

Technical Considerations for Real Time Forecasting with Models in Support of Water Project Operations

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Definitions

- Real Time
- Forecasting
- Decision Support

Definitions

"Real Time"

- Webster's:
 1. the actual time during which something takes place.
- Forecasting tomorrow today with data from yesterday

Definitions

"Decision Support"

- Chris Enright (straw man):
Development of information to improve decisions (and questions)

Definitions

"Forecasting"

- Webster's:
 1. To calculate or *predict* some future condition as a result of analysis of pertinent data.
- Change "*predict*" to "*effect*"

The Project Operator Real Time *Decision*:

- *What physical forcing should be imposed to effect a desired future state of the system?*
 - Given current system state, future (controlling) standards, future tide conditions
- Physical models explicitly incorporate all physical forcings.
- Models allow a range of physical forcings to be applied.

"Real-Time" Decisions

- Real-Time operations decisions are being made everyday by DWR, and USBR
- Recommendations occasionally come from Ops, DAT, NNG.
- It's a "what would happen if" decision dynamic. *Models are useful tools in this environment.*

Attributes of Real Time Forecasting Tools

- Supports thinking process
 - must be concrete about assumptions
- Facilitates quick check of innovative ideas
- Leads to better questions
- Raises participants level of understanding
- If output is available and understandable, trust and acceptance is created.

Real-Time Bay-Delta Modeling Efforts Past and Present

- DWR-ESO and O&M: SMSGC Gate Testing and Suisun Marsh Standards Compliance
- O&M Delta Environmental Compliance
- DWR South Delta Planning
- USGS 24-Hour Current Forecasting (TRIM Model)

Components of an Effective Real Time Forecasting Tool

- Responsive to needs of operators/decision makers (DWR, USBR, Ops, NNG, DAT)
 - Provides rapid forecasts for several "what if" scenarios per cycle
 - Complex output is summarized in a concise and information rich way
 - Output is readily available

Technical Issues

1. Initial conditions: water elevation, velocity, salinity
2. Boundary conditions
3. Real time data availability
4. Real time data accuracy
5. Efficient scenario crafting ---> results
6. Output
7. Document forecasting tool accuracy

Technical Issues

1. Initial Conditions

At time zero:

- Water surface elevation and velocity field
- Salinity field

Technical Issues

2. Boundary Conditions

For forecast period:

- estimate of Martinez stage (15 minute)
- estimate of Martinez salinity f(antecedent outflow)

Technical Issues

3. Real Time Data Availability

- IEP Server now updated at least daily: CDEC, USBR, NOAA, DWR O&M.

Technical Issues

4. Real Time Data Accuracy

- Real time data has gaps and errors which must be "fixed" and flagged in the output.

4. Continued:

Data Coordination and Accuracy

- Karl Jacobs recommends:
 - Implement Access clients for data collectors to allow "transaction logging."
 - Provide redundant data feed technology to fill gaps and insure accuracy.
 - Provide gage redundancy, especially at Martinez.
 - Agency coordination and cooperation.

Technical Issues

5. Efficient Scenario Crafting -> Results

- Modelers need to be plugged in to (part of) decision process.

Technical Issues

6. Output

- Underestimated importance
- Output is complex
- Many scenarios
- Output should meet decision makers' needs.
- Output should be concise and info rich.
- Iterate to consistent formats that work.
- Make output available to all.

Technical Issues

7. Documentation of Forecasting Accuracy

- Continuous post analysis
- Determine accuracy characteristics
- Calibration feedback?

How might it work best?

- Dedicated staff
- Daily model runs based on operations schedules.
- Interagency/stakeholder Technical Team participation
- Web based output
- Integration with fish sampling data
- Many Models (Like weather models)