

AUTOMATED RIVER SYSTEMS ACCOUNTING USING MODSIM

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Abstract The Rogue Accounting Tool (RAT) automates river systems accounting for water managers using a network connection to data source web sites and the functionality available in Microsoft .NET and MODSIM.

INTRODUCTION

River systems accounting quantifies the distribution of water by water rights priority dates, Federal storage contracts, private storage space, instream flow requirements, legal agreements, and traditional operations. Accounting procedures can be complex, and different states, Federal Projects, and basins may apply different rules for claiming return flows, sharing the consequences of flood releases, accruing additional water to storage after a reservoir fills, protecting storage releases as the water advances downstream, formal and informal exchanges of water, and much more. The network flow model MODSIM (2005) simulates the physical distribution of water while simultaneously performing complex water rights accounting. MODSIM is flexible and allows the modeler to easily describe water rights accounting procedures without writing scripts or rules.

The application of MODSIM presented here is new in several ways. First, the authors use MODSIM for after-the-fact accounting applied to recently observed (measured) basin data. Second, the authors introduce an interface to simplify the steps involved in downloading data, calculating unregulated flows, and populating the MODSIM input data files. The final product, the Rogue Accounting Tool (RAT), can be used by non-modelers such as water masters and irrigation district managers. Although RAT can update the accounting at any time, managers will likely perform daily or weekly updates.

THE RAT INTERFACE

RAT has a simple interface. The user first selects “Tools/Download Data” from the toolbar to update observed average daily river discharges, diversions, transbasin imports, drains, and end-of-day storage values from a web data source(s). The user can click on one or more selections in the selection tree to view the data, which are displayed either graphically (see Figure 1) or in time series tables (see Figure 2). The user can edit the data in the time series tables. The user then chooses “Tools/Run” from the toolbar to perform the accounting. The user can also generate accounting reports for individual or combined natural flow water rights and storage contracts using the selection tree. In the figures below, the selection tree is on the left hand side of the RAT window and the selected values are displayed in table format (Figure 1) or graphically (Figure 2) on the right hand side.

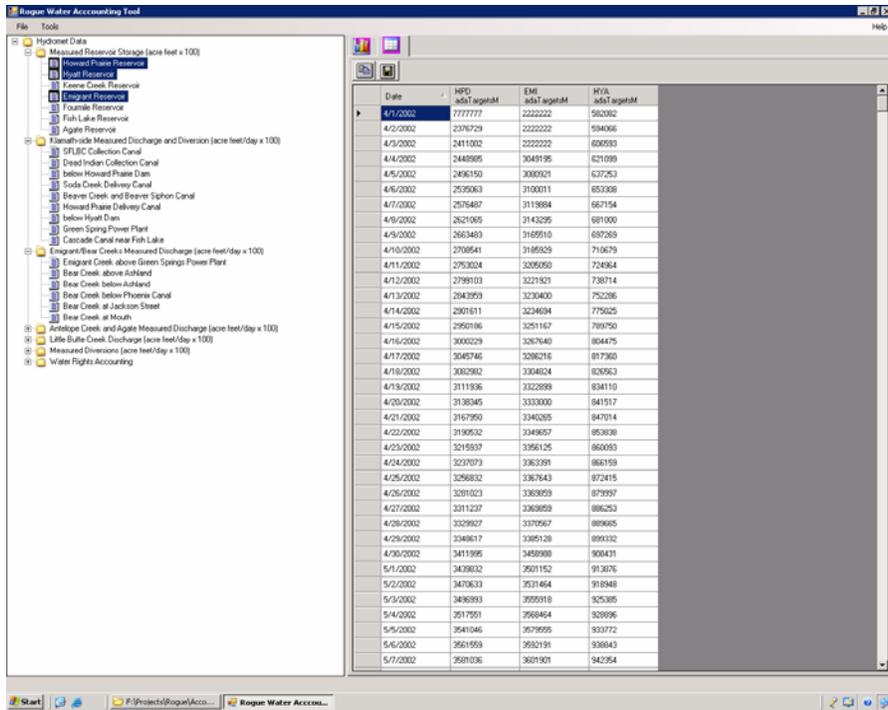


Figure 1 Table time series view of data downloaded from the web source. The user has selected end-of-day contents for three reservoirs in the selection tree and the tab for table data has been selected. The same data could be shown graphically by selecting the graph tab.

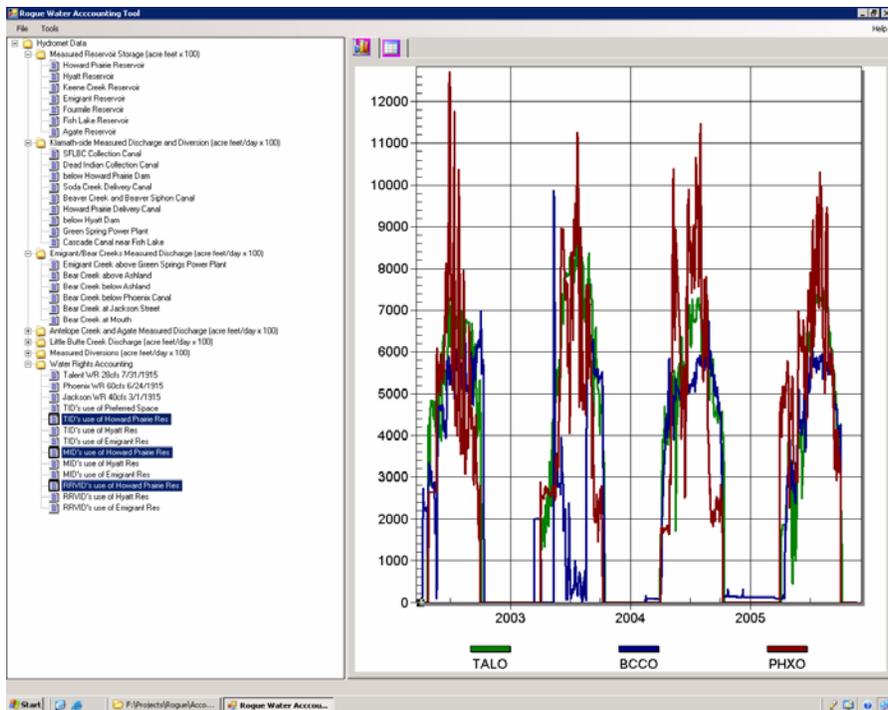


Figure 2 Graphic time series view of accounting results. The user has selected the use of Project stored flows for three different space holders in the selection tree and the tab for graph data has been selected. The same data could be shown in a table or report by selecting the table tab.

RAT APPLIED TO THE ROGUE RIVER PROJECT

RAT can be applicable to any river basin as long as most of the necessary data are available from a web source(s) and MODSIM models (following specific naming conventions) have been developed. A single input file to RAT, controls the linkage between the web data and the MODSIM models. RAT is written in C#, which takes advantage of the available .NET libraries for graphs and tables and the .NET-compatible MODSIM libraries. RAT and MODSIM are freely distributed. RAT's only software requirements are any Microsoft Windows operating system and network access.

RAT is currently being tested for use by the water master and irrigation districts for Reclamation's Rogue River Basin Project. The Rogue River Basin Project includes 3 irrigation districts, about 20 natural flow water rights, 3 Federal (Project) reservoirs, 1 Federal re-regulating reservoir, more than one accrual right for each Federal reservoir, 2 private reservoirs, transbasin imports, and 10 major diversion locations. Most of the Project data are downloaded from Reclamation's Hydromet web site; other data are downloaded from the Oregon Water Resources Department web site.

THE RAT APPROACH

Accounting in RAT is accomplished with the following automated steps:

The user selects "Tools/Download Data" from the toolbar to initiate steps 1 and 2.

- 1) Provisional data for observed average daily river discharges, diversions, transbasin imports, drains and end-of-day storage values are downloaded from the data source web site(s).
- 2) Editing and graphing tools are provided in the RAT interface to evaluate and correct the provisional data before it is appended to the MODSIM unregulation model input file (unreg.xy).

The appended and edited inputs can be saved when the user selects File/Save from the toolbar. The user selects "Tools/Run" to initiate steps 3 through 5.

- 3) System gains and losses are calculated by running the MODSIM unregulation model. This is called the unregulation step.
- 4) The calculated gains and losses from the unregulation step are incorporated in the MODSIM regulation model input file (reg.xy).
- 5) Accounting is performed by the MODSIM regulation model using the regulation input file (reg.xy). This is called the accounting step.

The user views account reports as time series tables or graphs by clicking on selections in the selection tree.

REFERENCES

Labadie, John (2005). MODSIM-DSS, <http://modsim.engr.colostate.edu/>