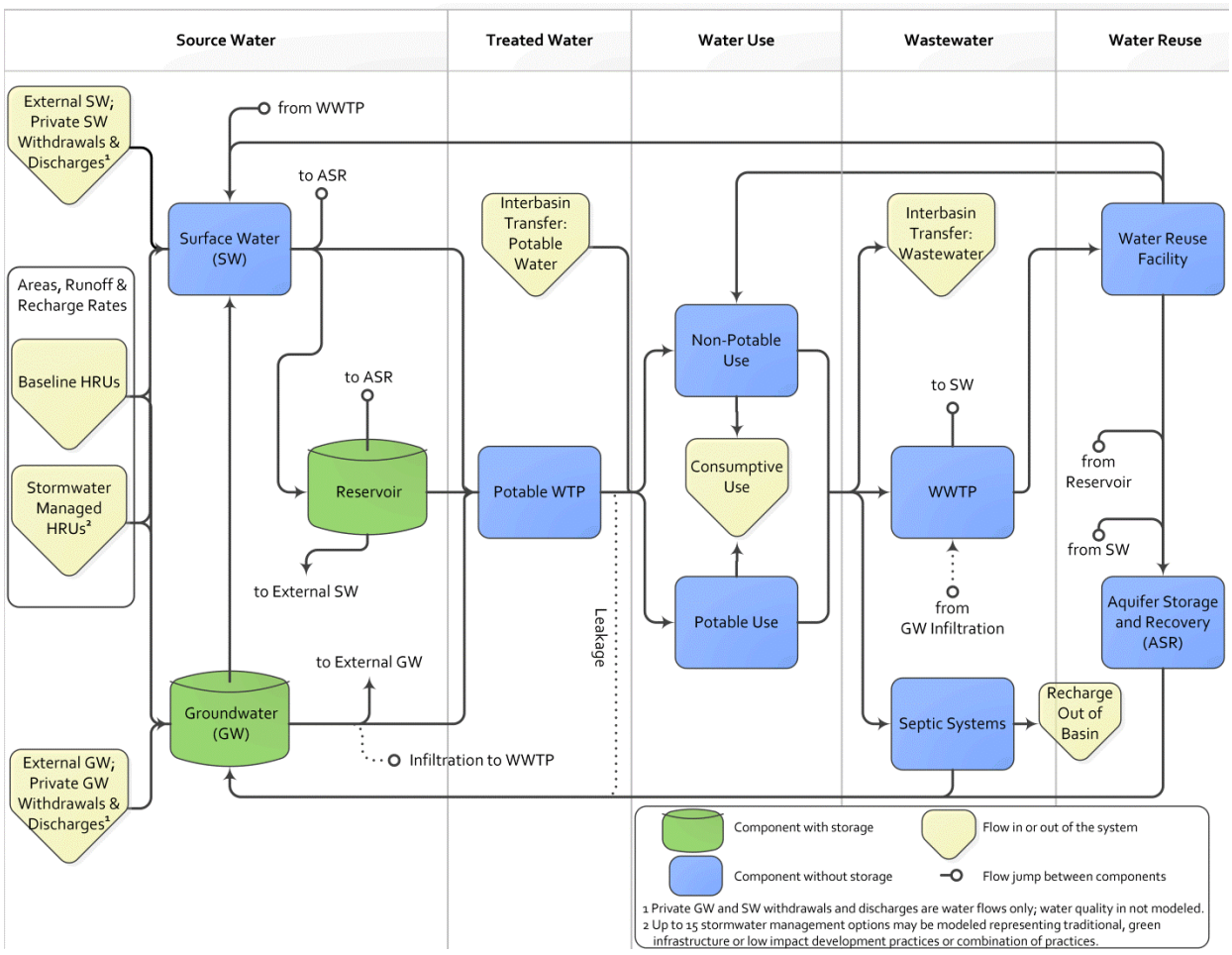
Watershed Management Optimization Support Tool

Purpose

The Watershed Management Optimization Support Tool (WMOST) is a U.S. Environmental Protection Agency, public-domain software application designed to facilitate integrated water resources management across wet and dry climate regimes. The tool allows water resources managers and planners to screen a wide range of practices for cost-effectiveness in achieving watershed or water utilities management goals such as meeting projected water demand, minimum in-stream flow targets, and reducing flooding. WMOST optimizes within a watershed system context accounting for the direct and indirect cost and performance of each practice (Figure 1).

WMOST can be used to (1) identify the most cost-effective mix of management practices to meet projected human demand and in-stream flow standards, (2) understand trade-offs between meeting management goals and total annual costs, (3) characterize the sensitivity of the solution to input data and parameters (e.g., effects of climate variability and resulting changes in runoff and recharge rates on the mix of least-cost practices, the robustness of the recommended mix of practices to a range of cost assumptions). Cost savings associated with reducing probability of flooding damage are incorporated using outputs of FEMA's HAZUS tool using publically available data from Flood Insurance Studies.

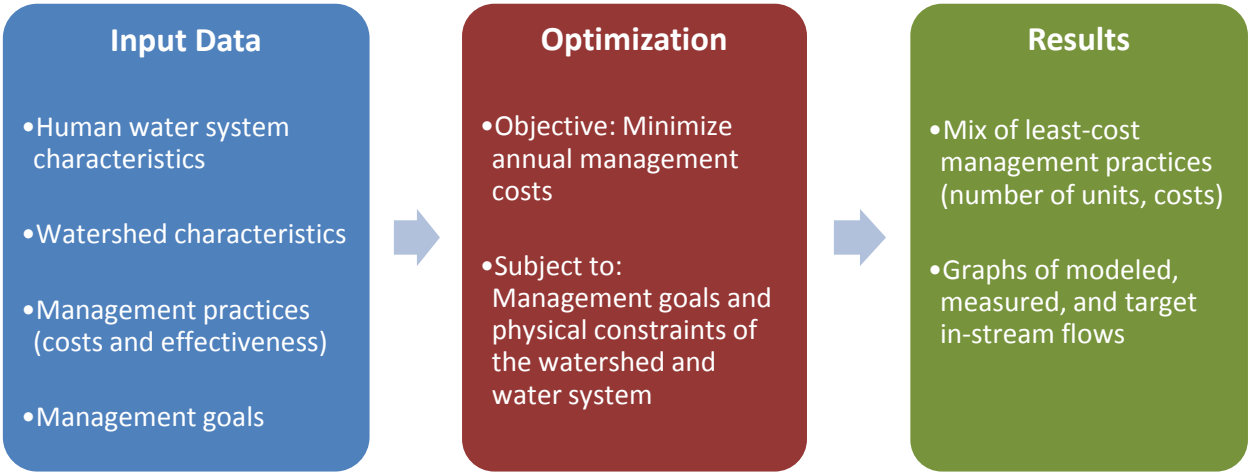
Figure 1. Watershed and Human Water System Components Represented in WMOST



Process

WMOST calculates the optimal solution based on user inputs of watershed characteristics, human water system characteristics, management practices, and management goals (Figure 2).

Figure 2. WMOST Modeling Process



Features

- Implementation in Microsoft Excel 2010© which is linked seamlessly with a free, linear programming (LP) optimization solver, eliminating the need for specialized software;
- Availability of over twenty potential management practices and goals related to water supply (demand management practices, surface and groundwater pumping, surface water storage, water treatment plant, potable (drinking) water distribution system leak repair), wastewater (septic systems, wastewater treatment plant, infiltration repair in wastewater collection system), nonpotable water reuse (wastewater reuse facility, nonpotable distribution system), aquifer storage and recharge, transfer of water and wastewater between drainage basins, land conservation and up to fifteen stormwater management practices including traditional, green infrastructure and low impact development (LID) practices, minimum human demand, and minimum and maximum in-stream flow targets;
- Spatially lumped calculations modeling one basin and one reach but with flexibility in the number of hydrologic response units (HRU = land-use and soil type combination), each with an individual runoff and recharge rate;
- Modeling time step of a day or month without a limit on the length of the modeling period;
- Consideration of baseflow and peak water flows only; water quality module to be added in summer 2015;
- Automated import of runoff and groundwater recharge rate time series from existing hydrology models and estimated performance of proposed BMPs (version 2)

Documentation and Model Download[1]: http://www2.epa.gov/exposure-assessment-models/wmost

Contacts

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[1] Version 1 currently available; version 2 release expected by late September 2015