Using RiverWare to Enable Drought Mitigation Planning in the Colorado River Basin in Utah

Betsy Morgan – Colorado River Authority of Utah
Leland Dorchester & Tony Powell – Precision Water Resources Engineering

RiverWare User Group Meeting

August 29th, 2023

Project Team

THE COLORADO RIVER AUTHORITY OF UTAH

"Protect, conserve, use, and develop Utah's waters of the Colorado River System"

PWRE PRECISION WATER RESOURCES ENGINEERING

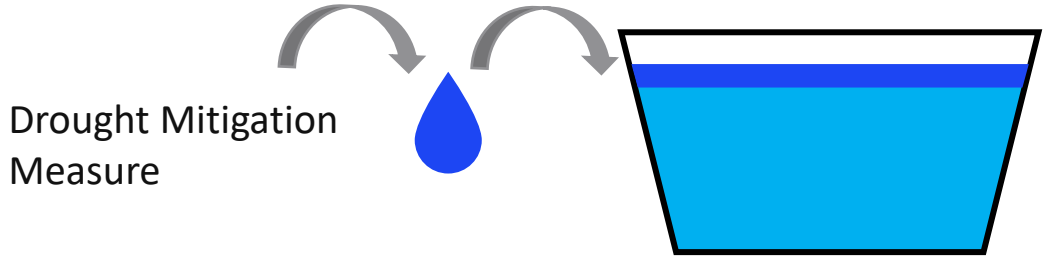
RiverWare and Basin Modeling
"Stewardship through technology"

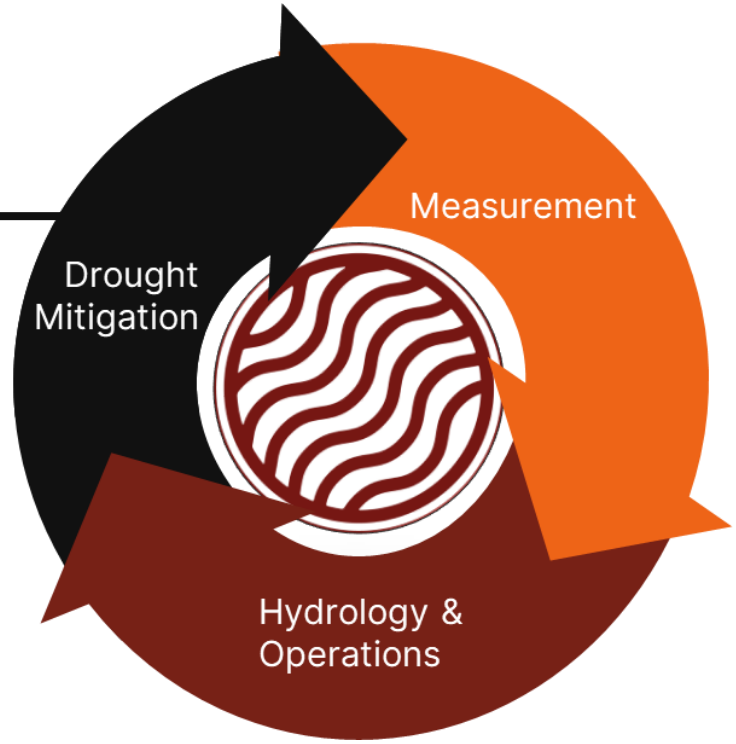
FHS FOLLUM HYDROLOGIC SOLUTIONS, LLC
PROFESSIONAL. INNOVATIVE. RELIABLE.

Hydrologic and Geospatial Analysis

Drought Mitigation

Develop solutions to support water use and demand under stressed conditions





- How much conserved water do drought mitigation measures produce?
- What are the most effective measures for producing conserved water?
- In what conditions will programs be successful?
- What are the unanticipated consequences?

Utah Colorado River Accounting and Forecasting (UCRAF)

UCRAF was proposed as a **planning tool** for the Colorado River Basin in Utah

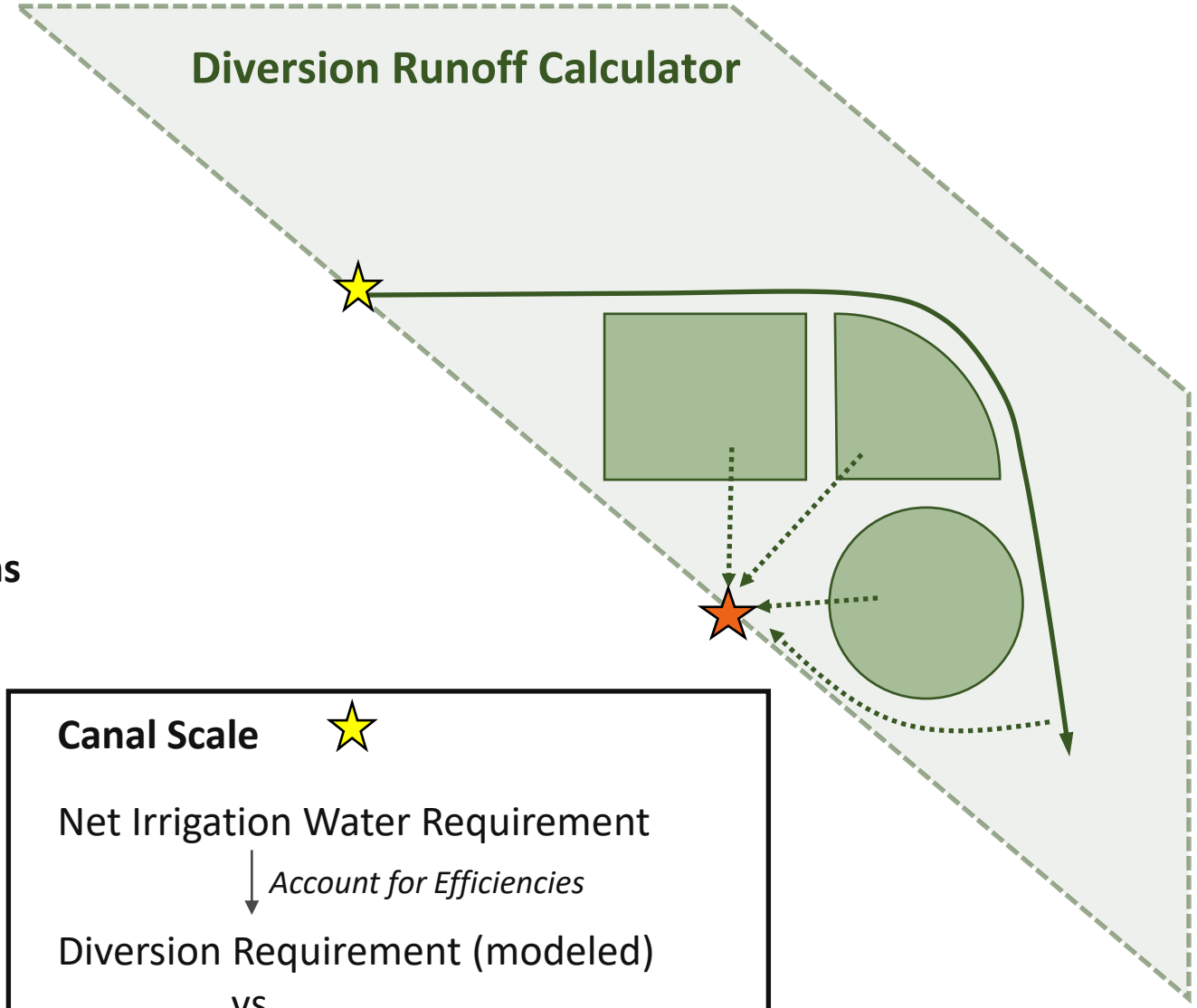
- Characterize the **water budget** (supply, consumptive use, losses) and **water rights**

- Understand the impact of **drought mitigation measures**
  - Identify potential programs and **quantify depletion savings**

UCRAF Development

Diversion Runoff Calculator

- Fields
- Canals
- Diversions
- Return Flows



Calculating Diversions

Field Scale

Net Irrigation Water Requirement

OPENET

Aggregate →

Canal Scale

Net Irrigation Water Requirement

↓ *Account for Efficiencies*

Diversion Requirement (modeled)

vs.

Observed Canal Data

UCRAF Development

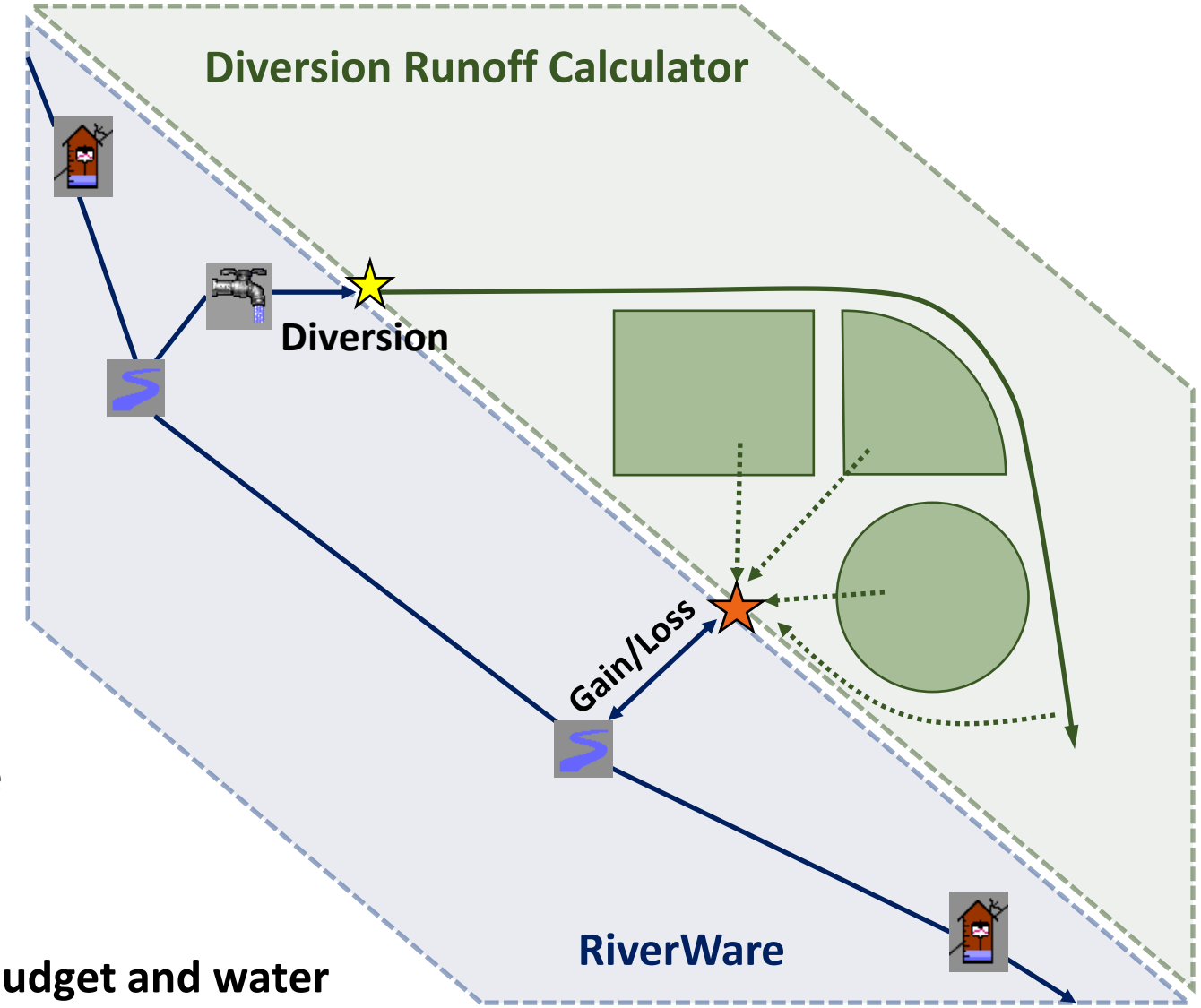
RiverWare Model

- Diversion
- Gain/ Loss
- Stream Gages

Linkages

RW Diversion – Canal Linkage

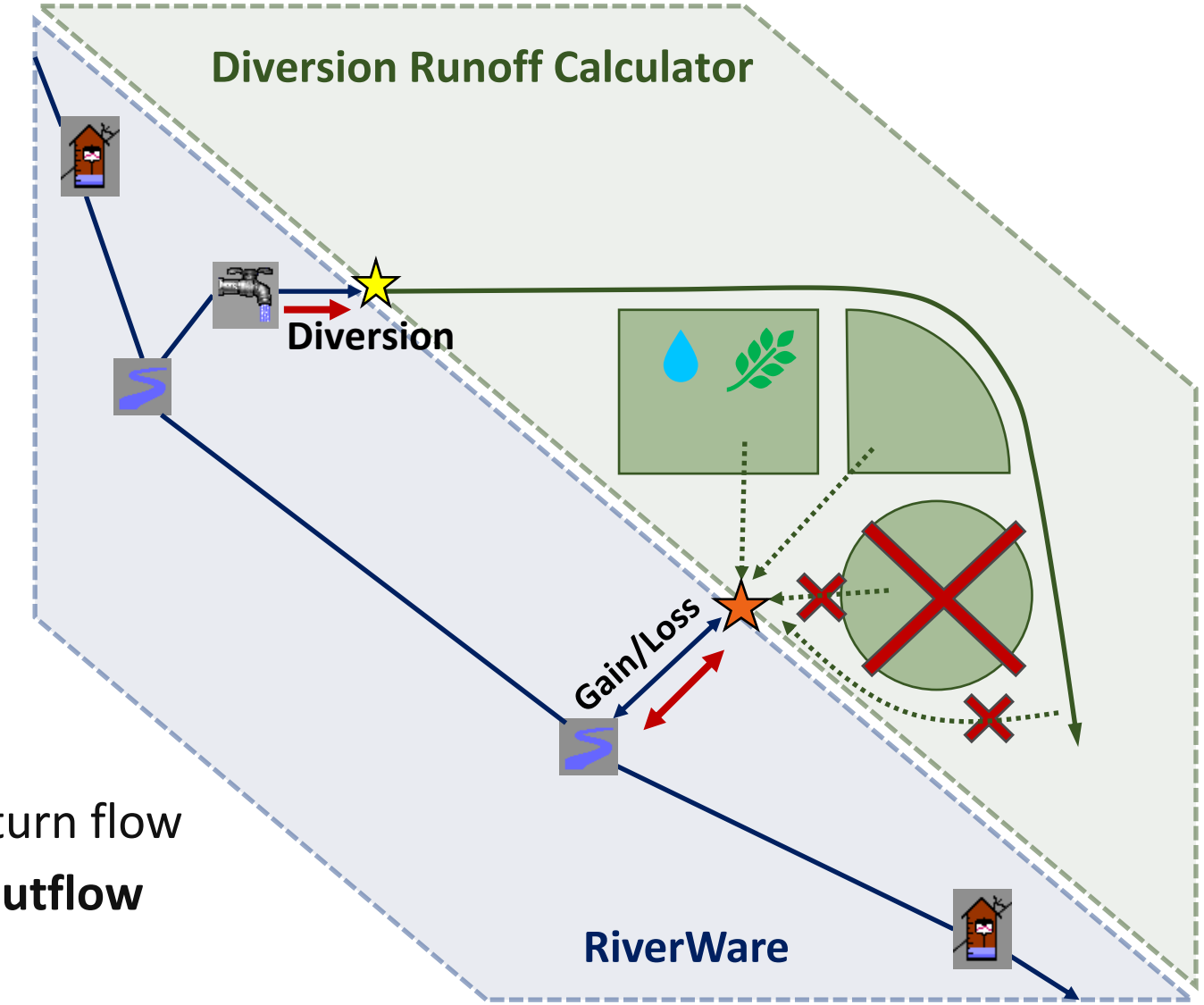
RW Gain/Loss – Return Flow Linkage



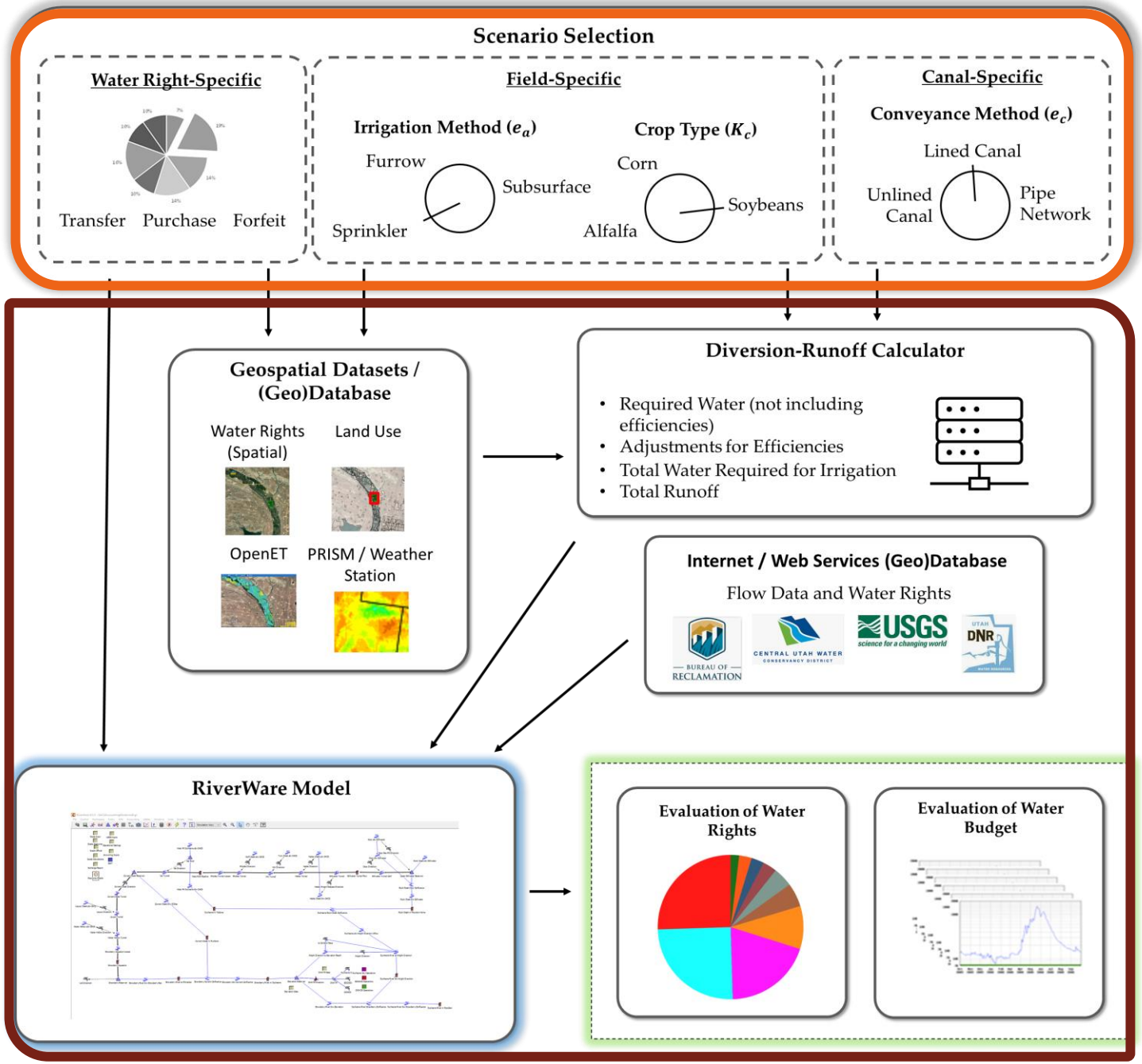
✓ **Characterize the current water budget and water rights within the basin**

UCRAF Application

- **Planning tool to assess the impact of drought mitigation measures**
  - Line canals
  - Fallow fields
  - Change irrigation methods
  - Change crop type
  - Change in diversion and return flow
  - **Estimate change in basin outflow**



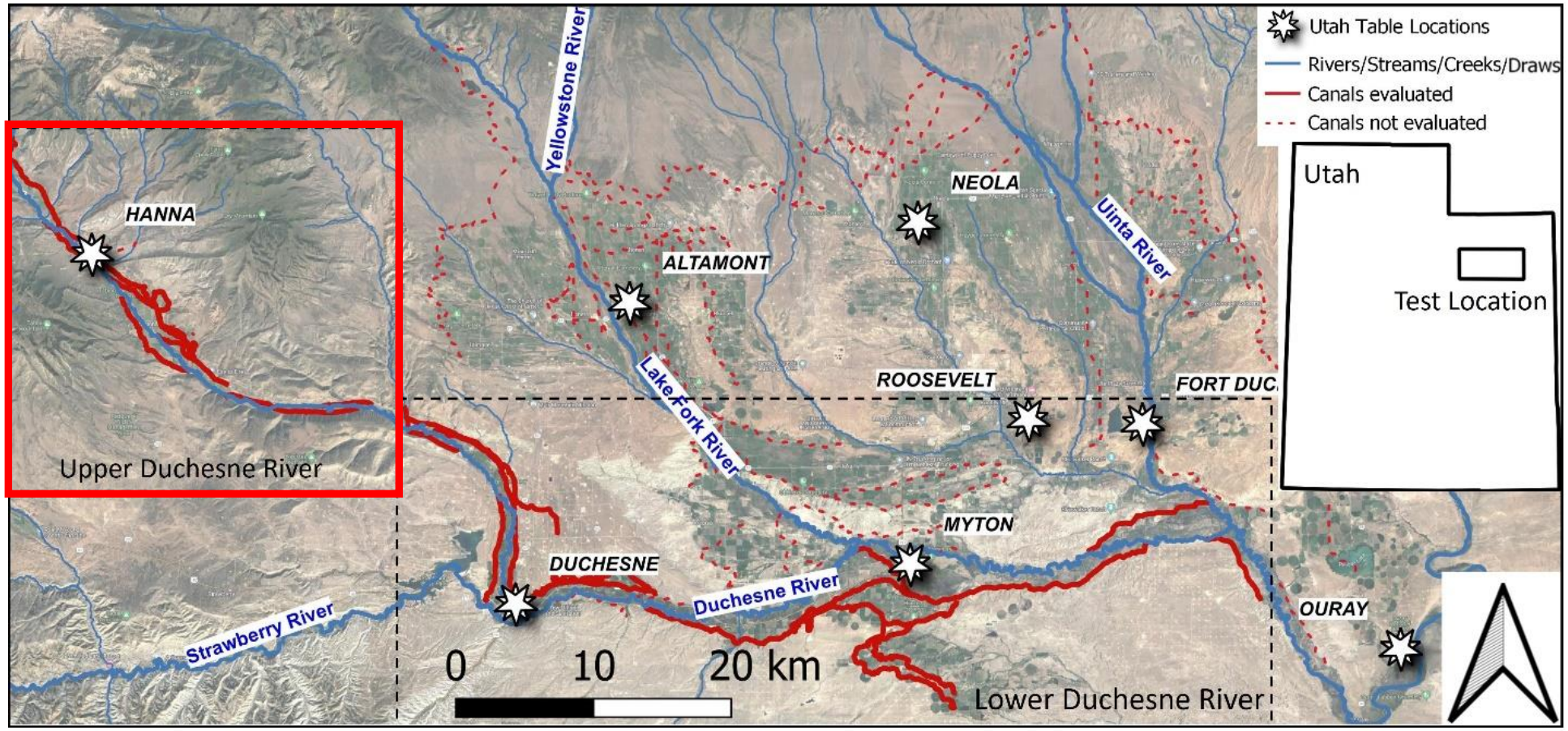
UCRAF Overview



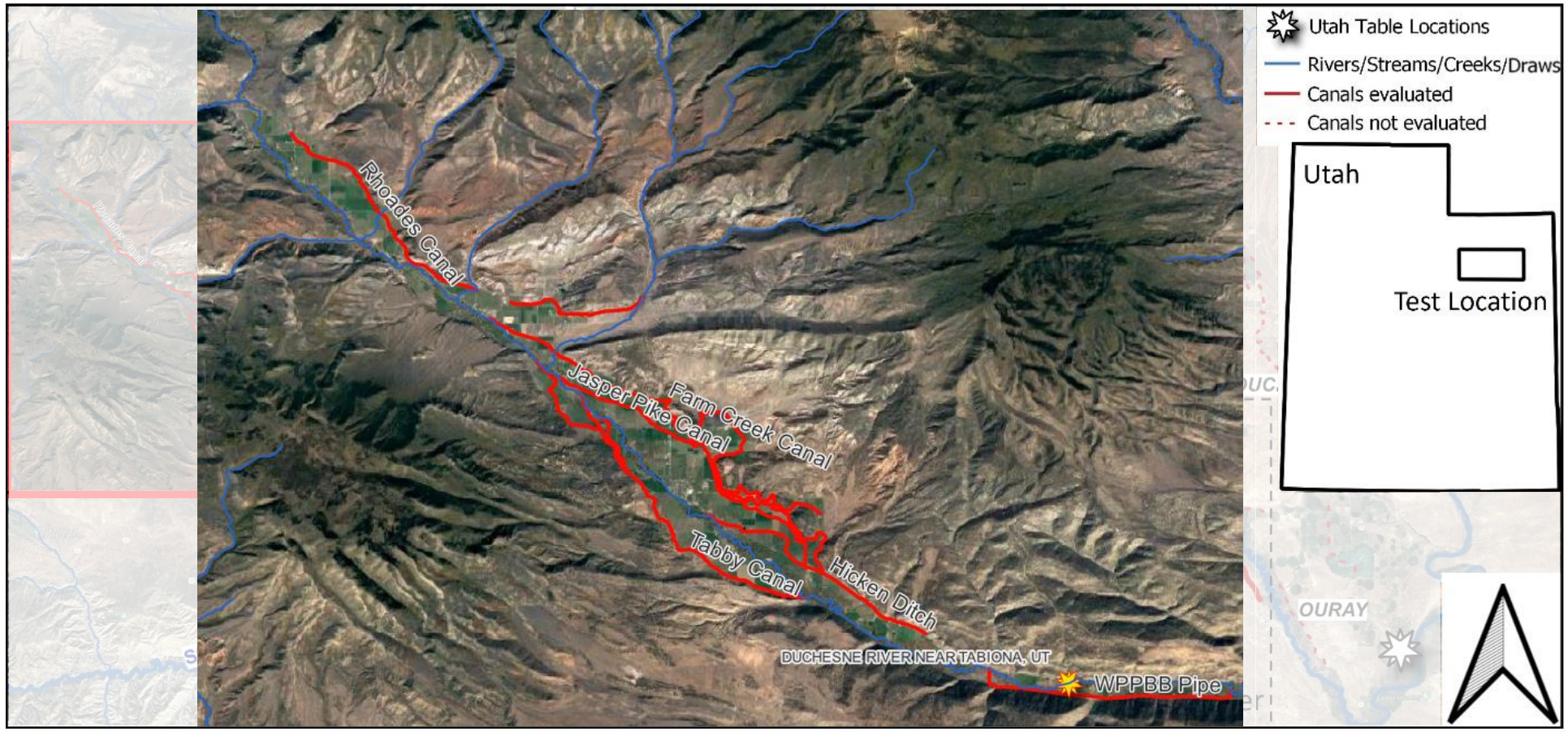
Decision Support

UCRAF Model

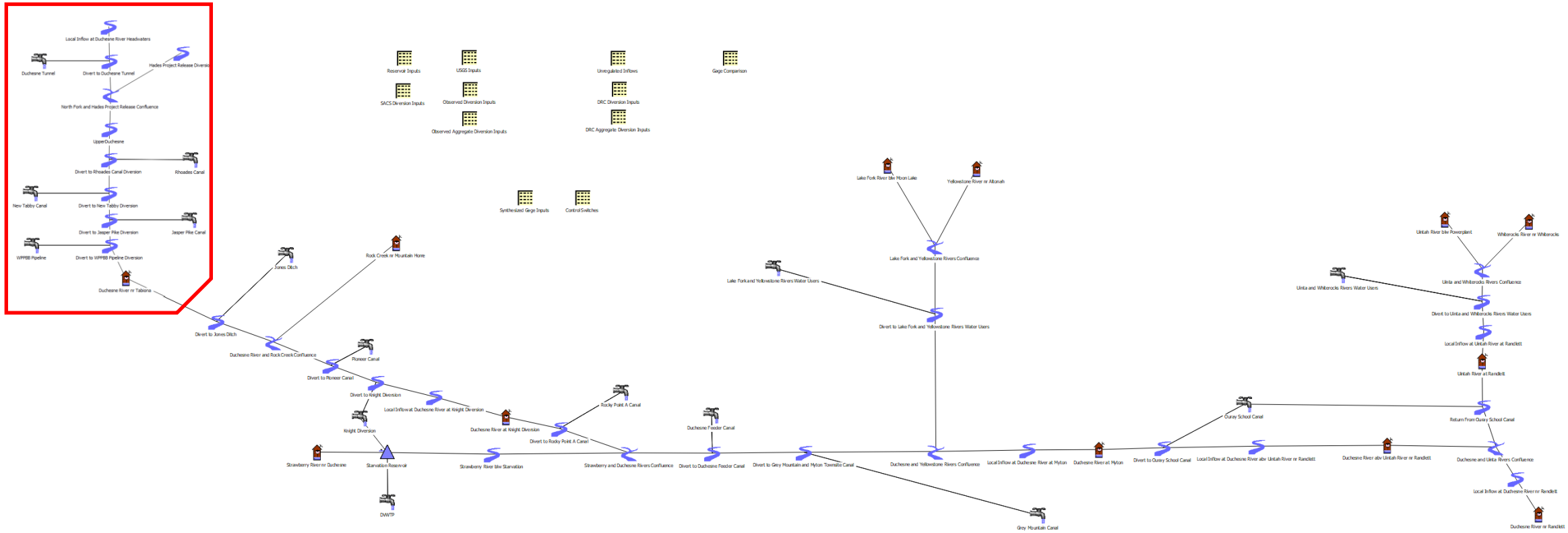
UCRAF Duchesne River Pilot



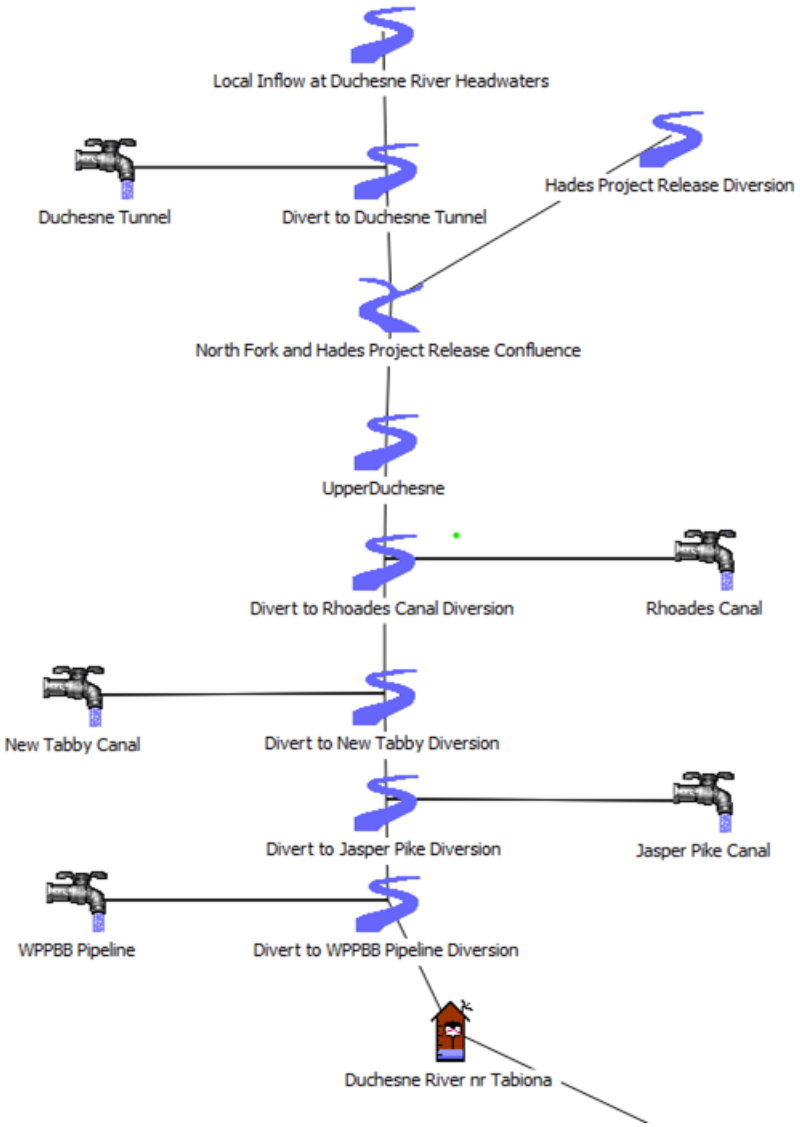
UCRAF Duchesne River Pilot



RiverWare Model



RiverWare is the computational hub of UCRAF



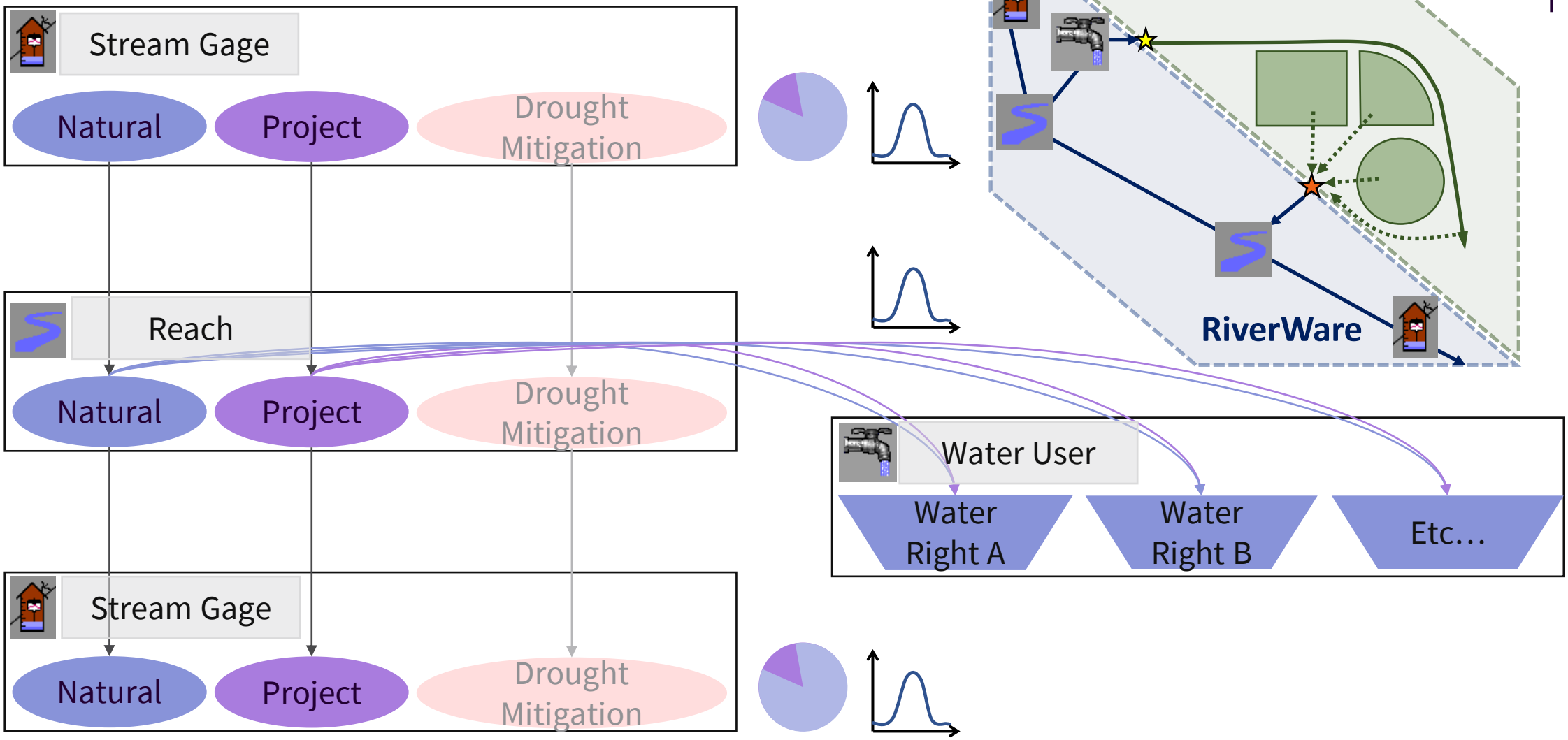
Computes basin-wide mass balance → Integration with geospatial datasets

RiverWare accounting framework → Enables shepherding via accounts

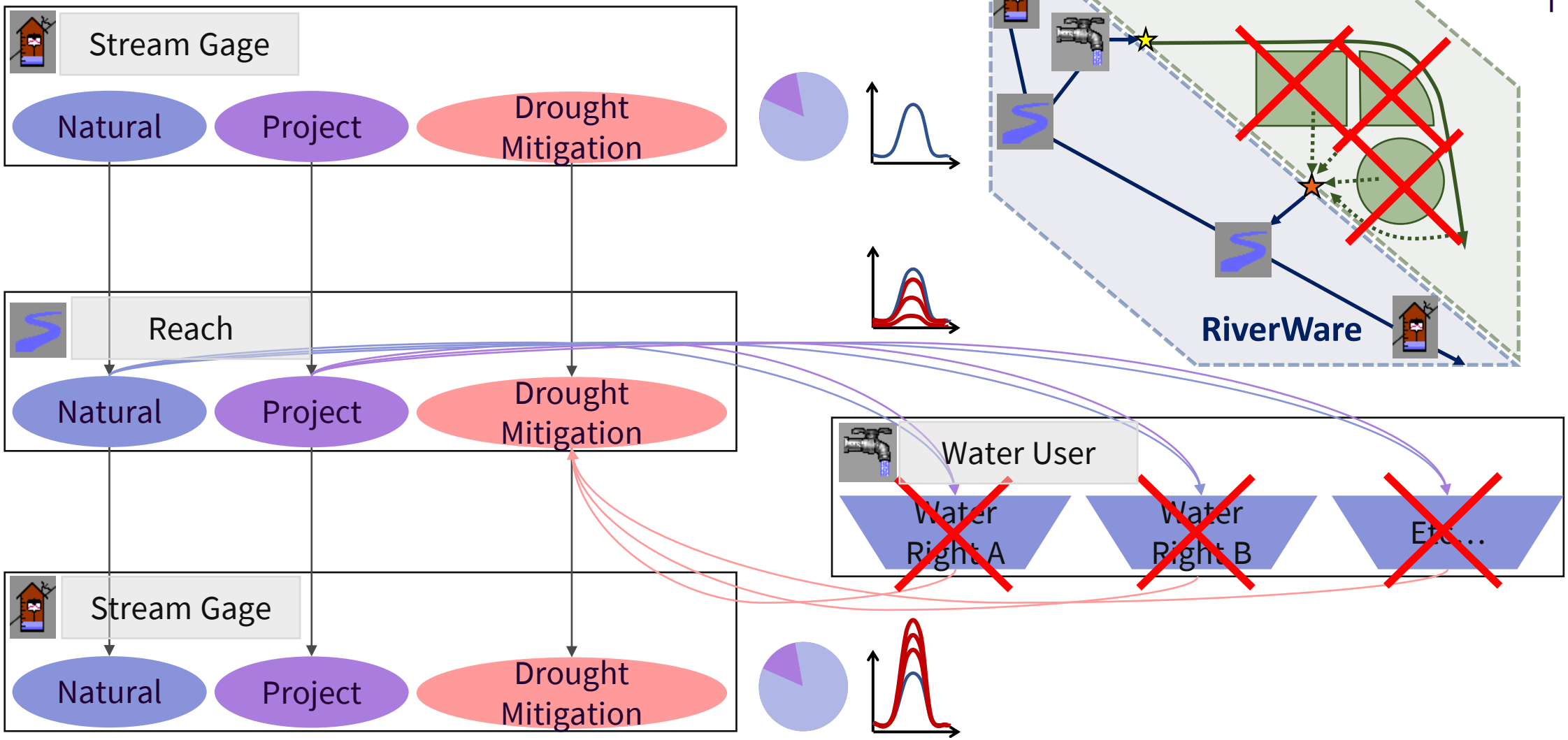
Water rights solver → Allocates water in priority

Facilitates estimated volume of conserved water

Water Rights, Accounting - Baseline



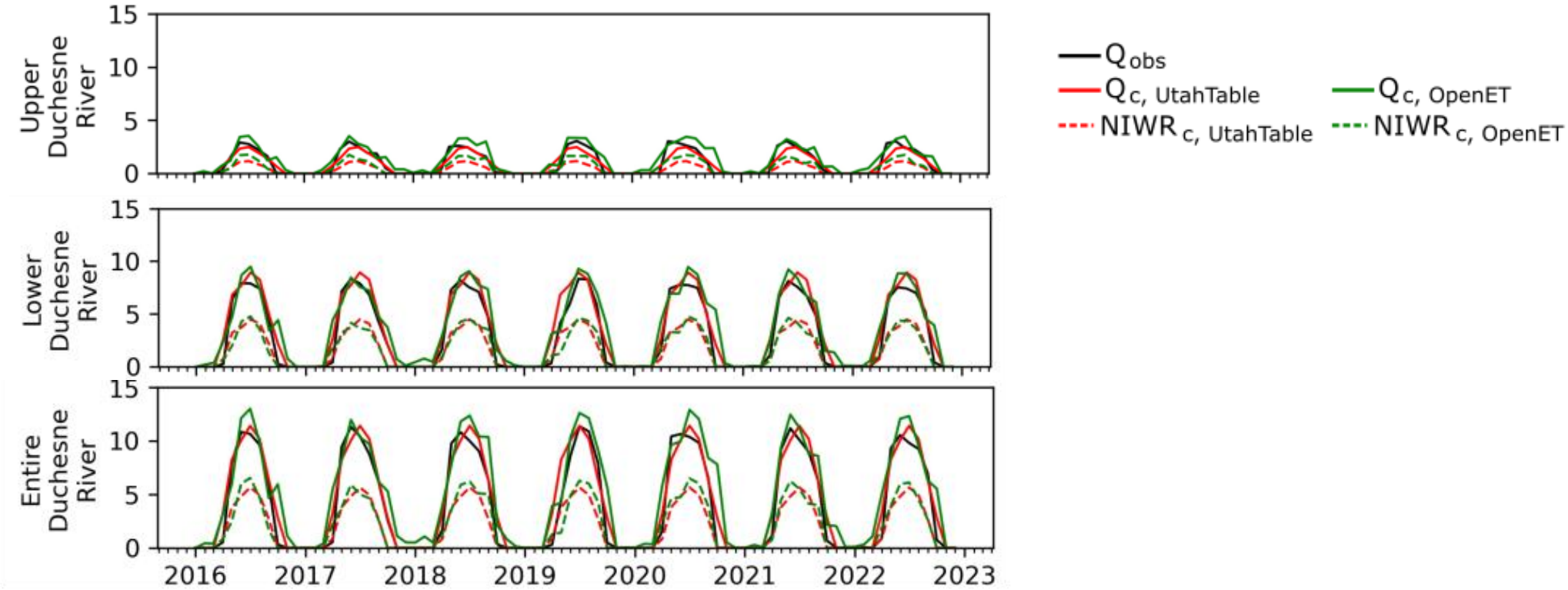
Water Rights, Accounting - Program



Preliminary Results – Diversion Runoff Calculator

Ongoing Work

Modeled Diversion | Simulated Baseline | Drought Mitigation Scenarios



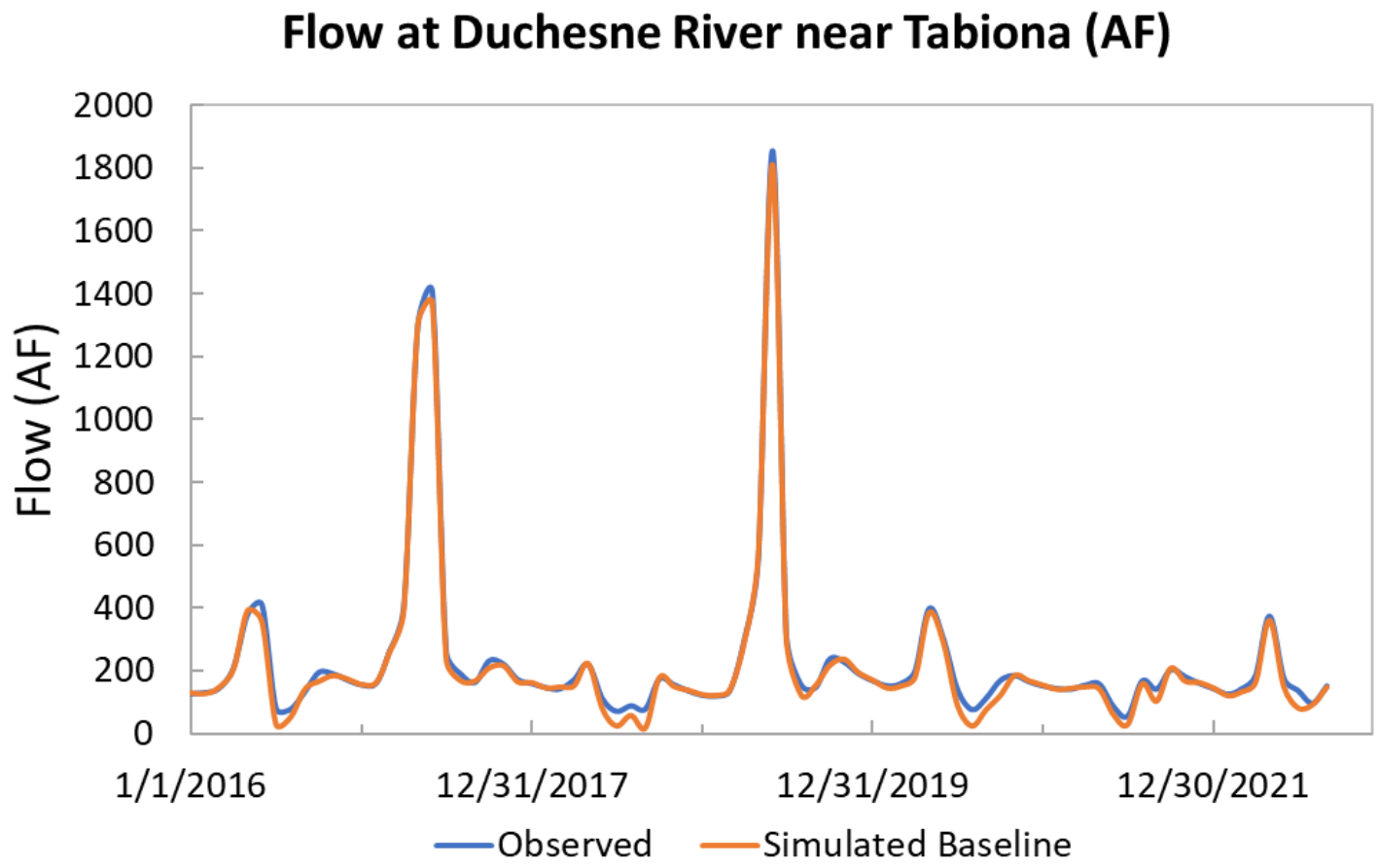
Follum, M., et al. (Submitted 2023) "Evaluating Agricultural Water Consumption, Water Diversion, and Efficiency of an Irrigation Network in Northeastern Utah". Available at SSRN: https://ssrn.com/abstract=4510862 or http://dx.doi.org/10.2139/ssrn.4510862.

Preliminary Results – RiverWare Model

Ongoing Work

Modeled Diversion | Simulated Baseline | Drought Mitigation Scenarios

OPENET



Lessons Learned

- Data Availability
  - Able to overcome data scarcity with novel thinking and collaboration
- Collaboration
  - Improves hydrologic characterization of basin
  - Required to successfully implement drought mitigation scenarios
  - Facilitate a smooth transition to other basins in Utah

Questions?

Betsy Morgan; *Colorado River Authority of Utah*
bdmorgan@utah.gov

Leland Dorchester; *Precision Water Resources Engineering*
Leland@precisionwre.com