MIDDLE RIO GRANDE COMMUNITY-BASED WATER MANAGEMENT MODEL

The Middle Rio Grande Community-Based Water Management Model Version 3.1 is a work in progress and may contain errors and omissions. In addition, the model allows the user to simulate water management scenarios that might be highly improbable or physically impossible, and the user is warned to build scenarios and interpret results with care.

Key Assumptions

1. The model functions at an annual timestep and is spatially aggregated across the entire Middle Rio Grande Planning Region.

2. Default values for future projections of surface water inflows to the Middle Rio Grande Planning Region and of climatic variables employed in evapotranspiration calculations are based on random selection from historic distributions from 1950-2000.

3. Default values for future population projections are based on projections published by the Bureau of Business and Economic Research at the University of New Mexico.

4. The model assumes that the City of Albuquerque will completely consume its San Juan/Chama Project allocation beginning in the year 2006, and that this consumption will offset groundwater pumping.

5. The model assumes the following approximate, annual average default consumption terms: Agricultural evapotranspiration (ET), 2.3 acre-feet/acre/year; Bosque ET, 3.5 acre-feet/acre/year. The model assumes bosque acreage in the MRG Planning Region is 21,791 acres

Project Objectives

To provide a tool for:

- Quantitatively comparing water management alternatives and scenarios in terms of water savings and costs

- Engaging policy makers, stakeholders and the public in the water resource management process.

- Educating about the complexity, interconnectedness and interrelationships in our regional water system.

Defaults

Modeling Boundary Conditions and Primary Components - The model is bounded by the planning region boundaries, including parts of Sandoval, Bernalillo and Valencia Counties, and extending along the river from Otowi to San Marcial. All inflows and outflows are aggregated across the entire planning area. Simulations occur on an annual time step. Primary components of the model include surface water, ground water, population and demand. Demand components include urban, agricultural, environmental and evaporative.

Surface Water Component - Among other capabilities, the surface water component accounts for relationships between the shallow acquire and the river, and between the river and the deep aquifer. It allows simulation of future withdrawals from the river by the City of Albuquerque. The surface water withdrawals and consumption are disaggregated among the three counties and self supplied users. Surface water inflows from 1960 to 2000 are drawn from historic data. Future flows are stochastically generated from historic distributions from 1950-2000 (See "About the Model: Future Projections" for more information). Drought of varying start time, duration and intensity can be simulated.

Agriculture Component - The Agricultural component includes data largely from the Middle Rio Grande Conservancy District and the Bernalillo County Extension Office. The component includes conveyance channel ET and leakage, and allows the user to simulate modifications. The component calculates irrigation recharge to the shallow aquifer and the river. Historical evapotranspiration (ET) depends on climate data from 1960 to 2000. Future ET values are stochastically generated from historic climate variable distributions from 1950-2000 (see "About the Model: Future Projections" for more information).

Evaporative Losses - Evaporative losses from surface water, including rivers, irrigation canals and reservoirs, are calculated using a modified Penman equation. Historic and future evaporative losses are modeled following the description above for Ag ET.

Pumping Induced Leakage - This component includes the total leakage from all sources (i.e., captured recharge, river flows, conveyance channel flows and agricultural recharge) captured by groundwater pumping. Pumping induced river leakage is simulated using the Glover Balmer equation calibrated to USGS Modflow data reported in Kernodle et al. (1995).

Shallow Aquifer System - This includes all drain return flow that is not derived from unused irrigation water. Unused irrigation water that returns to the river is never subtracted from total river flows. This component represents a balance between riparian/ditchbank ET with shallow aquifer inflows from mountain front recharge, agricultural recharge, and conveyance leakage. Bosque ET is calculated following the description above for Ag ET.

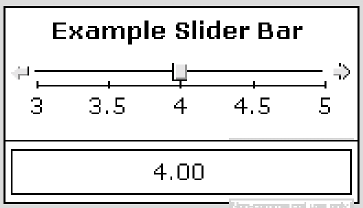
Groundwater - The groundwater component includes withdrawals disaggregated by counties and by self-supplied users, including major institutional users as UNM, KAFB and Intel. The component accounts for river leakage. Municipal demand is driven by population and per capita consumption rates. Default population projections are based on projections made by the Bureau of Business and Economic Research (BBER). at UNM. Demands are calculated separately for indoor and outdoor uses, and separately for municipal, commercial, industrial and institutional sectors.

Scenario Development - Different water management strategies can be modeled across a range of alternatives, leading to the development of future water management scenarios. These alternatives include municipal conservation (water pricing, re-use and harvesting, low flow appliances and xeriscaping), bosque revegetation, irrigated agriculture (irrigation efficiency conveyance system losses and alternative crops and crop acreage), desalination, reservoir storage (upstream storage, artificial recharge, new reservoir), intrabasin transfers, and population growth rate modification.

Using the model: More about sliders, buttons, and graphs

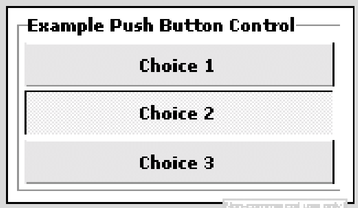
Slider Bars:

The majority of controls in the mode are slider bars like the one below. Place your cursor on the slider (the grey box above the number 4 on the number scale), hold down the left button of your mouse, and drag it lef or right to adjust the value. Release the mouse button when you have moved the slider to the desired location. Alternatively, you can place your cursor on the line that the bar slides along, and click once on the left mouse button for incremental changes. Give it a try!



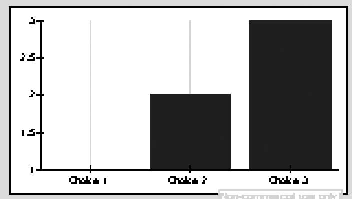
Switches:

Some of the variables in the model allow the user to select between a distinct set of choices. These variables are controlled by switches, like the push button switch shown below. To change the control, just place your cursor on the desired choice, and click the left button once. The choice selected is shown in a lighter grey, indicating that that button is depressed.



Graph Controls

Chart controls such as the one below, allow you to change multiple variables by moving the values corresponding to each. Think of the chart as several slider bars shown side by side. To change any of the values, click on any of the bars (in red below). Place your mouse over the small box in the middle of the ba you want to change until your cursor changes to a box with arrows above and below it. Hold down the left mouse button, and drag the bar, releasing the button at your chosen location.



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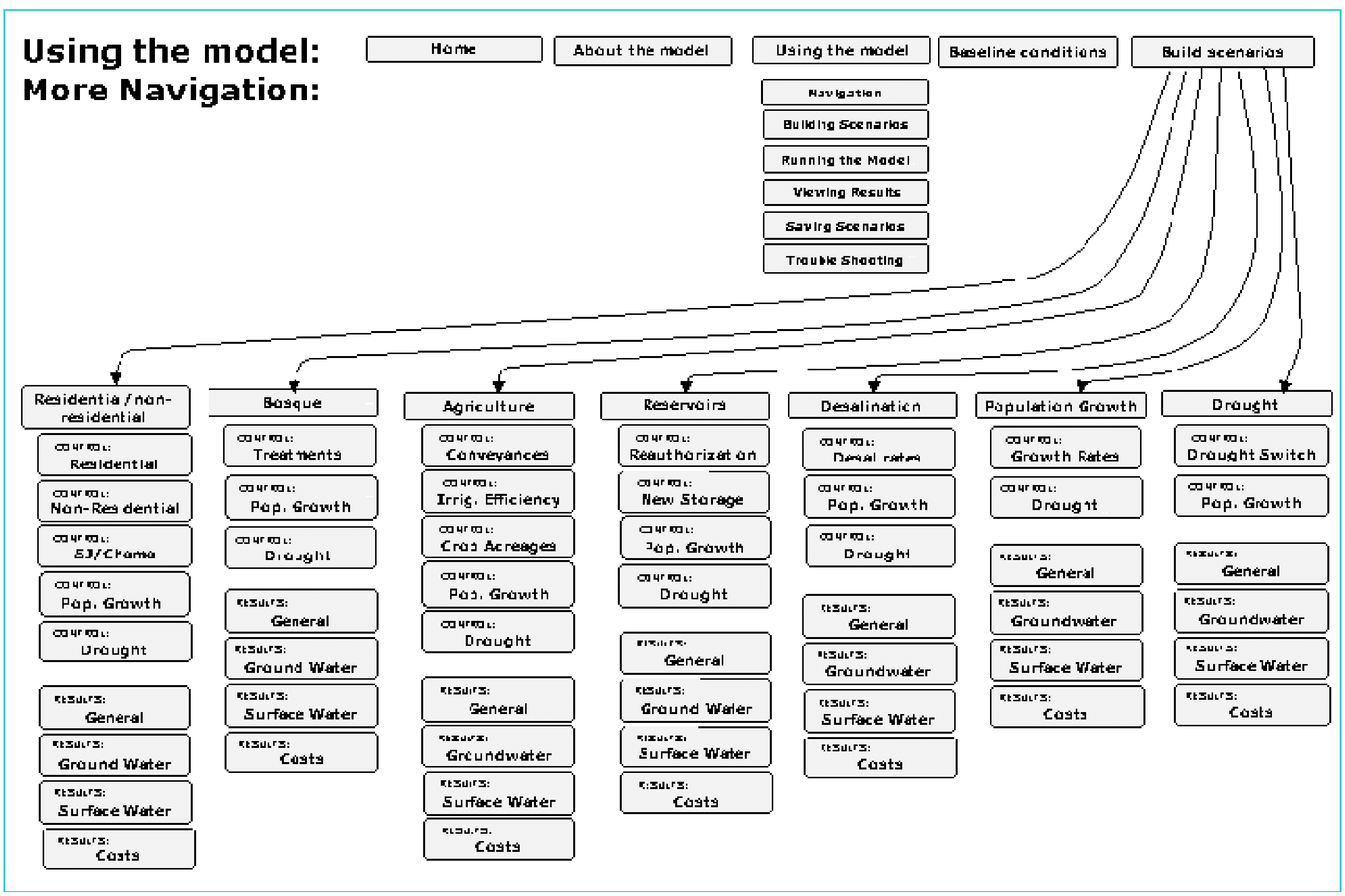
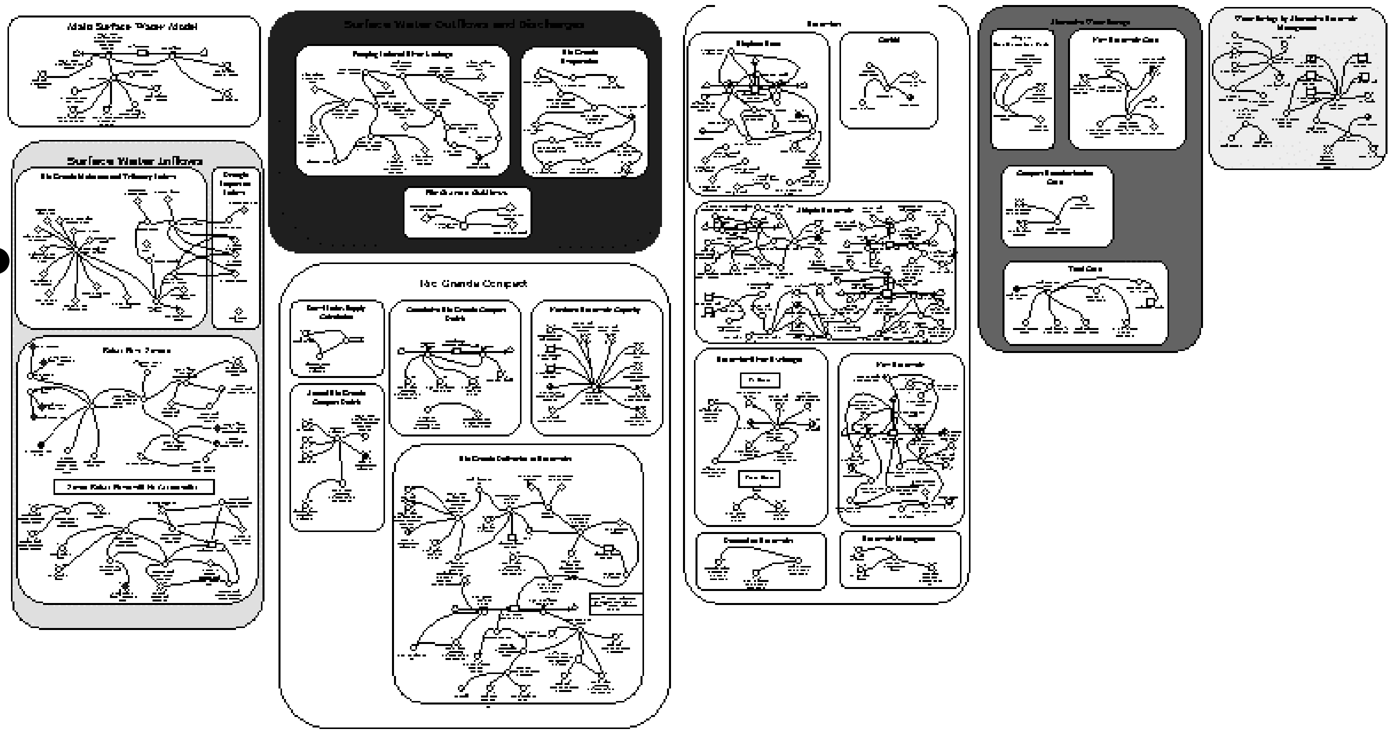
Having trouble? If you can't adjust any of the controls above, reset the simulation with the reset button in the toolbar at the top of the page. (See Running the model in the Using the model section for instructions on resetting the model.)

ORGANIZATION



Example of a modeled element, surface water:



More detail of above