 Authority, \$250,000 CUWCD, \$100,000 DWRe, \$1,000,000 WaterSMART)
  - Additional research and instrumentation budget to be developed and considered using federal BIL funds, not to exceed \$200,000 for FY25
- Services:
  - Grant Award from Reclamation to the Authority
  - Funds transfer from CUWCD
  - Funds transfer from DWRe
  - Sole source contract with Airborne Snow Observatories, Inc.
  - Competitive procurement for grant administration and technical consulting contract (FY25)
- Timeline: FY24 – FY27

### **Key Partners**

- Airborne Snow Observatories, Inc. (contractor)
- Bureau of Reclamation (co-funder)
- Central Utah Water Conservancy District (co-funder, technical collaboration)
- Utah Division of Water Resources (co-funder)
- Natural Resource Conservation Service (technical collaboration)

### 7.1 Agricultural Water Resilience Study

#### Description

The Authority is evaluating potential opportunities and risks for agricultural water resilience through a study by Jacobs Engineering Group (Jacobs). This study investigated the potential for conservation of consumptive use within the Colorado River system in Utah and CUWCD service area through five analysis steps: Water Resource Inventory, Water Demand Analysis, Quantify the Possible, Assess Economic Impacts, and Develop Prioritization Criteria. Outcomes from the study will inform the feasibility of drought mitigation programs and support prioritization of the various drought mitigation strategies. The study concluded at the end of FY24.

#### Progress to Date

Technical memoranda have been produced, reviewed internally and externally, finalized for each of the five analysis steps, and shared with collaborators.

#### FY25 Work Plan

Results from the study will be shared with partners and applied to the Authority's ongoing Drought Mitigation activities, particularly the Farm to Flow agricultural resilience and demand management pilot program (Section 7.6).

#### Project Information

- Funding Source: in-kind contributions from CUWCD
- Budget:
  - FY25: no additional costs
  - Total: \$700,000
- Services:
  - Task Order 1: Agreement between CUWCD and Jacobs following a competitive procurement process
  - Task Order 2: Amended Agreement between CUWCD and Jacobs, with Authority consultation, expanding geography and adding economic analysis
- Timeline: FY23 – FY24

#### Key Partners

- Jacobs Engineering (contractor)
- M.Cubed (subcontractor)
- Central Utah Water Conservancy District (in-kind contributions, project management, technical collaboration)
- Utah State University Extension (technical collaboration)
- Division of Water Resources (technical collaboration)
- Division of Water Rights (technical collaboration)
- OpenET (technical collaboration)
- WestWater Research (technical collaboration)

### 7.2 Emery County Irrigation Efficiency Study

#### Description

As Utah and other Upper Division States contemplate agricultural water conservation projects, it is increasingly important to understand potential long-term and secondary impacts of such projects. The goal of this effort is to analyze historical data from Emery County to understand the long-term impacts that have resulted from canal (unlined to pressurized pipe) and irrigation (flood to sprinkler) conversions over the past thirty years. This project will use several of the Authority's existing datasets and tools, including historic OpenET data, Google Earth Engine, and the Price/San Rafael UCRAF model. The Authority anticipates that this effort will be funded in whole or in part by federal BIL funds and will be completed in partnership with an academic institution (graduate-level research project).

#### FY25 Work Plan

In FY25, the Authority will work with the UCRC and other partner entities (e.g., DWRi, DWRe, Emery Water Conservancy District) to develop and refine a project scope and identify an academic institution to conduct the research project. The Authority anticipates that this project will begin in FY25 and last approximately 2-3 years.

#### Project Information

- Funding Source: federal BIL funds and one-time appropriations
- Budget: To be determined in early FY25
- Services: Research Grant Funding Agreement
- Timeline: FY25 – FY27

#### Key Partners

- Upper Colorado River Commission (interstate technical collaboration)
- Emery Water Conservancy District (technical collaboration)
- UCRAF Project Team (technical collaboration)
- Division of Water Rights (technical collaboration)
- Division of Water Resources (technical collaboration)
- Academic Institution (research entity)
- Additional entities to be identified as the project develops



### 7.3 Duchesne River Basin

#### Description

The Authority is developing a multi-year, multi-phased Utah Colorado River Accounting and Forecasting (UCRAF) model beginning with the Duchesne River Basin. The UCRAF model is a drought mitigation planning tool, and models supply according to priority using a rule-based and accounting RiverWare model. This effort will help develop a comprehensive understanding of current water rights and water usage (Phase 1) and will ultimately be used as a planning tool to evaluate how drought mitigation measures (e.g., crop types, irrigation methods, water reduction methods, water rights transfer, etc.) affect water availability and water rights (Phase 2). The Duchesne River Basin UCRAF Pilot will help support drought mitigation efforts in the Duchesne Basin and will inform the development of subsequent UCRAF models for other regions within the Colorado River Basin in Utah.

#### Progress to Date

Significant progress was made in FY24 on the two major elements of the Duchesne River Basin UCRAF model—the Diversion Runoff Calculator (DRC, a Python and geospatial-based model) and the RiverWare model. In early FY24, the project team transitioned the DRC from a standalone set of Python scripts to an ArcGIS Pro environment with Python-enabled tools. These updates were accompanied by an in-depth user manual, both of which provide a more user-friendly and transparent interface. The project team also incorporated new and updated datasets within the DRC as they became available, including the water rights network dataset that is continually being developed by DWRi, historical evapotranspiration data from OpenET (1991 – 2023), and the Evapotranspiration Demands Model effective precipitation dataset from the Desert Research Institute (DRI). Work was also done to ensure that the DRC could perform Phase 2 scenario comparisons that may be considered by the Authority. To date, the DRC for the Duchesne River Basin is mostly complete, apart from ongoing data updates.

For the Duchesne River Basin RiverWare model, the project team focused on continued development of the physical baseline RiverWare model including model calibration and baseline simulations. In addition, the team spent a large portion of the year developing an understanding of water rights accounting within the Duchesne Basin and implementing an accounting structure within the RiverWare model. The project team coordinated efforts to ensure that the outputs from the DRC are compatible with the input needs of the RiverWare model.

The UCRAF project team met several times in person for in-depth workshops during 2023 (July, October) and 2024 (March, May). Most workshops were two days each in duration and provided an opportunity to check in on progress, discuss any challenges, explore technical components within the model, and identify next steps for the coming months. The team also had several in-depth meetings with DWRi to receive guidance on water right administration, system operation, and data availability.

The project team also coordinated with other entities on data-related issues (e.g., OpenET, DRI). In August 2023, the Authority and Precision Water Resources Engineering gave a joint presentation at the annual RiverWare User Group Meeting in Boulder, Colorado, entitled, “Using RiverWare to Enable Drought Mitigation Planning in the Colorado River Basin in Utah.”

### **FY25 Work Plan**

Work on the Duchesne River Basin UCRAF Pilot will continue as outlined under an existing contract that was amended to add the development of verification capabilities within the UCRAF model and to expand the model effort to include the Price and San Rafael Basins. A UCRAF workshop is planned for early FY25 that will cover Phase 2 scenario development and the real-time verification aspect of UCRAF, which will be a large focus of FY25. Phase 2 scenarios may be informed by ongoing SCPP projects, the Authority’s Demand Management Pilot Program, or other efforts. FY25 is the third and final year of the Duchesne River Basin Pilot Project, so work is anticipated to focus on finalizing the model components, preparing deliverables (reports, model files), and transferring all models to the Authority staff.

### **Project Information**

- Funding source: one-time appropriations
- Budget:
  - FY25: \$200,000
  - FY23 – FY25: \$1,651,000 (Total for Duchesne, San Rafael, and Price River Basin UCRAF models)
- Services:
  - Pre-existing multi-year contract established through a competitive procurement process. A sole source contract was issued to build on and maintain the continuity of previously completed work.
  - Contract executed July 2022 and amended June 2023
- Timeline: FY23 – FY25

### **Key Partners**

- Precision Water Resources Engineering (contractor)
- Follum Hydrologic Solutions (subcontractor)
- Division of Water Rights (technical collaboration)
- Division of Water Resources (technical collaboration)
- OpenET (technical collaboration)
- Desert Research Institute (technical collaboration)



## **7.4 San Rafael & Price River Basins**

### **Description**

Following successful progress on the UCRAF pilot in the Duchesne Basin, the Authority has expanded development of the UCRAF model to the San Rafael and Price River Basins. Model development will follow a similar process as the Duchesne Pilot, which includes data collection and organization, development of a baseline model to characterize the current system (Phase 1), and development of capabilities within the Phase 1 model to explore the impact of drought mitigation measures (Phase 2). Because many of the tools and modeling approaches have already been developed under the Duchesne UCRAF Pilot, the development of the San Rafael/Price UCRAF model will be expedited and will conclude in the same timeframe as the Duchesne Pilot (FY25). Model development will also capitalize on an existing San Rafael RiverWare model developed by DWRe and will benefit from favorable data coverage in this region (diversion data, water right data, EC tower data). The San Rafael/Price UCRAF model will help facilitate drought mitigation planning efforts and is important given the current level of conservation engagement in this region (e.g., SCPP, Price River Water Bank Pilot, etc.).

### **Progress to Date**

The majority of FY24 tasks for the San Rafael and Price River Basin UCRAF models related to Phase 1 model development, which included collecting and organizing existing data, developing the DRC for the San Rafael/Price River Basin area, and developing baseline RiverWare models. The RiverWare models were informed by DWRe's existing model for the San Rafael Basin and by DWRI's distribution model for the Price River Basin. Workshops and meetings were held in conjunction with the Duchesne effort (see Section 7.3) and similar issues were discussed. The UCRAF team particularly benefited from an in-person meeting with DWRI in Price, Utah, that included an explanation of system operations, a tour of local canals, and a site visit to Scofield Reservoir. Overall, progress on the San Rafael/Price River Basin UCRAF model mirrored the Duchesne River Basin model and benefited from the prior development of tools and modeling approaches for the Duchesne effort.

### **FY25 Work Plan**

Similar to the Duchesne River Basin UCRAF model, work on the San Rafael/Price River Basin UCRAF model in FY25 will occur as outlined under the existing UCRAF contract. Since FY25 represents the second and final year for the San Rafael/Price River Basin UCRAF project, the project team will focus on finalizing the model components, developing Phase 2 scenarios, preparing deliverables (reports, model files), and transferring all models to the Authority staff. The San Rafael/Price River Basin UCRAF model may help inform project elements of a study in Emery County described in Section 7.2.

### Project Information

- Funding Source: one-time appropriations
- Budget:
  - FY25: \$562,000
  - Total: \$1,651,000 (includes Duchesne, San Rafael, and Price River Basin UCRAF models)
- Services: Amendment to a sole source, pre-existing, multi-year contract
- Timeline: FY24 – FY25

### Key Partners

- Precision Water Resources Engineering (contractor)
- Follum Hydrologic Solutions (subcontractor)
- Division of Water Rights (technical collaboration)
- Division of Water Resources (technical collaboration)
- OpenET (technical collaboration)
- Desert Research Institute (technical collaboration)

### 7.5 Decision Support Mapping Tool for Drought Mitigation

#### Description

The Authority is developing a drought mitigation planning model (UCRAF) and is pursuing on-the-ground projects to test the implementation of conservation programs (AG-DRIP, SCPP, and Farm to Flow Pilot Program). However, these efforts do not inherently identify the specific fields that would be advantageous for implementing drought mitigation projects. A Decision Support Mapping Tool will leverage existing datasets (e.g., water right date, crop type, water consumption, irrigation efficiency, runoff, distance of unlined canals, etc.) to help identify areas where further UCRAF modeling or pilot projects may be beneficial.

#### Progress to Date and FY25 Work Plan

This effort was initiated late in FY24 as an in-kind contribution to the Authority from CUWCD and is anticipated to conclude early in FY25. The Mapping Tool is anticipated to help inform drought mitigation scenarios in UCRAF and planning or outreach for the Authority's Pilot Program.

#### Project Information

- Funding Source: in-kind contributions from CUWCD
- Budget:
  - FY25: \$5,000
  - Total: \$30,000
- Services: Pre-existing multi-year contract with Precision Water Resources Engineering established through a competitive procurement process
- Timeline: FY24 – FY25

#### Key Partners

- Precision Water Resources Engineering (contractor)
- Follum Hydrologic Solutions (subcontractor)
- Central Utah Water Conservancy District (in-kind contributions, technical collaboration)

## **7.6 Farm to Flow: Agricultural Resilience & Demand Management Pilot Program**

### **Description**

During the 2023 Legislative Session, the Utah Legislature appropriated \$5,000,000 in one-time funds to the Authority for Agricultural Resilience Pilot Projects. The Authority will use these appropriations to develop the Farm to Flow pilot program and implement pilot projects that include temporary, voluntary, and compensated reductions in consumptive water use through a variety of mechanisms. Pilot projects will be specifically aimed at establishing defensible measurement of conserved consumptive use, shepherding of conserved water to target locations (“demand management”), evaluating market drivers, and evaluating the existing legal framework for purposes of developing scalable drought mitigation programs. Projects may investigate the potential application of Utah 2023 Session Senate Bill 144, which empowers the State Engineer to authorize and distribute conserved water in a qualifying program as confirmed by the Authority. The Authority is committed to using each project to learn about drought mitigation best practices, and to synergize pilot projects with other programs to maximize the use of resources and minimize duplication of efforts.

### **Progress to Date**

In FY24, the Authority conducted a competitive procurement process to engage an engineering consultant to support management and technical consulting for the Farm to Flow pilot program and projects. A Request for Proposals was posted on the State of Utah Public Procurement Place in October 2023, and four responses were received. An Evaluation Committee consisting of partners from DWRi, DWRe, UDAF, USU, CUWCD, the Authority Advisory Councils (Trout Unlimited) and the Authority Board supported evaluation and selection of the most-qualified consulting firm. Based on the recommendation of the Evaluation Committee partners, Jacobs Engineering Group was awarded the contract in March 2024 with Utah State University Extension, Precision Water Resources Engineering, Clyde Snow & Sessions, Hansen Allen & Luce, and M.Cubed as subconsultants (collectively the Jacobs Team).

In the final quarter of FY24, the Authority and the Jacobs Team initiated development of the Farm to Flow pilot program by holding a Consultant Kick-Off Workshop, establishing a Scope of Work Management Framework, and holding a Collaborator Kick-Off Workshop.

### **FY25 Work Plan**

In FY25, the Authority and the Jacobs Team will work closely together to develop and administer Farm to Flow, and design and implement water conservation pilot projects for the 2025 irrigation season. The Authority will continue to maintain its commitment to coordination and collaboration by working closely with entities running similar water conservation projects and connecting with local water users, water managers, and environmental organizations. The Authority will consult closely with DWRi to ensure defensible water conservation measurement activities, while maintaining water users' water rights. In evaluating and implementing projects, the Authority and Jacobs will carefully consider the potential social, economic, legal, and environmental impacts of projects on Utah's water and communities.

### **Project Information**

- Funding Source: in-kind contributions
- Budget:
  - FY25: \$1,435,000 (\$1,000,00 project implementation, \$435,000 Jacobs Team)
  - FY24 – FY27: \$5,000,000 (\$577,000 Jacobs Team Total for Task Order 1, \$4,423,000 for project implementation and any additional consultant services)
  - Total: \$5,000,000 (Jacobs Team and project implementation)
- Services:
  - Competitively procured agreement with Jacobs Engineering Group executed March 2024
  - Agreements with water right holders participating in pilot projects
  - Interlocal agreements with relevant agencies
- Timeline: FY24 – FY27

### **Key Partners**

- Jacobs Team (consultant)
- Agricultural water managers and water users (project proponents)
- Division of Water Rights (technical and legal support, possible administration support)
- Trout Unlimited (local knowledge, support for project proponents)
- The Nature Conservancy (local knowledge, support for project proponents)
- OpenET (technical collaboration)
- Utah Department of Agriculture and Food (program coordination)
- Central Utah Water Conservancy District (program coordination)
- Upper Colorado River Commission (program coordination)

## **7.7 AG-DRIP: Agricultural Water Demonstration, Research, & Implementation Pilot Program**

### **Description**

The Authority strives to balance proactive water conservation measures with the best available science and the needs of the agriculture community. Water conservation programs already exist under SSCP 2023 and 2024, Utah Department of Agriculture and Food's Agricultural Water Optimization Program, and similar federal and non-government efforts. More opportunities will become available through the Authority-specific Farm to Flow pilot program and ongoing Basinwide initiatives. Given the need to balance meaningful water conservation with sustained agriculture, and the variety of water conservation strategies and opportunities available, the Authority and CUWCD have partnered with USU Extension to implement the Agricultural Water Demonstration, Research, & Implementation Pilot Program (AG-DRIP). AG-DRIP will engage agricultural water users and irrigation companies by developing individual operation-specific Irrigation Management Plans (IMPs) to identify the full suite of water conservation methods and funding mechanisms available to a participant. Participants will be incentivized to implement their IMP and report water use. Finally, AG-DRIP will validate the success of efforts by helping water users collect and evaluate data and make adjustments where needed.

### **Progress to Date**

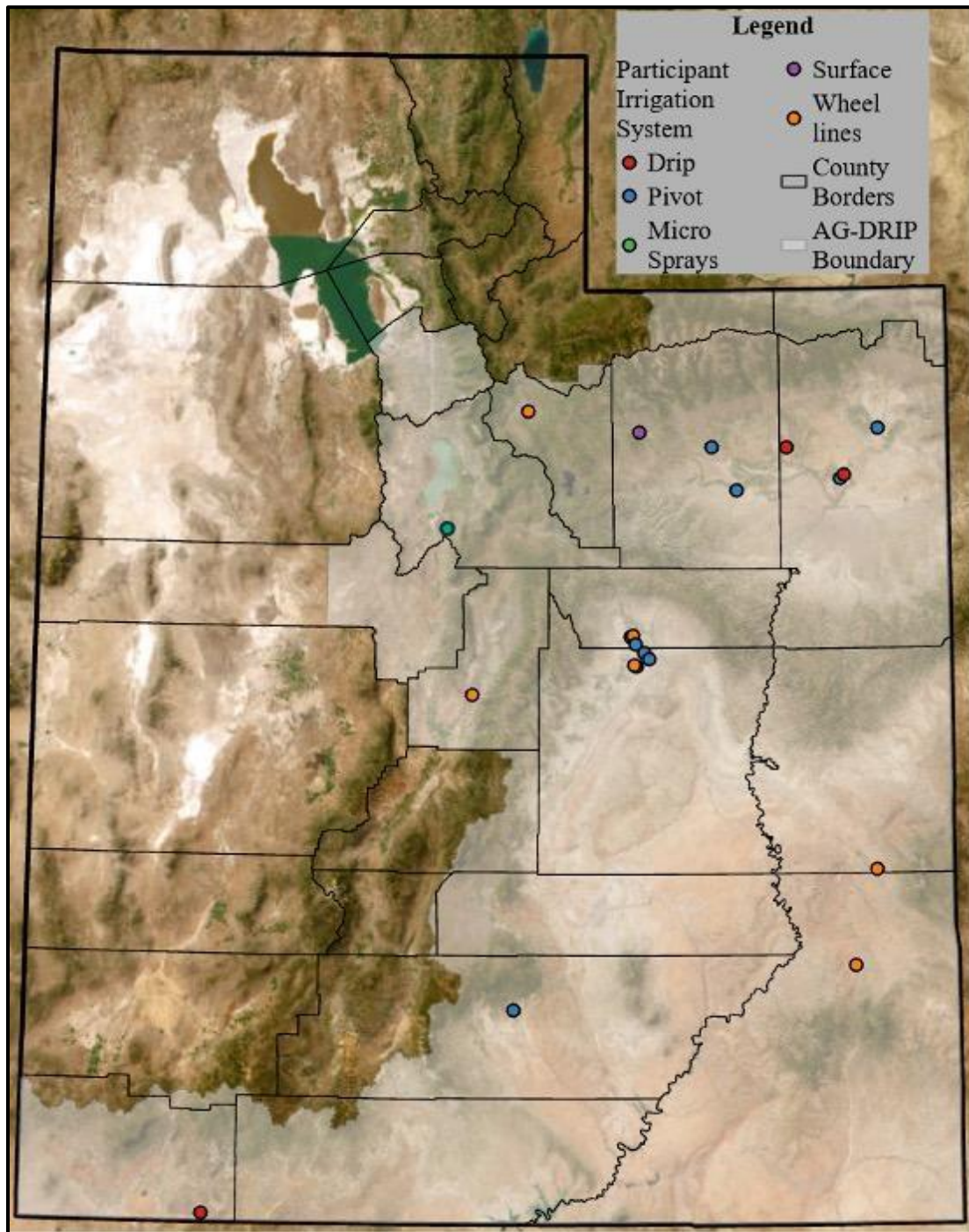
In FY23, AG-DRIP was developed through collaboration with USU Extension, CUWCD, Jacobs, and the Authority. Program development was informed by the experience of all the collaborators, early results from USU's Optimizing Water Use in Agriculture by Stacking Conservations Practices Project, and the Jacobs Agricultural Water Resilience Study under the FY23 Work Plan. AG-DRIP was established through funding agreements between USU Extension, the Authority, and CUWCD. Early outreach efforts began through news articles and announcements in relevant conferences and committees.

In the first year of the program, AG-DRIP enrolled 21 farms in the program (Figure 6). Ongoing outreach was conducted to current and potential participants, including monthly participant meetings and a workshop at the Utah Water Users Conference. Incentives were provided to participants, including for the purchase and installation of on-farm water meters, weather stations, and soil moisture sensors, and credits were established at local irrigation supply and seed supply companies. IMPs were developed by early participants with support from USU Program Coordinators.



## 7. Drought Mitigation

### Agricultural Water Resilience Initiatives



**Figure 6.** Map of AG-DRIP projects enrolled in calendar year 2023.



### **FY25 Work Plan**

Each year for five years, USU Extension will identify up to 25 farms and 10 irrigation companies to consult with for potential development of IMPs. Training, networking resources, and educational materials will be developed and disseminated each year. Water measurement devices will be provided to and installed with participants, and trainings on how to access and use the data will be conducted. IMPs will be developed and tested for participants, and on-farm operational changes may be made and monitored. Program outcomes will be tracked, evaluated, and reported as relationships are built, instrumentation is installed, and initial engagement and conservation data is collected.

### **Project Information**

- Funding Source: one-time appropriations and in-kind contributions from CUWCD
- Budget:
  - FY25: \$1,000,000 (\$500,000 Authority, \$500,000 CUWCD in-kind contributions)
  - Total: \$5,000,000 (\$2,500,000 Authority, \$2,500,000 CUWCD in-kind contributions)
- Services:
  - Funding agreement between USU and the Authority executed May 2023
  - Funding agreement between USU and CUWCD for in-kind contributions to the Authority executed May 2023
  - Participation agreements between USU and participants
- Timeline: FY23 – FY27

### **Key Partners**

- Utah State University Extension (contractor, program management)
- Central Utah Water Conservancy District (in-kind contributions, joint program oversight with the Authority, technical collaboration)
- Jacobs Engineering (technical collaboration)
- Utah Department of Agriculture and Food (inter-program coordination)
- Utah Agricultural Water Optimization Program (inter-program coordination)
- Water Users and Irrigation Companies (to be identified - program participants, local knowledge)
- Utah Farm Bureau (program coordination and outreach)

### 7.8 Pelican Lake Subsurface Drip Irrigation Pilot Project

#### Description

The Authority and CUWCD have both identified the need to develop drought mitigation measures in the Colorado River system in Utah to increase resilience against warming and drying climatic conditions. Additional research is needed to inform water managers and water users on the efficacy and tradeoffs of various drought mitigation measures that programs may employ, particularly changes to consumptive water use, or depletion, following irrigation system conversions to subsurface drip irrigation (SDI) systems.

The Pelican Lake Subsurface Drip Pilot Project (SDI Pilot Project) will compare water consumption of a study alfalfa field converted from wheel line sprinkler irrigation to subsurface drip irrigation with a neighboring control alfalfa wheel line field over three years. The SDI Pilot Project goal is to quantify any change in consumptive use of water that occurs when irrigating alfalfa using SDI compared to a traditional irrigation method (sprinkler, flood) within the Uinta Basin using direct measurement and remote sensing. The steps will also enable the changes in consumptive use to be well understood as they may relate to changes in crop yield and reductions in water losses aligned with the practice of SDI.

#### Progress to Date

In FY24, the opportunity for the SDI Pilot Project was identified and scoped, agreements were executed, and implementation began. The SDI system was installed by AES in May 2024, and instrumentation and data collection by USU began on both the study field and control field alongside SDI system installation.

#### FY25 Work Plan

The study field will be irrigated with subsurface drip irrigation throughout the 2024 irrigation season with support from the Landowner and AES. Both the study field and a control field will be maintained and worked by the Landowner, and data collection and analysis will be performed by USU. USU will work with the Landowner to understand crop yield and field maintenance parameters, and begin to evaluate the overall water balance and economic impact of SDI conversion on the study field. An annual report on the first of three years of the pilot project will be provided to the funders by USU.

### Project Information

- Funding Source: one-time appropriations and matching funds from CUWCD
- Budget:
  - FY25: no additional costs
  - Total: \$200,000 (\$100,000 Authority, \$100,000 CUWCD)
- Services:
  - Funding Agreement between Authority and CUWCD
  - Services Agreement between CUWCD and AES
  - Services Agreement between AES and Private Landowner
  - Services Agreement between AES and USU
- Timeline: FY24 – FY27

### Key Partners

- Central Utah Water Conservancy District (matching funds, project management, technical collaboration)
- Utah State University Extension (contractor)
- AES International PLLC (contractor)
- Private Landowner (contractor)
- Utah Department of Agriculture and Food (technical collaboration)
- Division of Water Resources (technical collaboration)
- Division of Water Rights (technical collaboration)

### 7.9 System Conservation Pilot Program (SCPP)

#### Description

The UCRC has administered SCPP in 2023 and 2024 with the Authority facilitating the program in Utah both years. SCPP provides municipal, industrial, and agricultural water users an opportunity to conserve consumptively used water through temporary, voluntary, and compensated projects. SCPP 2024 features a narrowed and focused scope of eligible projects to those that enable exploration of Demand Management feasibility and/or projects that support innovation and local resilience in water conservation. The Authority is closely evaluating attributes of SCPP for relevance and application in a potential long-term demand management program that would involve the shepherding of conserved water to storage locations.

#### Progress to Date

Federal reauthorization of SCPP was granted for up to two years as part of the 2023 Omnibus Appropriations Bill, and \$125,000,000 in federal funds from the Inflation Reduction Act (IRA) of 2022 was granted to the UCRC from Reclamation. The UCRC reauthorized and conducted SCPP for 2023 only, and again reauthorized SCPP for 2024 in September 2023 and released a Request for Proposals in October 2023.

In 2024, based on lessons learned from 2023, a fixed-firm compensation of \$150 per acre-foot of CCU was established for storage forbearance projects, and a fixed-firm compensation of \$506 per acre-foot of CCU was established for commodity-based projects in Utah, with a propose-and-justify compensation structure maintained for municipal and industrial project types. SCPP in 2024 included 12 public opportunities in Utah to learn about the program: 5 in-person information sessions across the Colorado River Basin in Utah (Green River, Price, Vernal, Roosevelt, Duchesne), 5 webinars, a presentation to the Ag Optimization Committee, and a presentation to the Utah Water Task Force.

For 2023 and 2024, proposed projects were selected based on criteria outlined in the UCRC-Reclamation SCPP Funding Agreement Facilitation Exhibit. For 2023 and 2024, System Conservation Implementation Agreements were executed by the UCRC and the participants for selected projects in the spring, and implementation and verification began at the outset of the 2023 or 2024 irrigation season. For the 2024 SCPP, DWRi has accompanied the Authority on field verification. SCPP projects for 2024 are summarized in Table 4.

## 7. Drought Mitigation

## Agricultural Water Resilience Initiatives

**Table 4.** Summary of SCPP 2024 projects for all Upper Colorado River Basin states and Utah as of June 30, 2024.

Total:	4-State	Utah
<b>Selected Projects</b>	110	31 (28% of total)
<b>Project Types</b>	Ag, Municipal, Industrial	Ag, Municipal, Industrial
<b>Estimated Conserved Volume (Acre-Feet)</b>	64,070	22,351 (35% of total)
<b>Total Compensation</b>	\$28,831,557	\$9,954,819 (33% of total)
<b>Price Per Acre-Foot</b>	\$150 Storage Forbearance \$506 Utah Commodity \$509 Colorado Commodity \$492 Wyoming Commodity \$300 New Mexico Commodity	\$150 Storage Forbearance \$506 Utah Commodity

### FY24 Work Plan

The Authority will support facilitation of SCPP projects through the end of calendar year 2024 by participating in verification efforts and communications between program participants and the UCRC. As information becomes available from the UCRC about future programs, the Authority will support facilitation of those programs in alignment with the Management Plan.

### Project Information

- Funding Source: one-time appropriations and federal IRA funds administered by the UCRC
- Budget:
  - FY25: no additional Authority costs for FY25
  - Total: \$105,000 Authority (2023 only), \$125,000,000 IRA
- Services:
  - Funding Agreement between the UCRC and Authority executed June 2023
  - Participation agreements between the UCRC and participants
- Timeline: FY23 – FY27

### Key Partners

- Upper Colorado River Commission (program administrator)
- Wilson Water Group (program support contracted with UCRC)
- Upper Basin States Agencies: Colorado Water Conservation Board, Wyoming State Engineer's Office, New Mexico Interstate Stream Commission (program facilitation in respective states)
- Trout Unlimited (support for program participants)
- Division of Water Rights (technical collaboration, local knowledge)
- Utah Program Participants
- Bureau of Reclamation (funding)