Aquarius

Description	A computer model depicting the temporal and spatial allocation of water flows among competing traditional and nontraditional water uses in a river basin. The model focuses on optimization of a nonlinear system, where supplies and requested demands are prescribed on the system. Water resource systems are described in a node-link architecture, with river reaches, reservoirs, lakes, and demand objects describing the system. A drag and drop user interface helps define the system layout, which is then translated into a quadratic objective function with linear constraints.
Appropriate Use	Determining economically efficient water destination strategies. Can be used in a full deterministic optimization mode, for general planning purposes, or in a quasi-simulation mode, with restricted foresight capabilities. Supports the following water uses (system components) storage reservoir, hydropower plants, agricultural water use, municipal and industrial water use, instream recreation water use, reservoir recreation use, and instre am flow protection. For a water use with a predetermined level of allocation but without a defined economic demand function, the analyst can either constrain the model to meet the specified allocation or experiment with surrogate demand curves until the required level of water allocation is reached. The latter approach indicates the level of economic subsidy required to provide the incremental increases of flow to sustain the use in open competition with other uses. The interactive nature of Aquarius facilitates such experimentation.
Scope	All locations; surface and groundwater systems; cost-effectiveness; national or site-specific.
Key Output	Economically efficient allocations that meet prescribed demands.
Key Input	The model's input data have been divided into physical and economic data. The physical data include the information associated with the dimensions and operational characteristics of the system components, such as maximum reservoir capacity, percent of return flow from an offstream demand area, and powerplant efficiency. The economic data consist mainly of the demand functions of the various water uses competing for water.
Ease of Use	Fairly easy to use. Straightforward user interface with limited modeling scope makes model setup time relatively short.
Training Required	Minimal training required. Requires knowledge of some optimization theory.
Training Available	Questions regarding software availability and training can be directed to Gustavo E. Diaz (see below).
Computer Requirements	PC Windows 95, 98, NT, or Windows 2000 operating system.
Documentation	Model documentation is available on line at http://www.fs.fed.us/rm/value/docs/aquadoc01.pdf.
Applications	Authors not aware of existing applications in developing countries.
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Aquarius (cont.)

Cost	Model documentation and software is free for government agencies and for teaching and research purposes.
References	Diaz, G.E., T.C. Brown, and O. Sveinsson. 2000. *Aquarius: A Modeling System for River Basin Water Allocation*. General Technical Report RM-GTR-299-revised. U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.