COLORADO'S
Decision Support Systems
CWCB / DWR

Arkansas River Decision Support System (ArkDSS) Update

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Technical Lead:	Kelley Thompson, DWR
Colors of Water PM:	John Rodgers, DWR
Critical Staff:	DWR Division 2 Staff, OIT App Dev

ARCA Annual Meeting / Engineering Committee – December 12, 2024

ArkDSS Progress

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- Phase I:
  - GIS ✓ cdss.colorado.gov/gis-data/division-2-arkansas
  - Admin Tools ✓ div2waterops.com
  - Modeling cdss.colorado.gov/arkansas-river-dss
    - Evapotranspiration Dataset ✓
    - Surface Water Model **95% Complete**
    - Trinidad Project Scenario **Late 2025?**
- Phase II:
  - Colors of Water
    - Data Viewer ✓ **Deployed – diversion data and tool improvements**
    - Scenario Planner **Deployed – finalizing testing and documentation**
  - Groundwater Data Project **RFP in January 2025**

ArkDSS STATEMOD Model

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water right allocation / surface water planning model

- Done… model structure and input data are complete and the model runs
- Currently…. wrapping up model coding for basin-specific operations
  - Changes for Arkansas highlighted issues / broke models for other basins
  - Current work is to finalize model code that will work for all Colorado basins
    - Have had coder in from California to work in WWG office and may do again soon
- Then… finalize natural flow estimation and model calibration
  - Estimate "natural" flows by removing effects of diversions, RFs, reservoirs, etc
  - Compare simulated results from the model to measured data at streamflow gages, diversions, and reservoir contents
  - Calibrate primarily by adjusting return flows and operations
- Then… finalize documentation and baseline model/dataset
- Then… update full model through 2024
- Then… initiate Trinidad Project Scenario for 2015-2024 period
  - Well behind original schedule but should still be timely for 10-year review

ArkDSS Groundwater Project

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developing data and tools, not a new groundwater model

- **Scope of work ready and RFP issued in January 2025**
  - Upper and Lower basin alluvial aquifers and major bedrock aquifers
  - Tasks I and II: Compile existing data for physical parameters
    - Develop GIS based grids of geo., sat.thick, k, S, T and harmonic T
    - Map drain locations and conditions in lower aquifer
    - Collect and catalog KS v. CO hydrogeologic data and model files
    - Identify and fill data gaps, ~ 20 aquifer tests + ~ 20 monitor wells
    - Catalog futile call and hydraulic disconnect areas
    - Link hydrogeologic documents spatially
  - Task III: Link Administrative Documents Spatially
    - Map spatial boundaries of aug., administrative, decree, etc areas
    - Link to documents, decrees, wdids, etc

ArkDSS Colors of Water (COW) Tool

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Webtool to evaluate transit losses and display colors of all water in river and to design and evaluate reservoir releases and (eventually) exchanges

Transit Loss / Timing Model Engine

- Routing – Muskingum type
- Transit Loss - bank storage, evaporation, capture rules
- Network – nodes and reaches
- Livingston framework and routing/aquifer parameters
  - Using Livingston parameters rather than recalibrated

Hydrobase

- release, diversion, telemetry records
- model output
- Network locations
- web interactions

Web Tool

- Data Viewer
- Scenario Planner
- Conductor / Manager

ArkDSS Colors of Water Data Viewer

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Visual webtool to evaluate river and release transit losses and display colors of water in river – releases, native, and exchanges, at all primary nodes including in front of headgates

- **Data Viewer Webtool Deployed**
  - Currently missing current year release/diversion records
  - Just built connection to Pueblo and JMR DWR daily transaction (google sheet) worksheets
    - Will plug into webtool soon after ARCA if Div2 agrees
- **Bureau of Reclamation Water-Smart Grant wrapped up**

Colors of Water – Viewer

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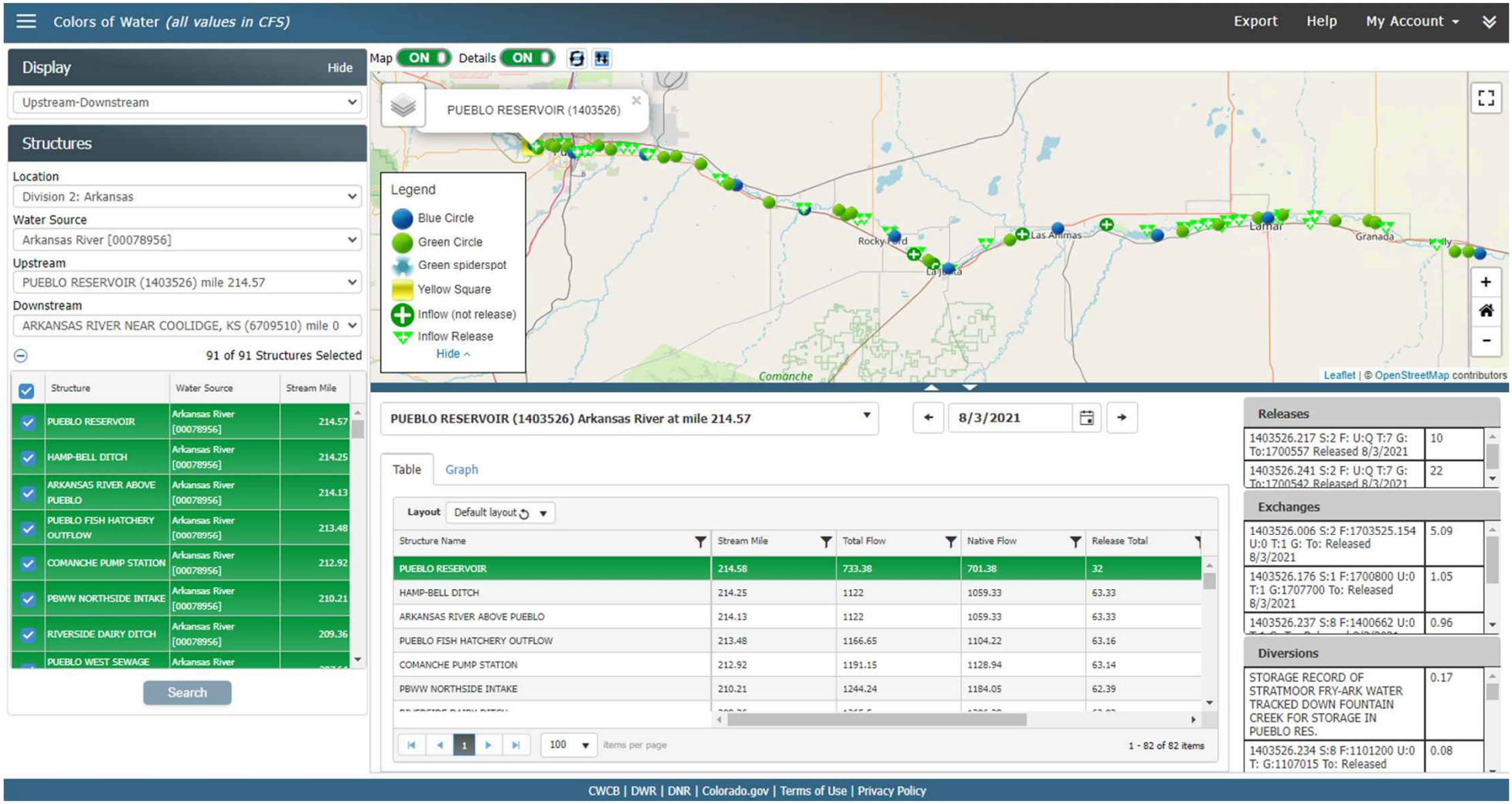

Colors of Water – Spatial View

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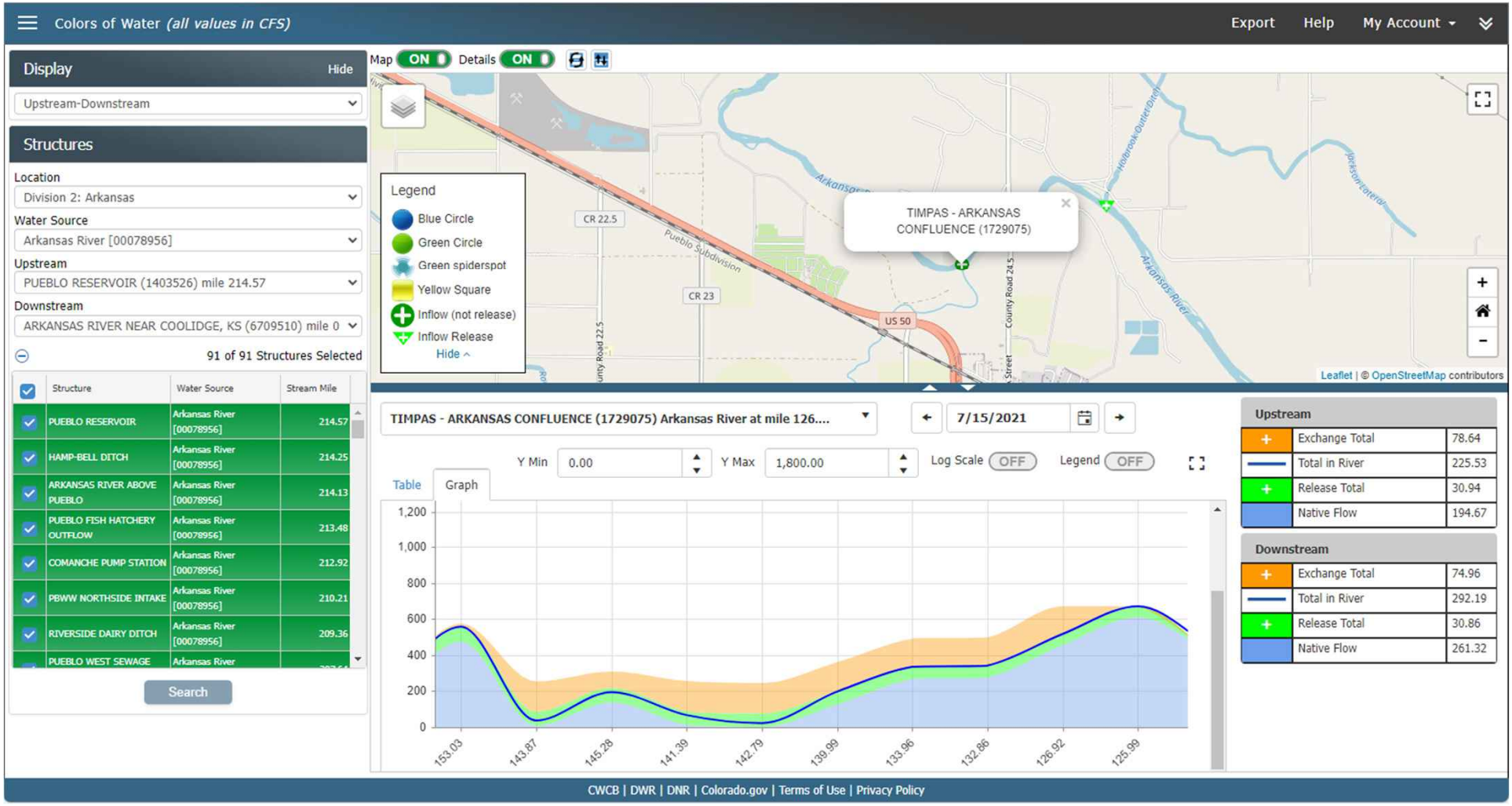

Colors of Water – Time Series View

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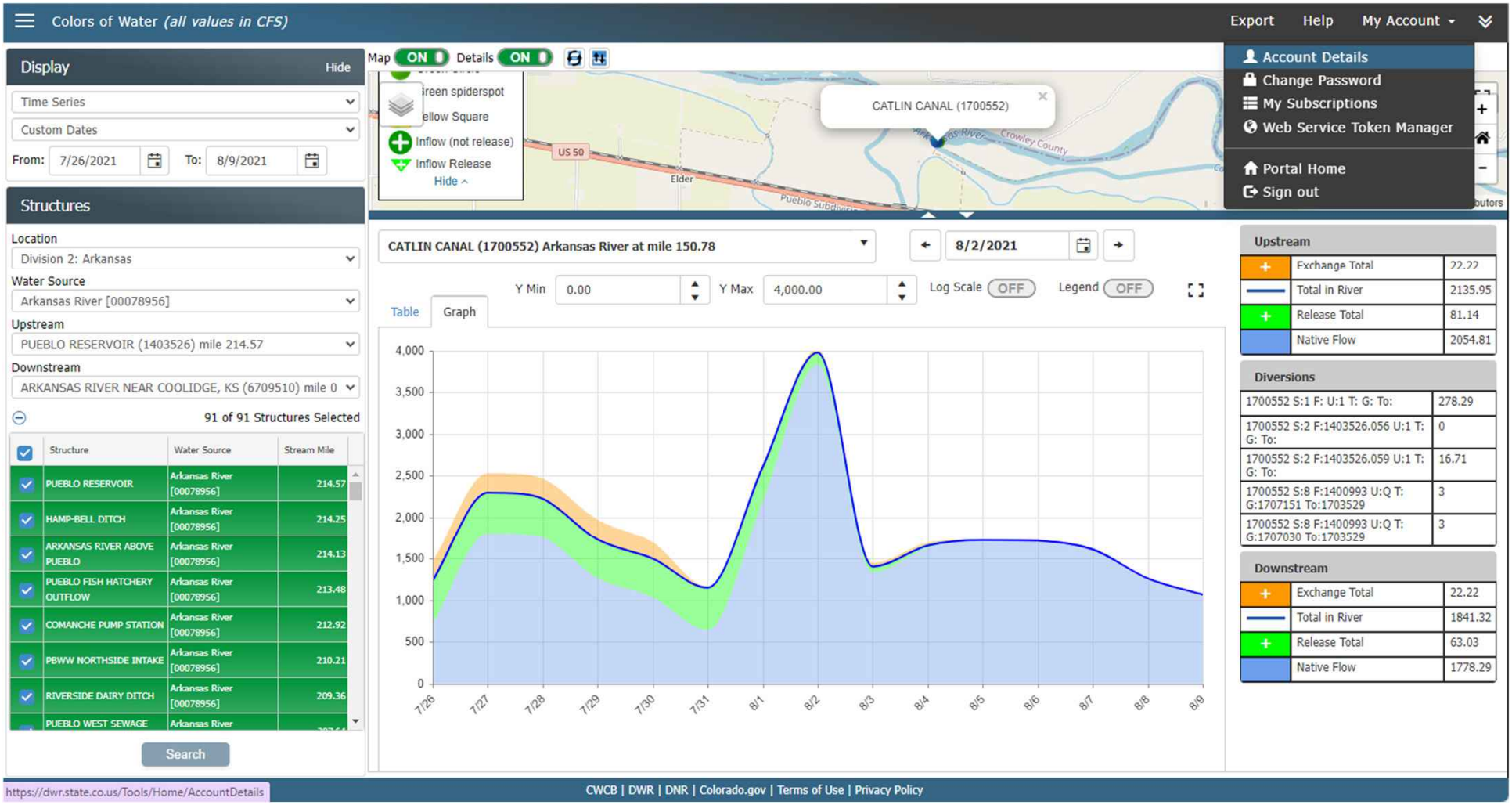

ArkDSS COW Scenario Planner

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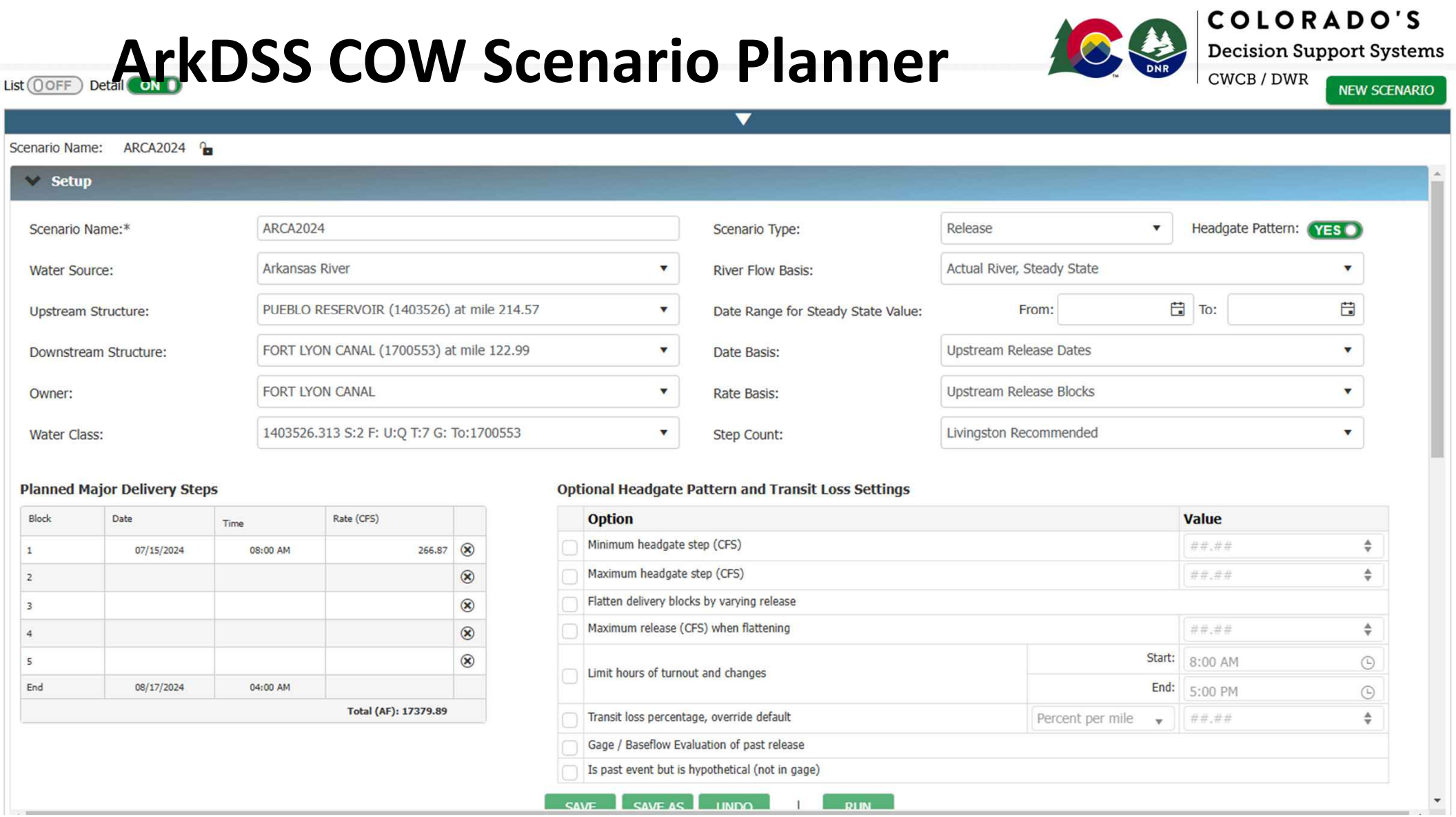
Webtool to estimate transit losses and design headgate diversion patterns for future reservoir releases or evaluate past releases

- **Used TL Livingston parameters rather than re-calibrated**
  - For both WD17 (Pueblo-JMR) and WD67 (JMR to stateline)
  - In WD17 testing, median TL difference with TLAP was +1.2%
- **3 step options – same TL but different headgate patterns**
  - Livingston recommended number of steps (using TLAP adaptive)
  - Specify number of equal steps (using TLAP adaptive)
  - Original COW method with variable "optimized" steps
- **Deployed and in final testing and documentation**
  - On public web server but only permissioned for CDWR
  - Anticipated for use for 2025 Water Year for Pueblo to JMR
  - Still hope to build out capability to design exchanges

ArkDSS COW Scenario Planner



ArkDSS COW Scenario Planner

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Results

Table | Graph

	Release	Delivery	Headgate	Evaporation	Unconsumed TL	Gage Eval
Totals (AF)	17379.89	16060.46	16060.46	625.54	693.88	N/A
Percent		Delivery TL	Potential TL	Gage Eval TL		
		7.59	7.59	N/A		

TL Rule: Cutoff at 10% of average release

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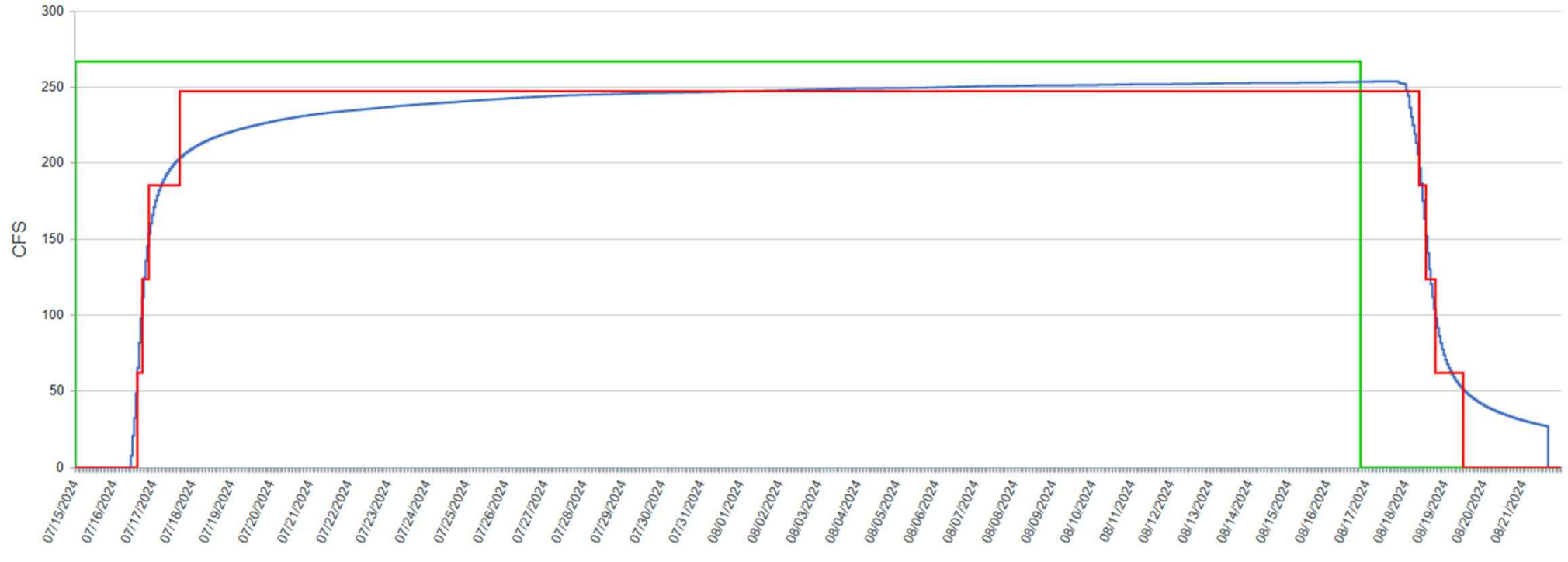

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Totals (AF)

Release	Delivery	Headgate	Evaporation	Unconsumed TL	Gage Eval
17379.89	16060.46	16060.46	625.54	693.88	N/A

Totals (%)

Delivery Transit Loss	Potential Transit Loss	Gage Eval Transit Loss
7.59	7.59	N/A

Infrequent

Structure	Type	Date	Amount (CFS)
PUEBLO RESERVOIR (1403526)	Release (CFS)	07/15/2024 07:00 AM	0.00
PUEBLO RESERVOIR (1403526)	Release (CFS)	07/15/2024 08:00 AM	266.87
PUEBLO RESERVOIR (1403526)	Release (CFS)	08/17/2024 03:00 AM	0.00
FORT LYON CANAL (1700553)	Headgate Intake(CFS)	07/16/2024 09:00 PM	0.00
FORT LYON CANAL (1700553)	Headgate Intake(CFS)	07/16/2024 10:00 PM	61.71
FORT LYON CANAL (1700553)	Headgate Intake(CFS)	07/17/2024 01:00 AM	123.42
FORT LYON CANAL (1700553)	Headgate Intake(CFS)	07/17/2024 05:00 AM	185.13
FORT LYON CANAL (1700553)	Headgate Intake(CFS)	07/18/2024 12:00 AM	246.85
FORT LYON CANAL (1700553)	Headgate Intake(CFS)	08/18/2024 04:00 PM	185.13
FORT LYON CANAL (1700553)	Headgate Intake(CFS)	08/18/2024 08:00 PM	123.42
FORT LYON CANAL (1700553)	Headgate Intake(CFS)	08/19/2024 02:00 AM	61.71
FORT LYON CANAL (1700553)	Headgate Intake(CFS)	08/19/2024 07:00 PM	0.00