Tennessee Regional Water-Supply Planning Pilot: Progress

Modeling Technical Subgroup

July 10, 2009

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Group Operations

- Task: evaluate the need for and possible benefits of “modeling” as a tool in regional planning
- Four meetings so far...effort ongoing
- Participation by 12 organizations
- Starting with assumptions and building consensus
- Continued technical exchange and updates

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How do we understand ‘modeling’ in the context of water availability?

- Users:
  - State government
  - Advocates for drinking water systems
  - Resource managers and permit writers
  - Municipalities/ Utilities
  - Cities
  - NGOs
  - Industry
  - Consultants
  - Regional planners
  - Political community
  - Chambers of commerce / The Municipal League
  - Transportation industry
  - Power generation (hydro)
  - Recreation
  - Emergency management agencies
  - Concerned citizens
  - Academics
  - Science community
  - Courts

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How do we understand 'modeling' in the context of water availability?

- Questions:
  - How much water is available and when for the multiple uses?
  - How much is needed and when for the multiple uses?
  - How much risk are you willing to accept (how wrong is too wrong)?
  - How much do you want to pay to be right?
  - How do you frame growth scenarios?
  - How do we deal with multiple scales and interconnections?
  - How do we determine alternatives?
  - How do we optimize the resource for long-term prosperity (sustainability)?
  - How can we better evaluate the effects of extremes (climate) and decadal variations?
  - What standards of proof may be required by our legal system?

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How do we understand ‘modeling’ in the context of water availability?

- Addressing four areas of concern:
  - Accounting for water (needs & availability)
  - Improving projections/scenarios and what we want to be (growth, development)
  - Anticipating social & economic response (conservation, changing use patterns) and unintended consequences
  - Anticipating risk & dealing with uncertainty (climate change etc)

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Accounting for water (needs & availability)

- Needs: human uses and preferences

- Availability:
  - hydrology
  - environmental requirements
  - other uses (agriculture, industry, recreation)
  - system management – capacity

- Models that show how systems "might behave" – explore policy realms and possible effects

- Models of system management:
  - address capacity limitations through management of the system
  - anticipate response due to hydrologic change, response to policy changes

- Models that provide:
  - visualization trade-offs curve
  - access to software
  - optimization
  - design-level data
  - technical expertise must be available to do and interpret work

(Need to research and list best available models for need and availability and share w/group)

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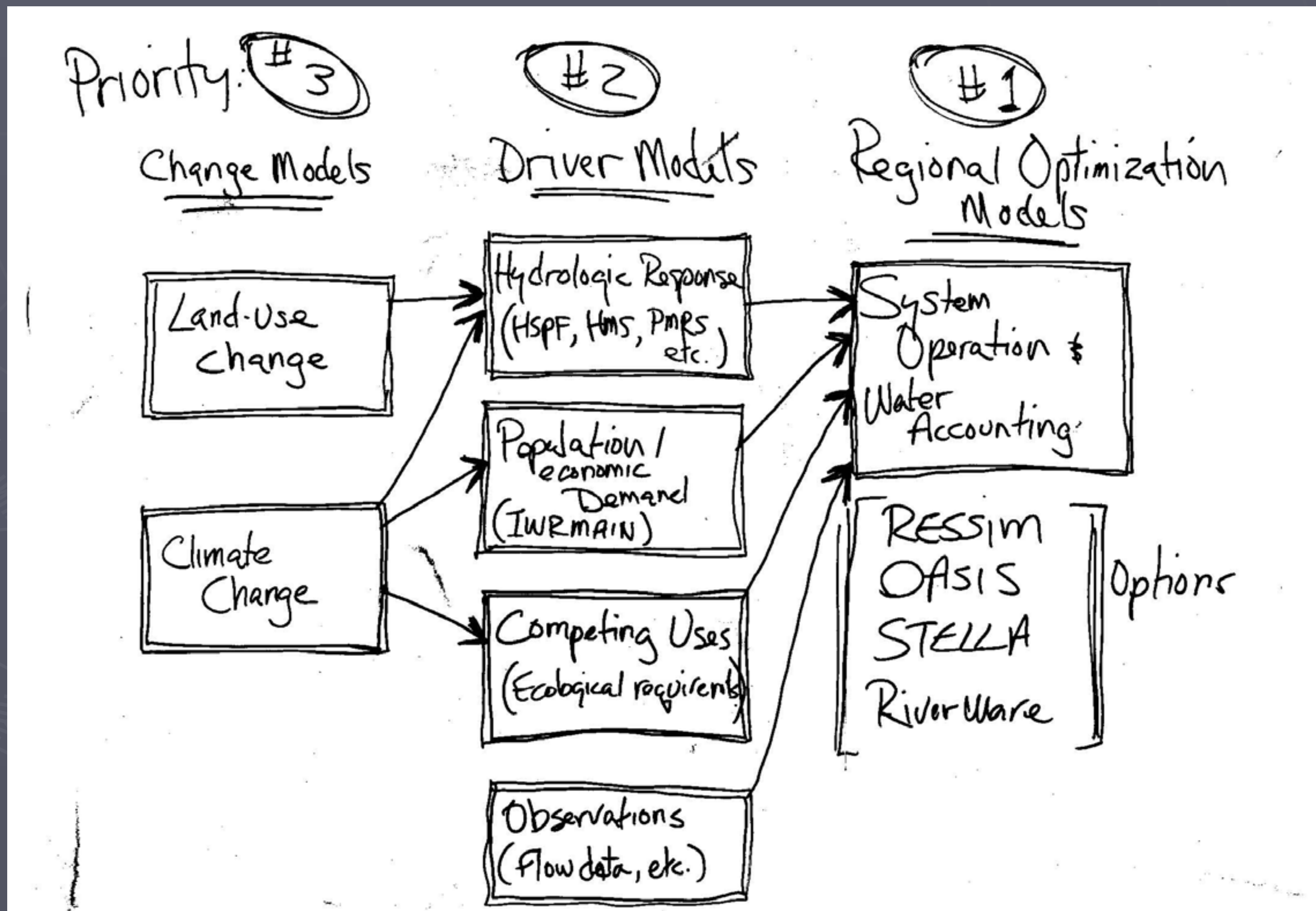
Accounting for water (needs & availability): model types



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What kinds of optimization models are out there?

- Hydrologic Modeling System (HMS – HEC product)
- Reservoir simulation model (ResSim)
- STELLA
- OASIS

How would these fit into the current effort?

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Matrix of system model capabilities

Attribute	ResSim	STELLA	OASIS	RiverWare
Interconnections among systems	x	x	x	x
Diffuse & point sources	x	x	x	x
Optimization platforms	x	x	xx	x
Available at low cost	xx	-	--	-?
Technical support	x-	x	?	x
Expandable across system size	x	x	x	x
Relatively easy to present	x	xx	x	-?
Quantity & quality	-	-	-	x
Easy to run	-	xx	xx	-
Quality as constraint	x	x	x	x

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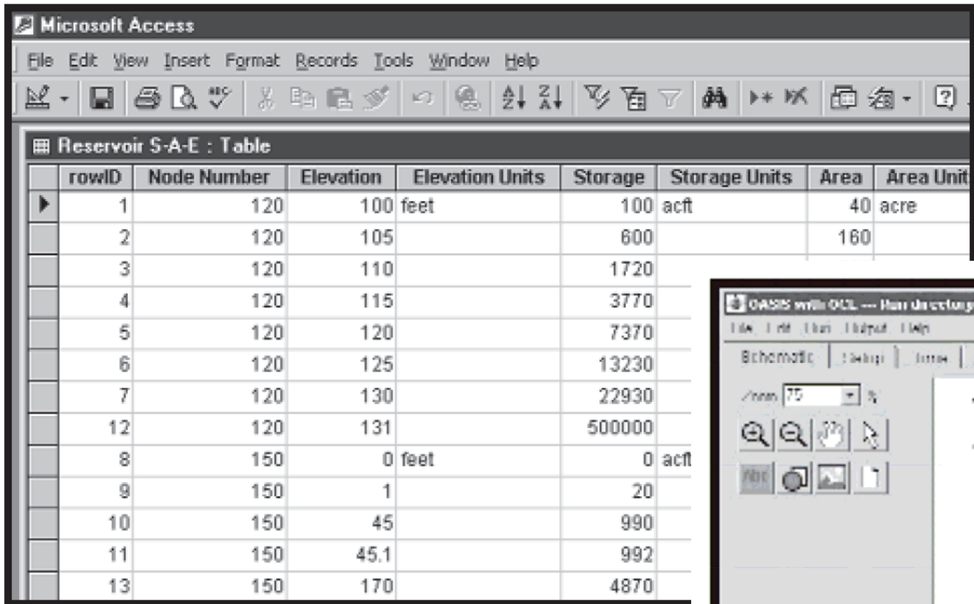
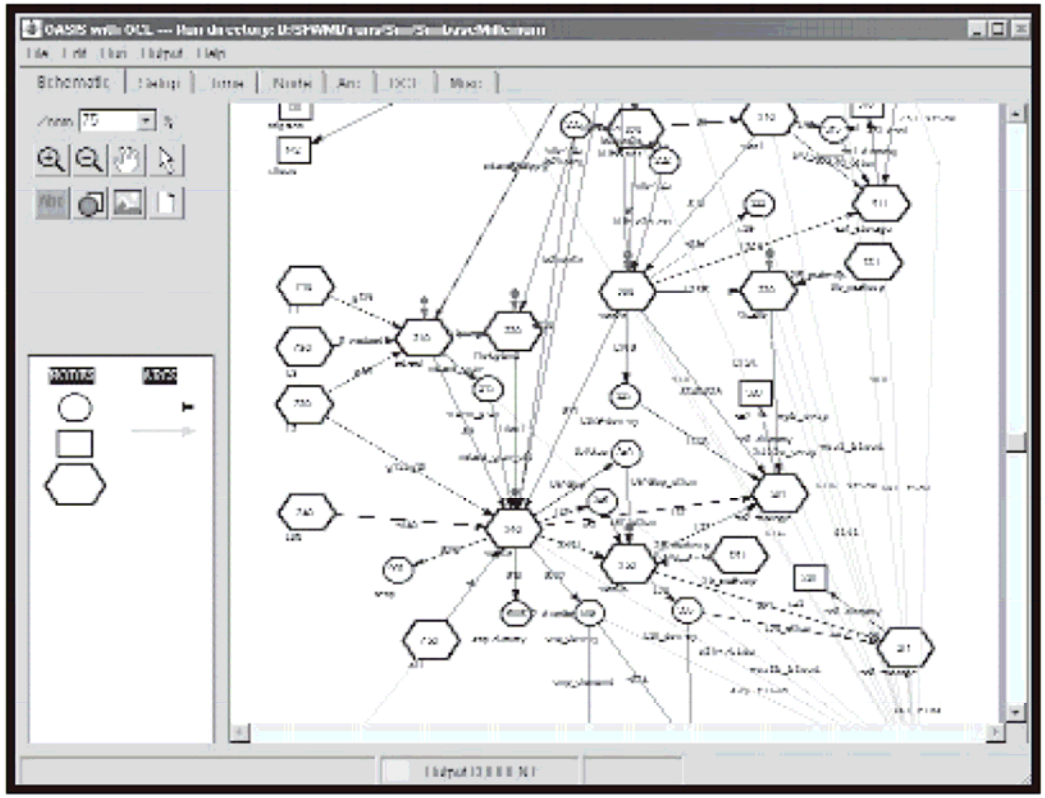
OASIS



rowID	Node Number	Elevation	Elevation Units	Storage	Storage Units	Area	Area Unit
1	120	100	feet	100	acft	40	acre
2	120	105		600		160	
3	120	110		1720			
4	120	115		3770			
5	120	120		7370			
6	120	125		13230			
7	120	130		22930			
12	120	131		500000			
8	150	0	feet	0	acft		
9	150	1		20			
10	150	45		990			
11	150	45.1		992			
13	150	170		4870			

Static data is kept in a relational data
Microsoft Access



Example of the Graphical User Interface (GUI) from OASIS

- ► Operations
- ► Inter-connections
- ► Optimization

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OASIS

- Two presentations: (Sally Palmer and Brian McCrodden)
  - Arcs and nodes are not hardwired—anyone can add components
  - Mass balance model for water can be linked dynamically water quality, etc.
  - “Process” is as important as the model
  - Multi Objective modeling—“optimum” is <u>defined by agreement among users</u>.
- Virginia’s experience: (Scott Kudlas)
  - Multi-state agreement based on OASIS to model “what if’s (bi-state River Commission)
  - Charlottesville—optimize operation of impoundments (run by Hydrologics)

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QUESTION: do we have the time and resources to do this in the current pilot?

- ANALYSIS:
  - Challenges to including an operational model in the pilot
    - COST
    - TIME
    - TURF
    - MAINTENANCE
  - Benefits to including a model:
    - Provides tools and context for conflict resolution
    - Standardization helps to improve efficiency ands scales across systems
    - A model can help to identify data needs and gaps in understanding
    - By providing a state-wide model we add economy of scale (and cost savings to communities)

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QUESTION: do we have the time and money to pursuer this in current pilot?

- CONSENSUS
  - Challenges are not insurmountable
  - Benefits are sufficient to move forward with operational modeling by either OASIS or STELLA with a goal of a working model by January of 2009
  - Some effort can be scope within existing funding. Other expenses for licenses etc. might be worked out
  - Group began work on implementation plan and schedule

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INITIAL STEPS TOWARD IMPLEMENTATION

- **5/31/09**
  - 3. TNC approach Hydrologics about licensing and setting up basic framework for pilots. (**Task completed by TNC**)
- **6/30/09**
  - 8. Get realistic cost estimates for purchase and maintenance of state-wide license **(TNC working)**
- **7/1/09**
  - 6. Approach climate specialist concerning an interpretation of existing record and prevailing understanding of climate change (literature review) for understanding and qualifying model results in final report. **(On track: USGS discussing needs with Randy Gentry. Working group discussed level of involvement and means by which to engage ORNL and UTK)**
- **7/10/09**
  - **Set goal for outline of project report**
- **7/31/09**
  - **Schedule meetings to engage stakeholders in identifying priorities and constraints, etc.**
- **8/1/09**
  - 7. Get OASIS framework (schematic) set up; start to identify gaps in information etc. **(TNC has agreement with Hydrologics to establish schematic)**
- **10/1/09**
  - 5. Get things we know we have and identify what we don't have: utility interconnection capacities (hydraulics); hydrologic analyses, reservoir operation schedules; water demand projections; regional drought evaluation; existing source yield; other requirements and competing needs. **(USGS working water demand)**
- **12/1/09**
  - 9. Develop technical requirements for maintenance and collect documentation of planning process and assumptions.
- **12/31/09**
  - 1. Identify completion timeline for a running model that can be demonstrated before January 2010—a report will come later.
  - 2. Continue assessment of advantages and pitfalls for wide-scale use including stories from other states etc. (NC example)
  - 4. Track and incorporate comparison of experience in running OASIS vs. STELLA by COE consultant (Ongoing)

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Water Supply Planning: Modeling and documenting a process

All Tennessee Communities and Utilities

Advice and consultation — Consulting Engineers

Facilitation, policy, and oversight — State Government and Regional Authorities

System data and description — State and Federal agencies (USGS) Universities

Economic projections and analysis — Universities, City planners, TVA etc.

Alternatives and structural analysis — Federal agencies (COE) and consulting engineers

Environmental limitations and decision support — The Nature Conservancy, other NGO's

Informed and effective decision making

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