

DRAFT (Not Reviewed)

MEMORANDUM

To: ESHMC
Fr: B. Contor
Date: 18 August 2007

Re: "Wish List" and data requirements

INTRODUCTION

This memo is a follow-up to a 31 July 2007 memo "MEMO_WishList_20070731.pdf" which requested input from the ESHMC on additional data that might be required to support contemplated changes in the conceptual model for the next round of calibration. That memo included three questions:

1. What additional changes to the conceptual model should the ESHMC discuss prior to embarking on calibration of ESPAM 2.0?
2. Which potential changes are most important?
3. Which potential changes might possibly be delayed until version ESPAM 3.0 or later?

Responses included two main points:

1. The changes in conceptual model to be considered should go beyond "putting a finer point" on data but should address the underlying questions of our actual ability to understand and simulate underlying physical processes (for instance, for tributary underflow or recharge from precipitation on dry lands). We should be attempting to reduce uncertainty in the model inputs and not just adding meaningless figures after the decimal for our current rough methods.
2. An 11 July 2007 document (source unclear) was forwarded, which includes additional potential changes to the conceptual model. It is included with this mailing as "Goals to enhance and recalibrate ESPAM version 2.pdf."

The first response is correct and very important. In the future the ESHMC will be tackling the vital question what modifications to make. This memo and the 31 July memo are related to that process in that data requirements and costs may provide useful input to the decision process. However, the current communication is *not* that process. The primary purpose of these two memos is for guidance on the soon-to-commence data gathering activities for ESPAM 2.0. That is why they focus only on data, though it is acknowledged that the broader questions are more important than data questions.

DRAFT (Not Reviewed)

DATA REQUIREMENTS

Table 1 combines the wish list from the white board photos (reported in the 31 July memo) with the 11 July document. It reports only the *changes* that would be required in data gathering to support the potential change in conceptual model. This memo strictly considers the *non-target* water budget data required and not data requirements for calibration targets.

Table 1
Potential Changes to Conceptual Model
and Required Changes in Data Gathering

Potential Change	Brief Description	Additional Non-target Water Budget Data Required
1. One-month stress periods	ESPAM 1.x was calibrated using model-estimated heads and fluxes calculated approximately every 18 days, based on non-target fluxes held constant for six-month stress periods. This change would be to vary the non-target aquifer fluxes on a monthly basis	Option a) No additional data required, but non-Snake diversion volumes would have to be partitioned from the annual native frequency of currently-gathered data. Option b) Monthly diversions for non-Snake entities would have to be tabulated by hand from 27 years of daily watermaster records.
2. Extend data to 2006 (2007)	ESPAM 1.x was calibrated using data from May 1980 through April 2002. This proposal is to extend the full data set as far as possible. This is not a change in conceptual model nor calculation methods but represents a significant data requirement.	This activity requires update of all data for current conceptual model, plus additional data for other changes.
3. Return Flows	ESPAM 1.x used measured return flows for the Big Wood and Little Wood rivers, with returns for all other entities estimated as a fraction of gross diversions. The change proposal is to explore alternate algorithms to estimate return flows for entities without direct measurements.	The investigation will rely upon return-flow measurements that are already being reported by IDWR. IWRRRI expects that the outcome will be an algorithm that relies upon some combination of data that are already being gathered under the existing contract.
4. River/	Because the stress periods in	None. ¹

¹ This change *would* require a time series of river and reservoir stage targets. These should be available

DRAFT (Not Reviewed)

Potential Change	Brief Description	Additional Non-target Water Budget Data Required
reservoir stage time variable.	ESPAM 1.x were six months long, only an average river/reservoir stage had meaning. With one-month stress periods, the possibility exists to define a meaningful average stage for each one-month period.	
5. Aggregation of conductance reaches	In calibration of ESPAM 1.x, parameter zones for riverbed conductance matched gaged reaches for which targets were matched. This potential change involves assigning conductance reaches based on other criteria.	None.
6. Tributary valley underflow	ESPAM 1.x used long-term-average estimates of tributary valley underflow from prior studies, scaled annually by the outflow of Silver Creek, an aquifer-fed stream in one tributary valley. This potential change is to explore alternate methods to estimate the volume and temporal variability of tributary-valley underflow.	Potential changes may require precipitation and evapotranspiration data in tributary valleys outside the model boundary, and may require additional water-level data from wells in tributary valleys.
7. Reach gains (spring discharges) below Milner	ESPAM 1.x used Kjelstrom full-reach estimates in steady-state calibration and individual springs within reaches for transient calibration. Three different proposed changes follow:	
7 a. Calibrate to gage gains.	An alternate (or additional) target could be gains from Milner to King Hill, subtracting south-side surface contributions and	None. ²

directly from USGS and/or BOR with low to moderate data-processing costs.

² This would require additional target data. Gage data for surface-water balance should be readily obtainable at low cost. Estimates of south-side subsurface fluxes may be more problematic and costly.

DRAFT (Not Reviewed)

Potential Change	Brief Description	Additional Non-target Water Budget Data Required
	estimates of south-side subsurface contributions.	
7 b. Change number of reaches.	In ESPAM 1.x, reaches were defined by analysis of changes in slope of cumulative downstream gains, coupled with consideration of water chemistry. This proposal is to define below-Milner reaches in some other fashion.	None.
7 c. Multiple springs per model cell.	In ESPAM 1.x, each model cell represented as being a spring discharge cell was modeled using a single drain. This proposal is to consider using more than one drain (with unique conductance and elevation parameters) for some model cells.	None.
8. Re-evaluation of recharge on non-irrigated lands.	ESPAM 1.x used an algorithm to estimate monthly recharge on non-irrigated lands based on monthly precipitation. It may be possible to use a daily soil-moisture balance calculation to improve these estimates, or identify other, better methods.	Daily soil-moisture-balance calculation will require daily precipitation and temperature data. These should be readily available from NOAA and NWS.
9. Treatment of mixed-source lands.	ESPAM 1.x identified mixed source lands using water-rights and adjudication data, and partitioned the supply between ground-water and surface-water based on analysis of total surface-water volumes by irrigation entity. For model use it would be useful to have finer estimates of the actual ground-water fraction on these lands, and to understand expected changes in fraction with	These estimates may require ground-water pumping volume data from Water Measurement Districts, Ground Water Districts and Water Districts that administer ground-water rights.

DRAFT (Not Reviewed)

Potential Change	Brief Description	Additional Non-target Water Budget Data Required
	hypothetical management actions.	
10. Model Boundaries	ESPAM 1.x includes Oakley Fan, Rexburg Bench, and much of the Big Lost and Little Lost valleys.	Extending the model boundary extends the area over which all water-budget data are gathered. Contracting the model boundary reduces data requirements.

Table 2 lists qualitative estimates of the difficulty and cost of obtaining the data to support these potential changes in conceptual model. However, because some of the potential methodology has not yet been finalized, these estimates are necessarily uncertain.

Table 2
Qualitative Difficulty and Cost of Obtaining Required Data

Potential Change	Expected Cost and Difficulty of Obtaining Data	Decision Needed Soon	Comment
1. One-month stress periods	Option a) Low cost Option b) Very high cost		Option a) involves partitioning only a small fraction of total diversions, in locations distant from reaches of interest.
2. Extend data to 2006 (2007)	High cost		Data-gathering for current conceptual model is already contracted.
3. Return Flows	Low cost		
4. River/reservoir stage time variable.	Low cost		
5. Aggregation of conductance reaches	Low cost		
6. Tributary valley underflow	Moderate cost (possibly high cost if spatial extent of ET estimates must	Yes, if spatial extent of	

DRAFT (Not Reviewed)

Potential Change	Expected Cost and Difficulty of Obtaining Data	Decision Needed Soon	Comment
	be extended)	precipitation or ET data must be extended.	
7 a. Calibrate to gage gains.	Moderate cost		
7 b. Change number of reaches.	Low cost		
7 c. Multiple springs per model cell.	Low cost		
8. Re-evaluation of recharge on non-irrigated lands.	Moderate cost		
9. Treatment of mixed-source lands.	Moderate cost.		
10. Model Boundaries	Low cost unless extension requires additional ET data.	Yes, if changes include extending boundaries	

SUMMARY

Only two of the listed items are estimated to be high cost items; obtaining monthly diversion estimates for non-Snake surface-water entities, and extending the data set through 2006 or 2007. IDWR has already committed to extending the data set and funded the gathering of data to support the current conceptual model.

Two of the items require that a decision be made soon, because they may affect the spatial extent of data to be gathered. These are the refinement of tributary-valley underflow, and the extension of the model boundary. Extension of precipitation data is essentially costless, and extension of diversion and stream gage data should be low to moderate in cost. However, extension of evapotranspiration data beyond the LANDSAT areas currently contemplated could increase the cost of METRIC ET estimates by 50% to 100%, since this will increase both the number of images to be purchased and the personnel time required to process images.

DRAFT (Not Reviewed)

INPUT REQUESTED

IWRRI requests input from the ESHMC by 31 August 2007 on the following questions:

1. Do ESHMC members have comments or alternate opinions on the estimates of the data required and the cost/effort to obtain these data, for the listed potential changes?
2. Do we contemplate extending the model boundary?
3. Should we extend the spatial extent of ET data, to support either extended model boundaries or tributary-valley underflow estimates?
4. Should we manually extract daily diversion records from water-master data, for non-Snake surface-water irrigation entities?
5. Should we identify or request additional funding? Current funding is sufficient only for gathering the data required for the current conceptual model and methods.