

Building Models from the Data Up: From Calvin to Hobbes

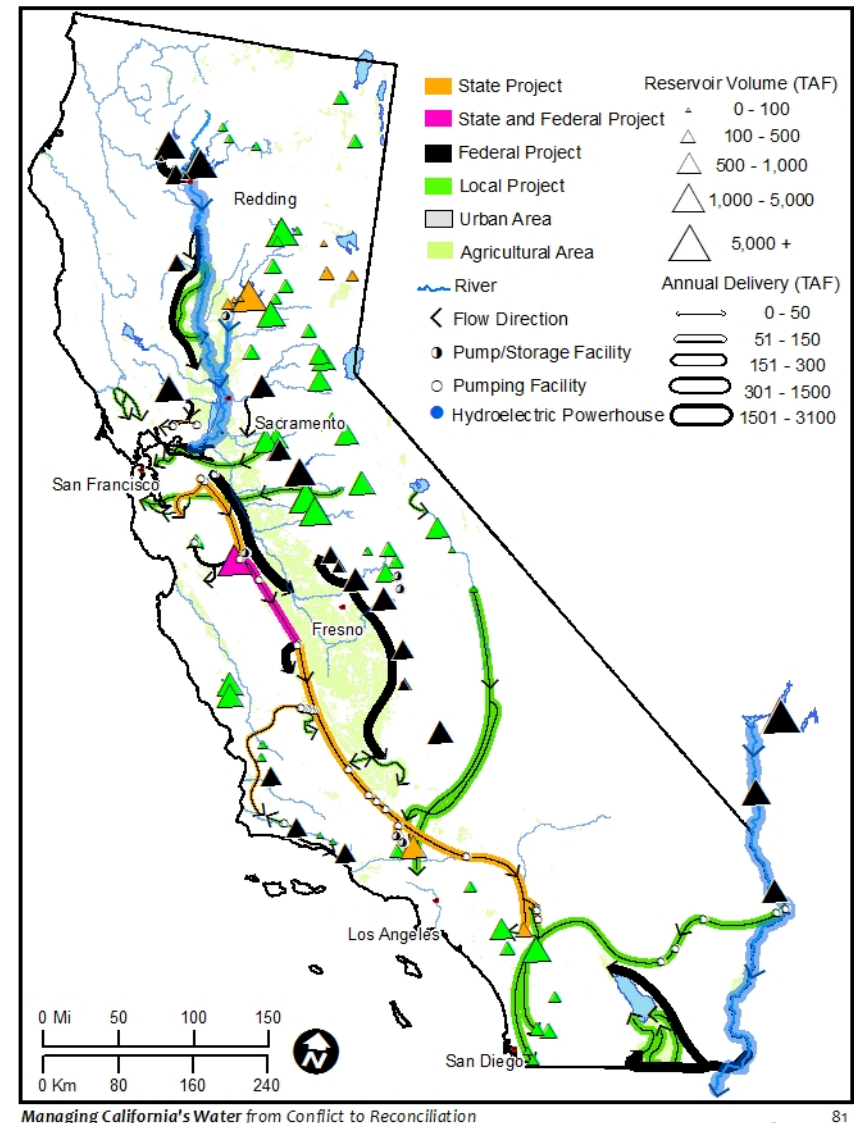
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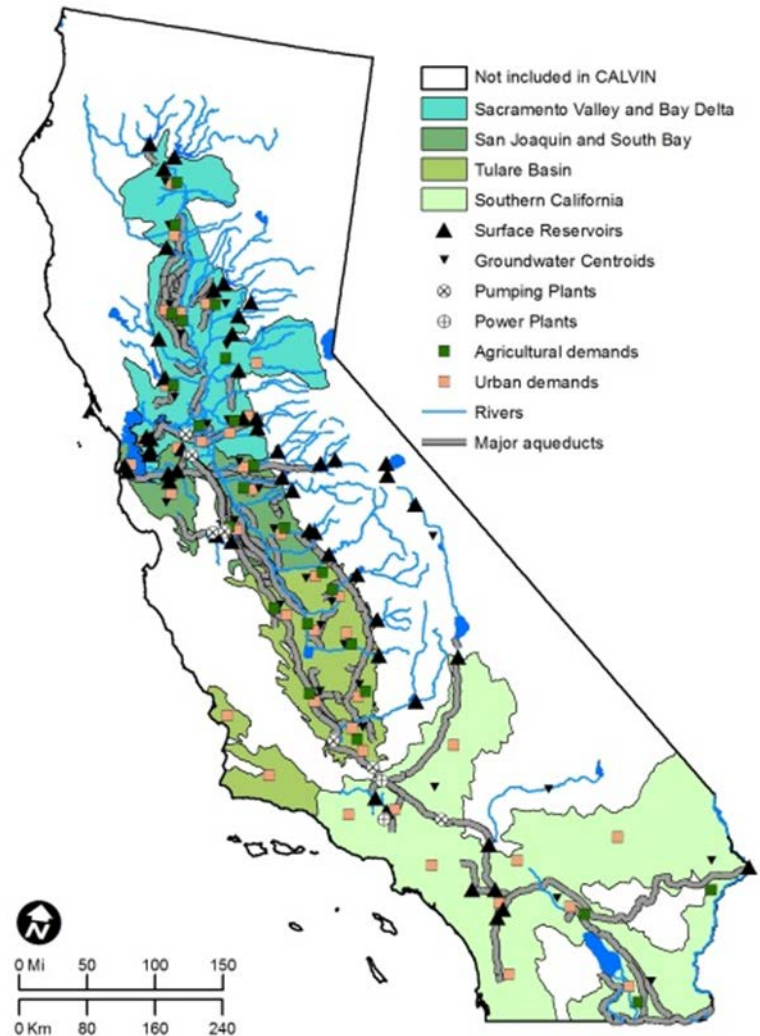
California Water Problems

- Asynchrony in supply and demand
- Droughts & climate change
- Water quality
- The Sacramento-San Joaquin Delta
- Groundwater
- Flood management
- Ecosystem services
- Quantitative understanding



The (12 Year Old) CALVIN Model

- Entire inter-tied water system
- Hydro-economic model
- Prescribes 72 year of operations
- Surface and Groundwater infrastructure
- Quantitative understanding of the system



Applications and Insights

Topics	Citation
Integrated water management, water markets, capacity expansion, at regional and statewide scales	Draper et al. (2003); Jenkins et al. (2001; 2004); Newlin et al. (2002)
Conjunctive use and southern California	Pulido et al.(2004)
Hetch Hetchy restoration	Null (2004); Null and Lund (2006)
Perfect and limited foresight	Draper (2001)
Climate warming, wet and dry	Lund et al. (2003); Tanaka et al.(2006; 2008)
Climate warming, dry	Medellín-Azuara et al.(2008a; 2009)
Climate warming, dry and warm-only	Medellín-Azuara et al.(2008a; 2009); Connell (2009)
Severe sustained drought adaptation (paleodrought)	Harou et al. (2010)
Increasing Sacramento River outflows	Tanaka and Lund (2003)
Reducing Delta exports and increasing Delta outflows	Tanaka et al.(2006; 2008; 2011); Lund et al.(2007; 2008)
Colorado River delta and Baja California water management	Medellín-Azuara et al.(2006; 2007; 2008b)
Cosumnes River and Sacramento area water management	Hersh-Burdick (2008)
Bay Area adaptation to severe climate changes	Sicke (2011)
Responses to Water Scarcity in Southern California	Bartolomeo (2011)
Ending overdraft in the Tulare Basin	Harou and Lund (2008); Chou (2012), Zikalala (2013)
Urban water conservation with climate change and reduced Delta pumping	Ragatz (2013)

What we have learned

- Need integrated and workable technical plan
- Organize model data into databases
- Document data in databases
- Modeling capabilities for water issues
- Don't wait for perfect data
- Quantify, document, improve cycle

Hobbes: Building Models from Data Up

- Need a new approach
- Models are too big and detailed to build around solution algorithms
- Need to build models on top of data to allow flexibility with algorithms
- Problem determines algorithm and scenarios
- Reality determines the data

New Directions: Data Management and Documentation System

- Standards for storing and sharing datasets and metadata
- A object-oriented geospatial database platform
- Automatic network generation
- User-friendly Graphical User Interface (GUI)
 - GUI for general users
 - GUI for DMDS managers

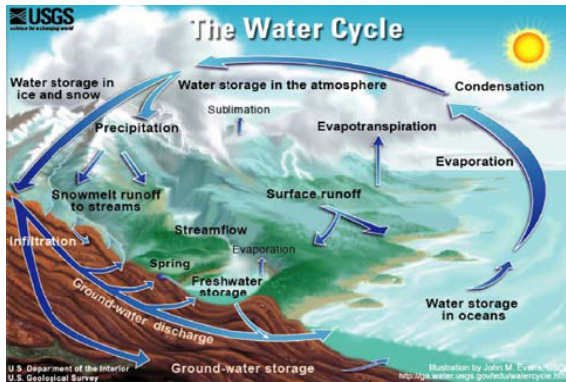
What goes in the DMDS?



Water infrastructure



Environmental Services



Hydrology

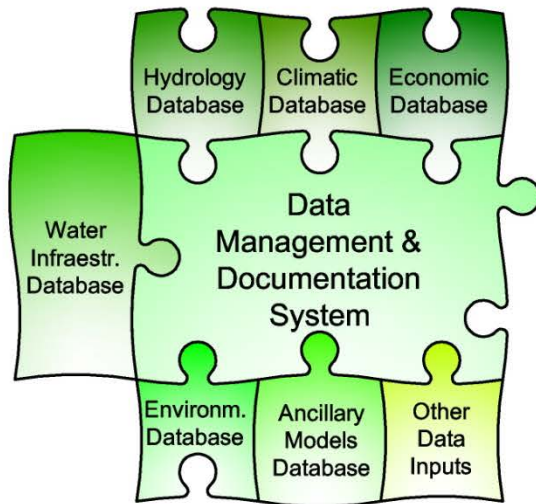


Water Economics

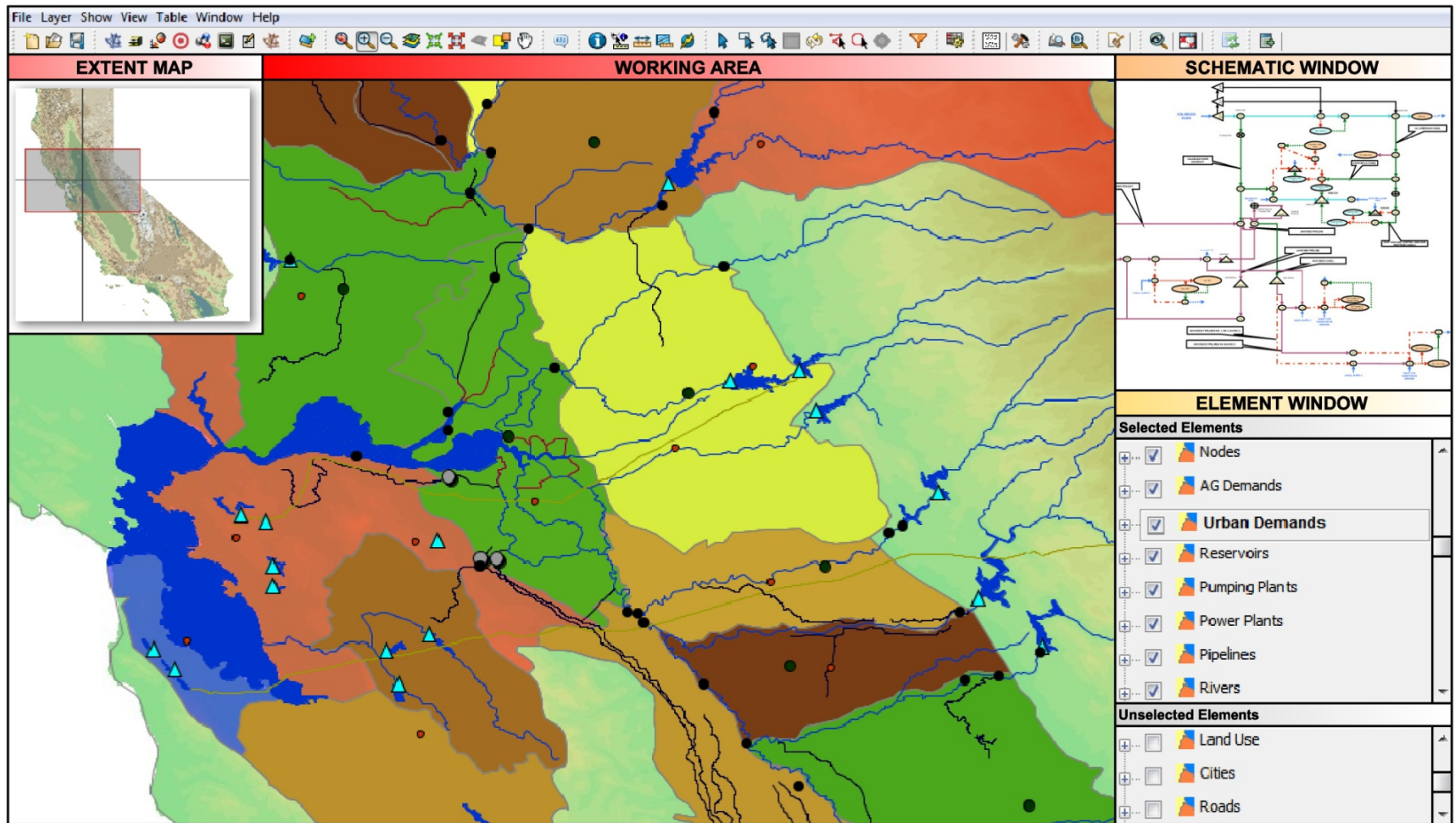
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Ancillary model specifications and connections

Hobbes: Assembling the puzzle



Graphical User Interphase



Synchronized network generator

The Hobbes Project is a Venue for:

- Database standardization and data documentation
- Geocoded data element representation
- Open platform with web access
- Transforming database elements into documented model inputs
- Focus on data and database structure, and documentation instead of specific models
- Framework for agencies and interests to largely agree and document fundamental data for long term modeling

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