Implementation of the Truckee River Operating Agreement with the RiverWare Modeling Platform

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Abstract: Implementation of the Truckee River Operating Agreement (TROA) in the Lahontan Basin prompted a transition from pre-TROA to TROA operation. The pre-TROA operations model codified policies and rules in a number of historical decrees and agreements; the TROA RiverWare operations model incorporates all past decrees and agreements and additional TROA policies. The TROA RiverWare operations model has been developed and used by the Federal Water Master's Office in collaboration with Reclamation and other stakeholders, with a toolset that enables flexibility of water exchanges and trades within the Truckee and Carson River Basins which TROA dictates.

With the aid of the RiverWare operations model, the Bureau of Reclamation's (BOR) Lahontan Basin Area Office (LBAO) is able to estimate, at the start of the growing season, the amount of water potentially available for use in the coming season. The water availability information is then presented to the stakeholders for their input. Based on this information, growers in the Newlands Project are able to formulate a planting and irrigation strategy for the season. Using the TROA RiverWare operations model, monthly adjustments to the available water for diversion are made with the ongoing water and weather forecasts. The RiverWare modeling platform was tested and proved to be a versatile tool for simulating complex water management policies and strategies.

1 The Study Area

The Truckee and Carson Rivers are two of the main rivers in western Nevada. Both rivers originate from the Sierra mountain range of California and flow eastward, as shown in Figure 1. The Truckee River is about 105 miles long, flows from the outlet of Lake Tahoe to its terminus at Pyramid Lake, and through the metropolitan areas of Reno-Sparks.

South of the Truckee River Basin, the Carson River stretches about 130 miles long, and flows to its terminus at Carson Lake. A map of the main facilities in the Truckee-Carson Basins is shown in Figure 1.

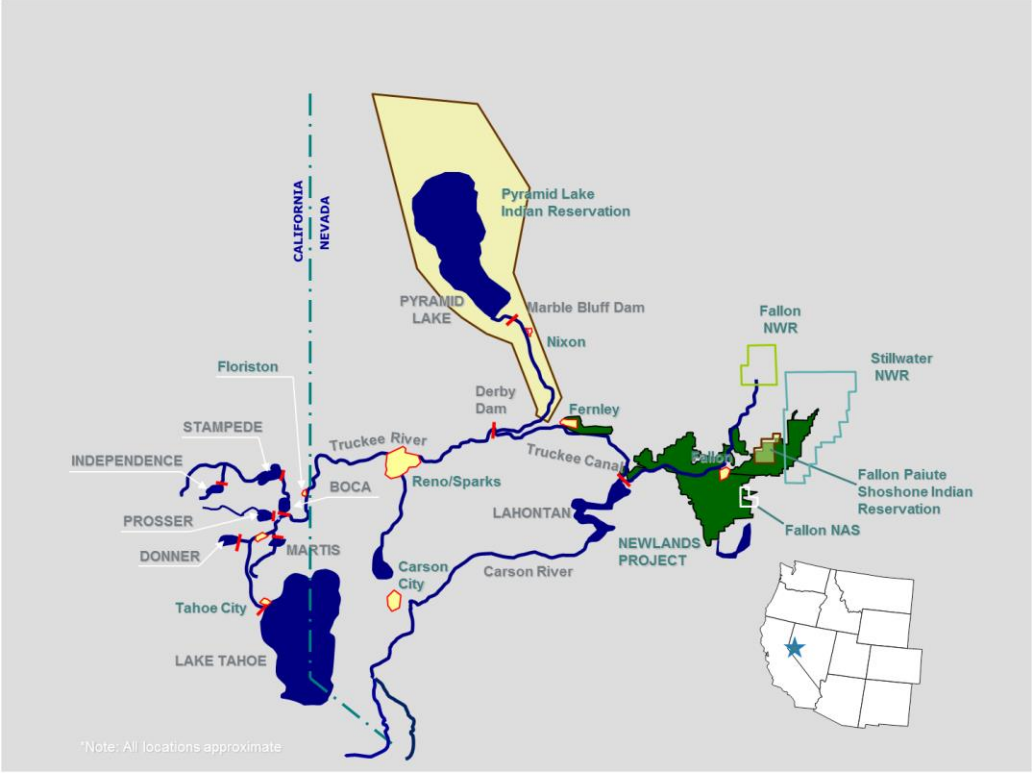


Figure 1 Physical locations and major facilities of the Truckee-Carson Basins.

2 RiverWare Overview

RiverWare is a policy-based reservoir and basin modeling system. Water rights, governmental regulations, informal agreements between stake holders, and conventional practices are examples of policy. Therefore, RiverWare is ideal for modeling river and reservoir operations for watersheds that are highly regulated. Projects using RiverWare as a modeling tool include Bureau of Reclamation projects in the Colorado River basin, Upper Rio Grande, Yakima River, and the Truckee-Carson River basins. RiverWare users also include numerous water utilities, private consultants, water management agencies, and academic research units.

RiverWare is an object-oriented modeling system. In RiverWare, all physical features are objects. The features include reservoirs, reaches, confluences, diversions, power generating facilities, and water users. These objects are linked

and arranged to visually mimic the layout of the basin. Engineering methods in the objects govern the simulation of water flow from upstream to downstream. Details about RiverWare can be found in the online RiverWare documentation through http://www.riverware.org/PDF/RiverWare/documentation/index.html.

3 The RiverWare TROA Operations Model

Simulated water policy include:

- General Electric Decree (1915)
- Truckee River Agreement (1935)
- Orr Ditch Decree (1944)
- Donner Lake Agreement (1943)
- Tahoe-Prosser Exchange (1959)
- Interim Storage Agreement (1994)
- Adjusted OCAP - Operating Criteria and Procedure (1997)
- New Operating Policy: TROA
    - Negotiated pursuant to PL 101-618 (1990)
    - Partially implemented on December 1, 2015
    - Full implementation - coming soon
- TROA Builds on current Truckee River Agreement policy
    - Adds operational flexibility
        - Users may hold back their water as “credit water”
        - Allows for system of exchanges between reservoirs

Operation:

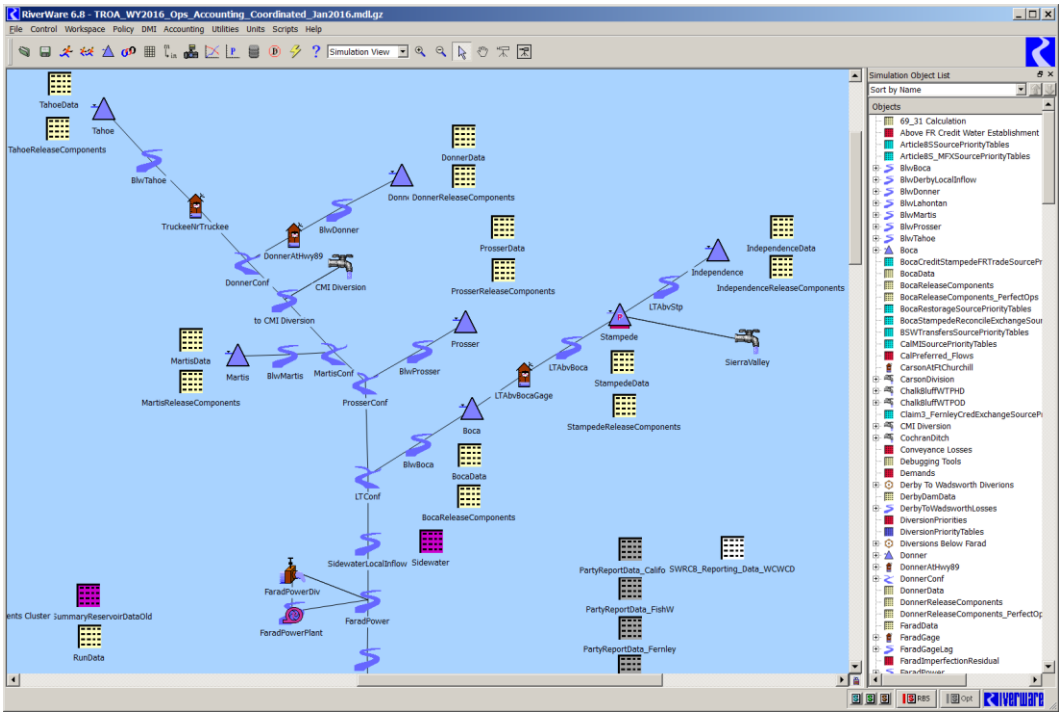
- Day-to-day Operations and Look Ahead
- Short-term Model - 15 months hydrology
- Operational forecasts for stakeholders since 2004
- Inflow – Current Gage and Forecasted

Model Use:

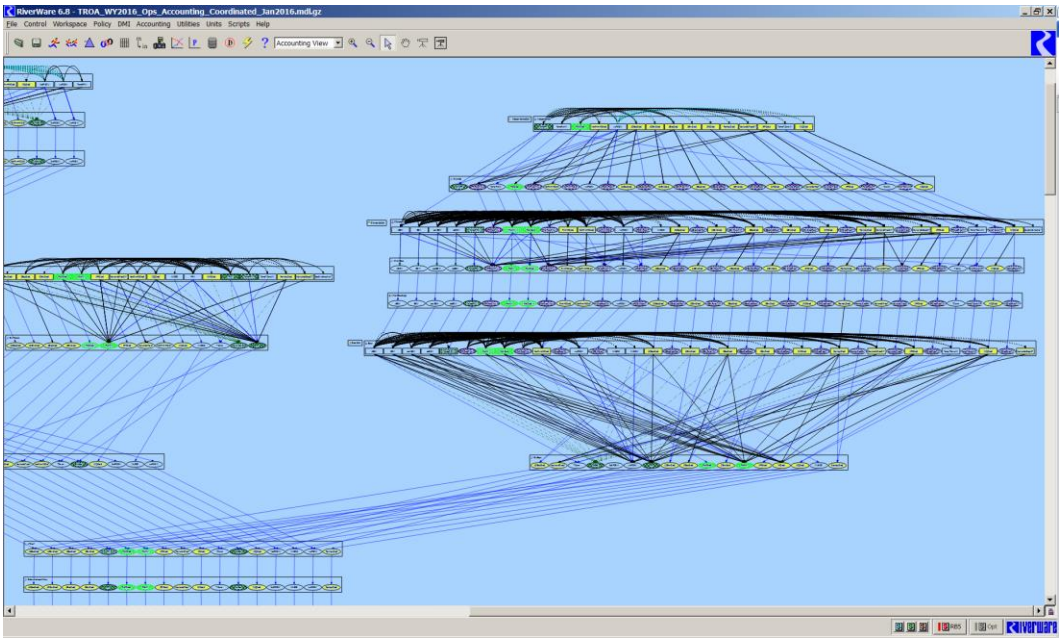
- Water Master - Daily operations and TROA Scheduling Committee
- Reclamation - Truckee Canal Diversion operations & Lahontan Flood operations

Forecasts:

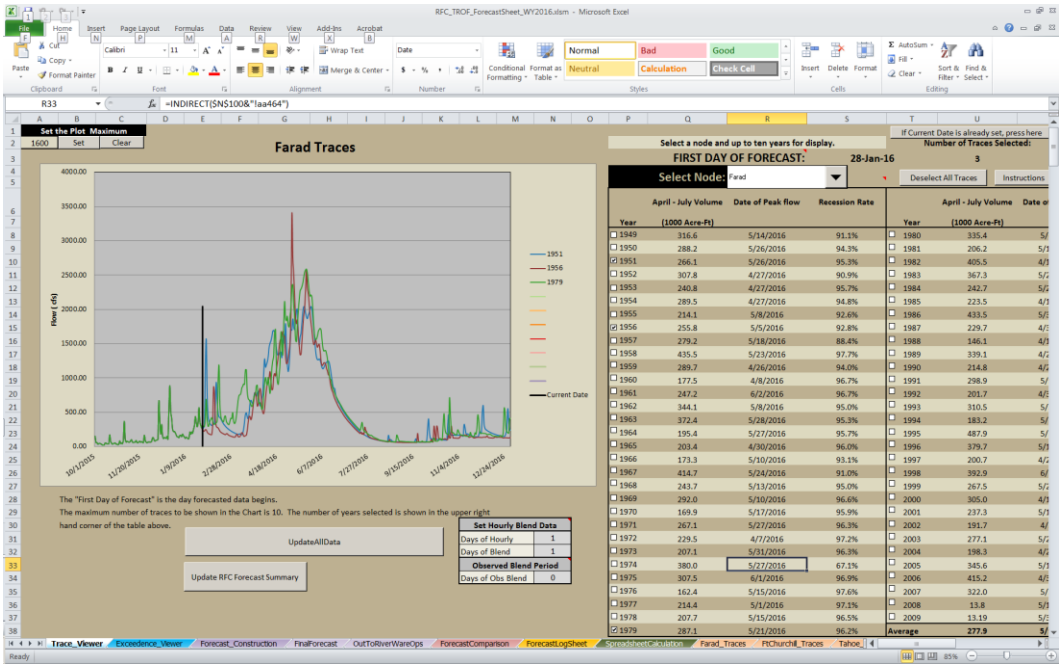
- NRCS/RFC April-July runoff volume forecasts for 3 basins:
    - Tahoe, Truckee, and Carson.
- Forecasts are given as probability of exceedance:
    - 10 percent, 30 percent, 50 percent, 70 percent, and 90 percent
- Obtain inflow hydrograph patterns - volumes are matched to historically similar years
- Disaggregate hydrographs to several basin locations
- Model is run for each exceedance value



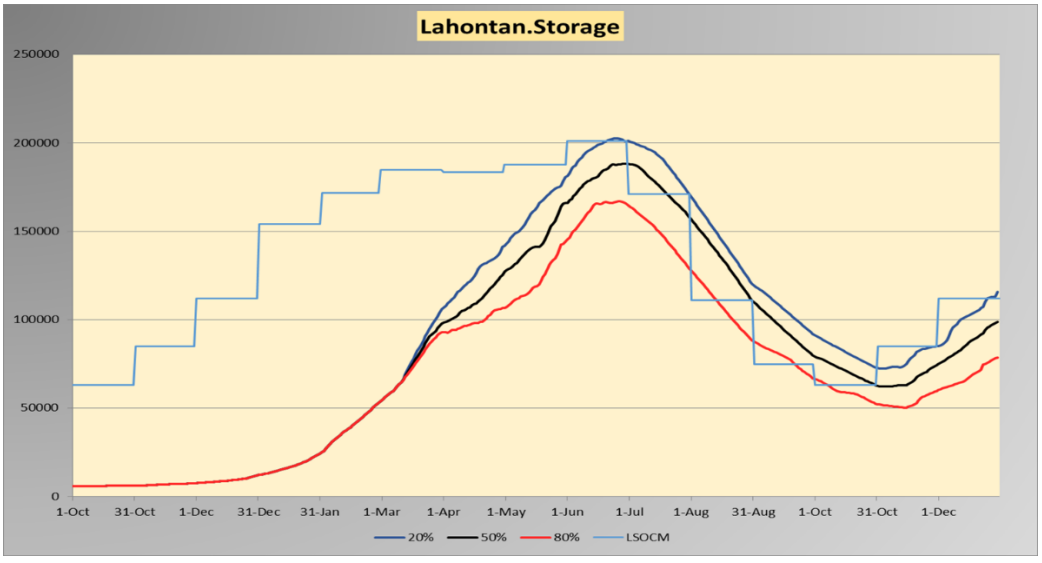
Screen shot of the simulation view of TROA Operations Model.



Screen shot of the accounting view of the TROA Operations model.



Screen shot of the Trace Viewer of the ESP Forecast Spreadsheet tool.



Water Year 2016 projected preliminary Lahontan storages.

4 Conclusion

TROA created great complexities in the daily river and reservoir operations in the Truckee-Carson system. However, the Federal and local stakeholders acted promptly to adopt the RiverWare modeling platform to meet the challenge. Thanks to this decision, the transition from pre-TROA to TROA operations went smoothly.