



EAA Modeling Program Discussion

February 3, 2016

Topics

- Modeling Five-Year Plan
- MODFLOW Drought-Of Record Simulations
- Recharge Estimation Methods
- Groundwater Model Uncertainty Analysis

Groundwater Model 5-Year Plan

- 2015
 - Begin process of uncertainty analyses with MODFLOW model using an ensemble approach, as recommended by NRC review committee
 - Complete documentation for updated MODFLOW model
 - Evaluate potential uses of new FEFLOW groundwater model
- 2016
 - Initiate uncertainty and sensitivity analyses on the updated MODFLOW model using the ensemble approach recommended by NRC
 - A primary goal will be to quantify uncertainty in the “bottom up” analysis used to establish conservation measures associated with the EA HCP

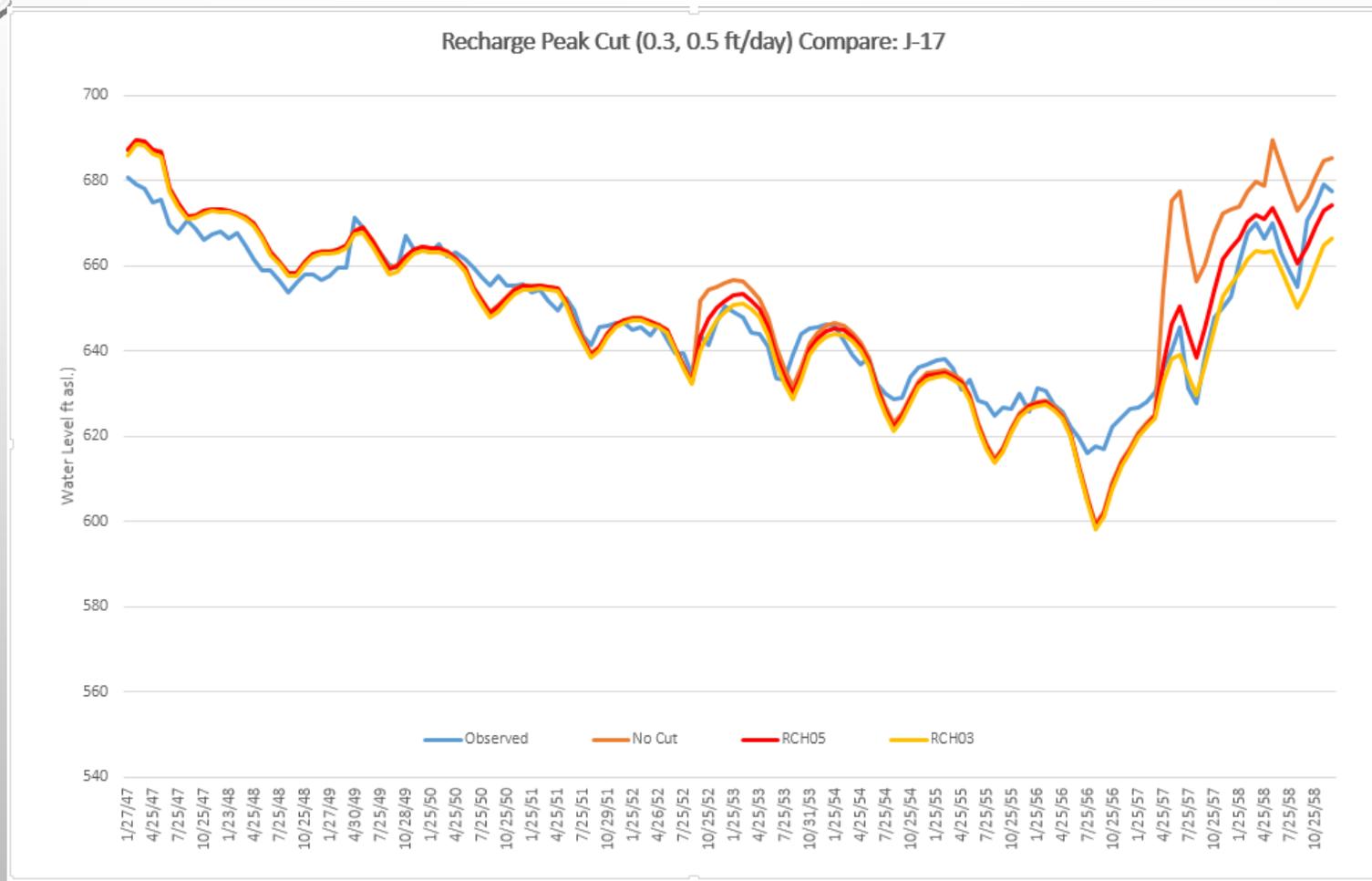
Groundwater Modeling 5-Year Plan

- 2017
 - Begin planning stages for next major model update
 - Assess conceptual model in light of new data
 - Assess current best practices and modeling software
 - Run model scenarios with existing model as requested
- 2018
 - Document proposed conceptual changes and modeling approach in a model update plan
 - Obtain expert/peer review of update plan, revise and finalize
 - Begin Procurement process for outside consulting/expertise, if needed
 - Run model scenarios with existing model as requested
- 2019
 - Begin model updates: 1 to 3 year process depending on scope of changes

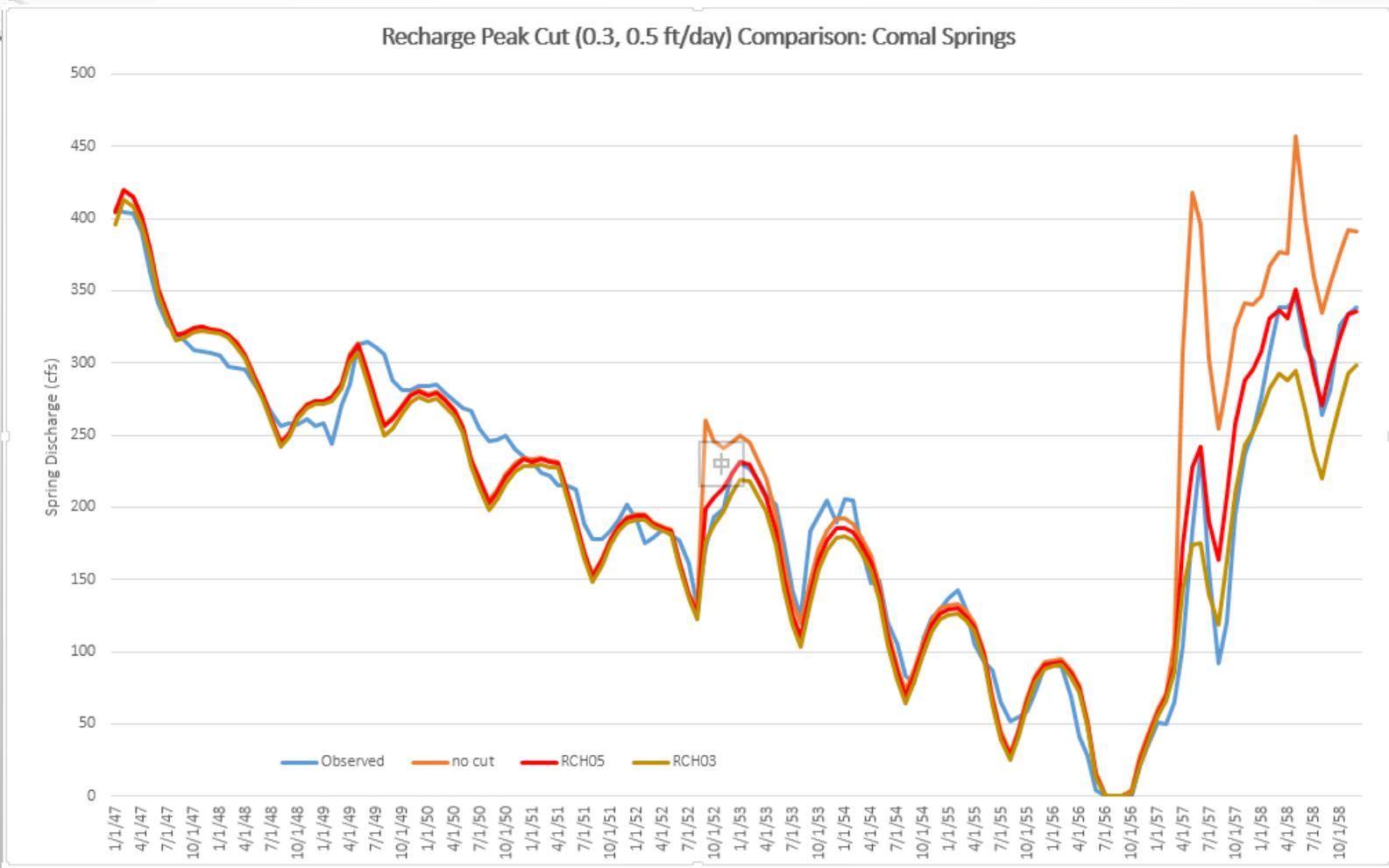


Preliminary Drought-of-Record Simulations with Updated MODFLOW Models

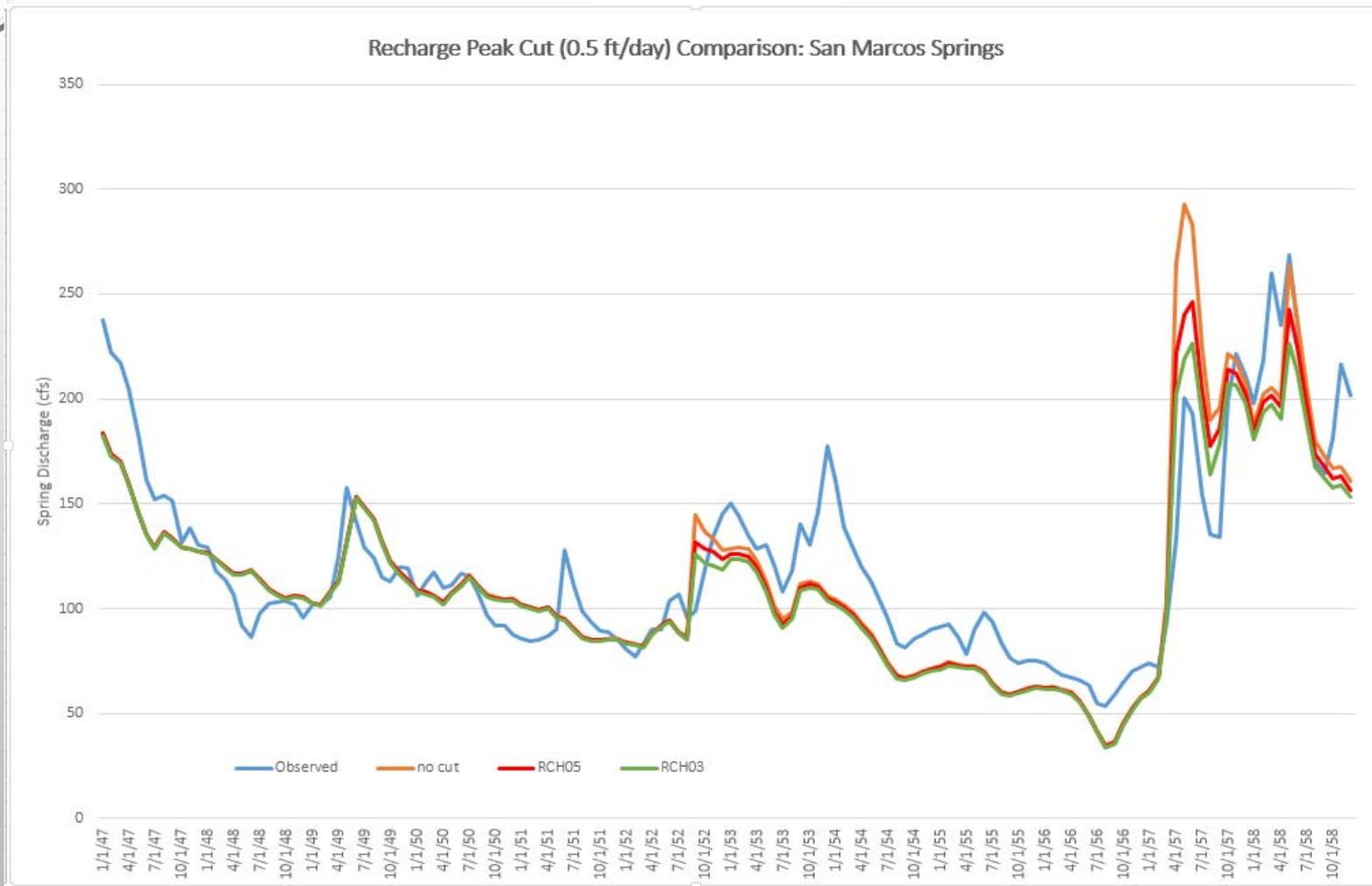
MODFLOW Drought-of-Record Scenario: sensitivity to limiting peak recharge rate

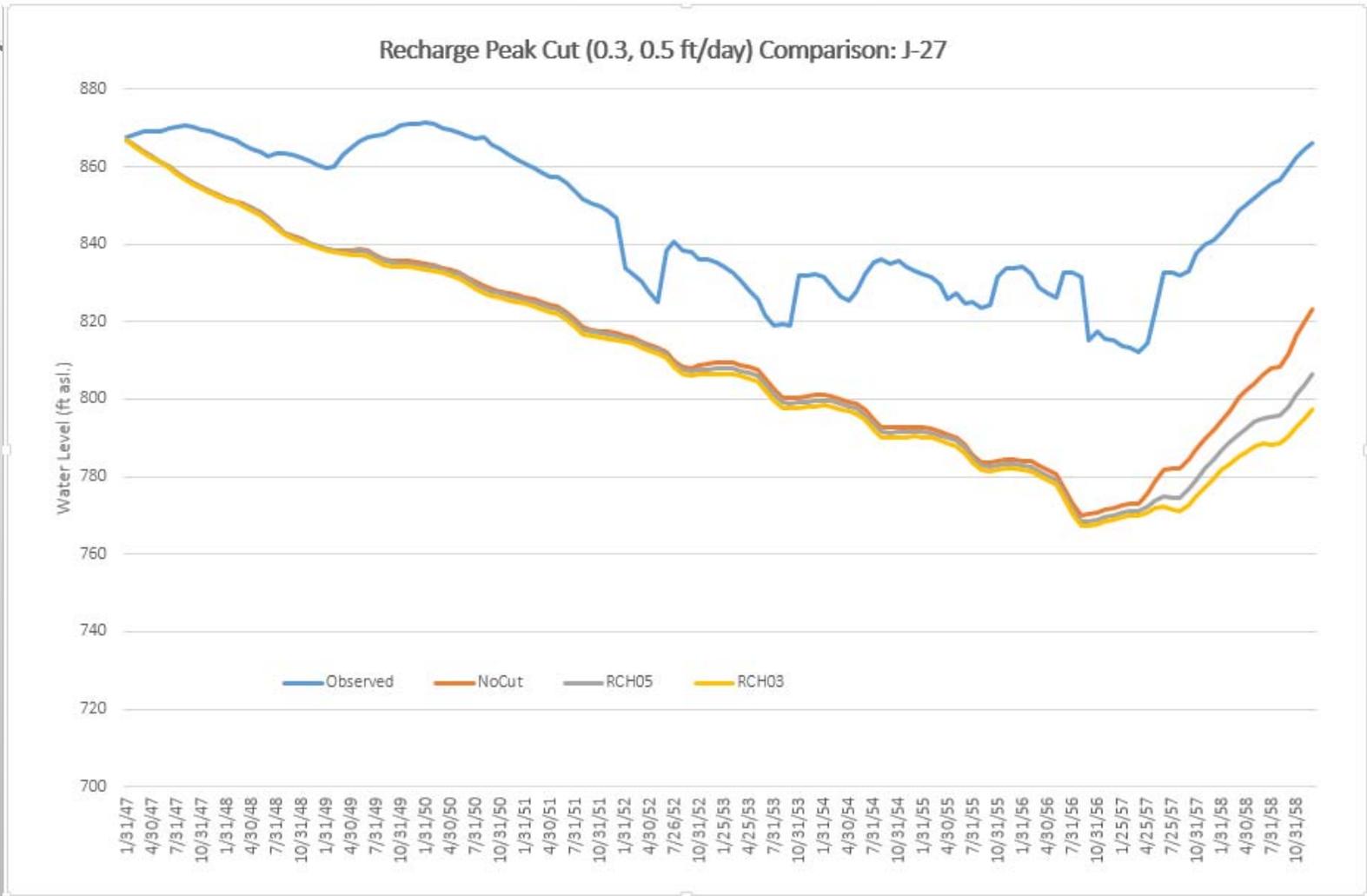


MODFLOW Drought-of-Record Scenario: sensitivity to limiting peak recharge rate



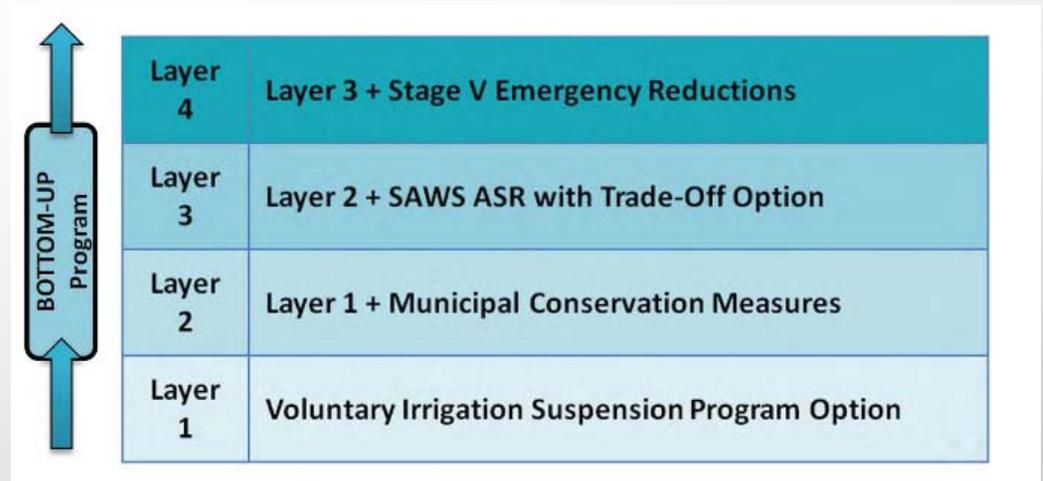
MODFLOW Drought-of-Record Scenario: sensitivity to limiting peak recharge rate





Model Usage in Developing the HCP

- MODFLOW model used to assess the effects of four mitigation measures
- Evaluated 572,000 acre-ft pumping scenario with reductions when critical period management triggers were hit
- Simulated drought of record recharge conditions and evaluated effect on springflow



Model Usage in Developing the HCP

- Result with original model show that all mitigation measures are needed to keep simulated springflow at Comal Springs above 30 cfs

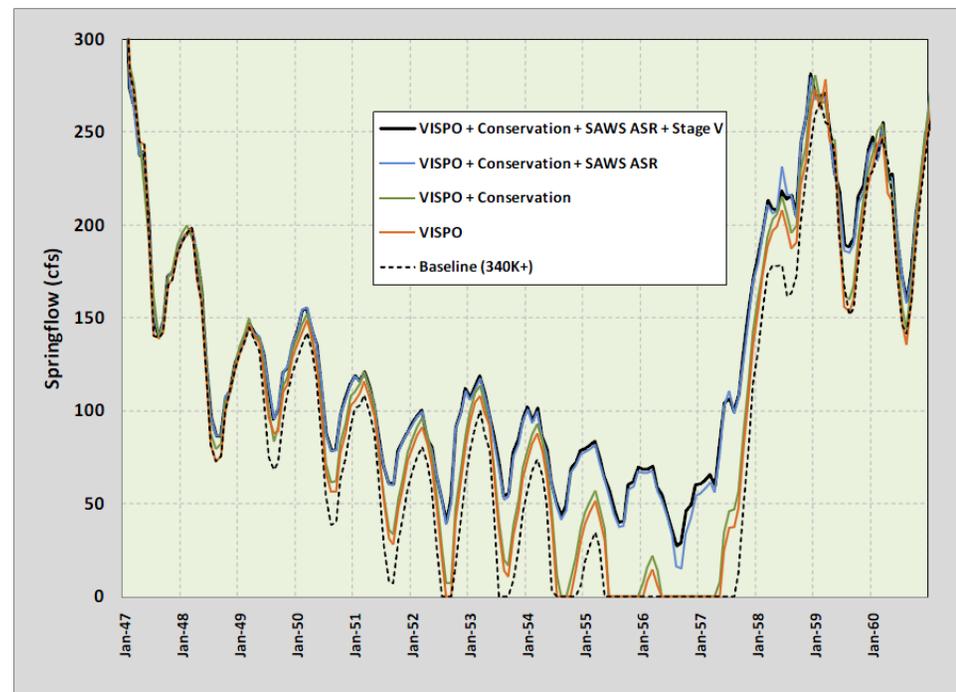


Figure 3-9. Simulated Springflow at Comal Springs (1947-1960)

Use “Groundwater Management Package” to Rerun “Bottom Up” Analysis

User's Manual for the Groundwater Management Package for MODFLOW-2000

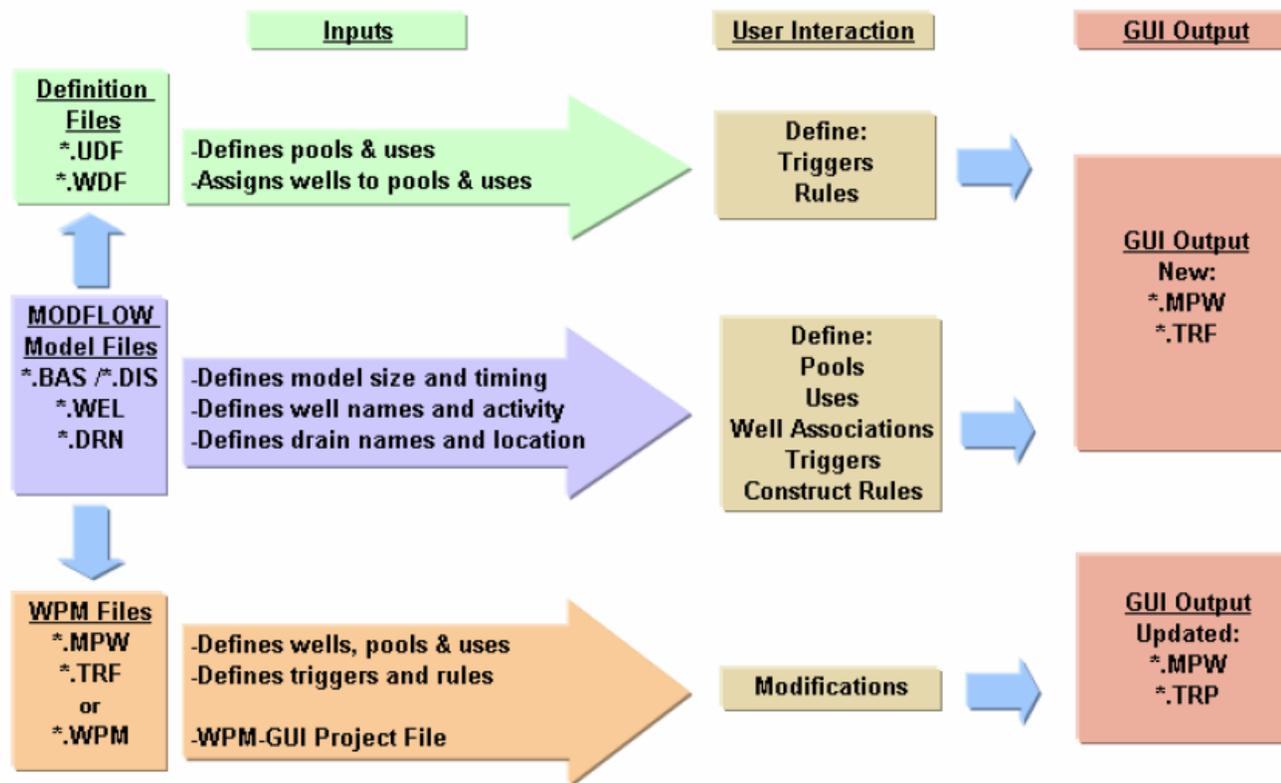


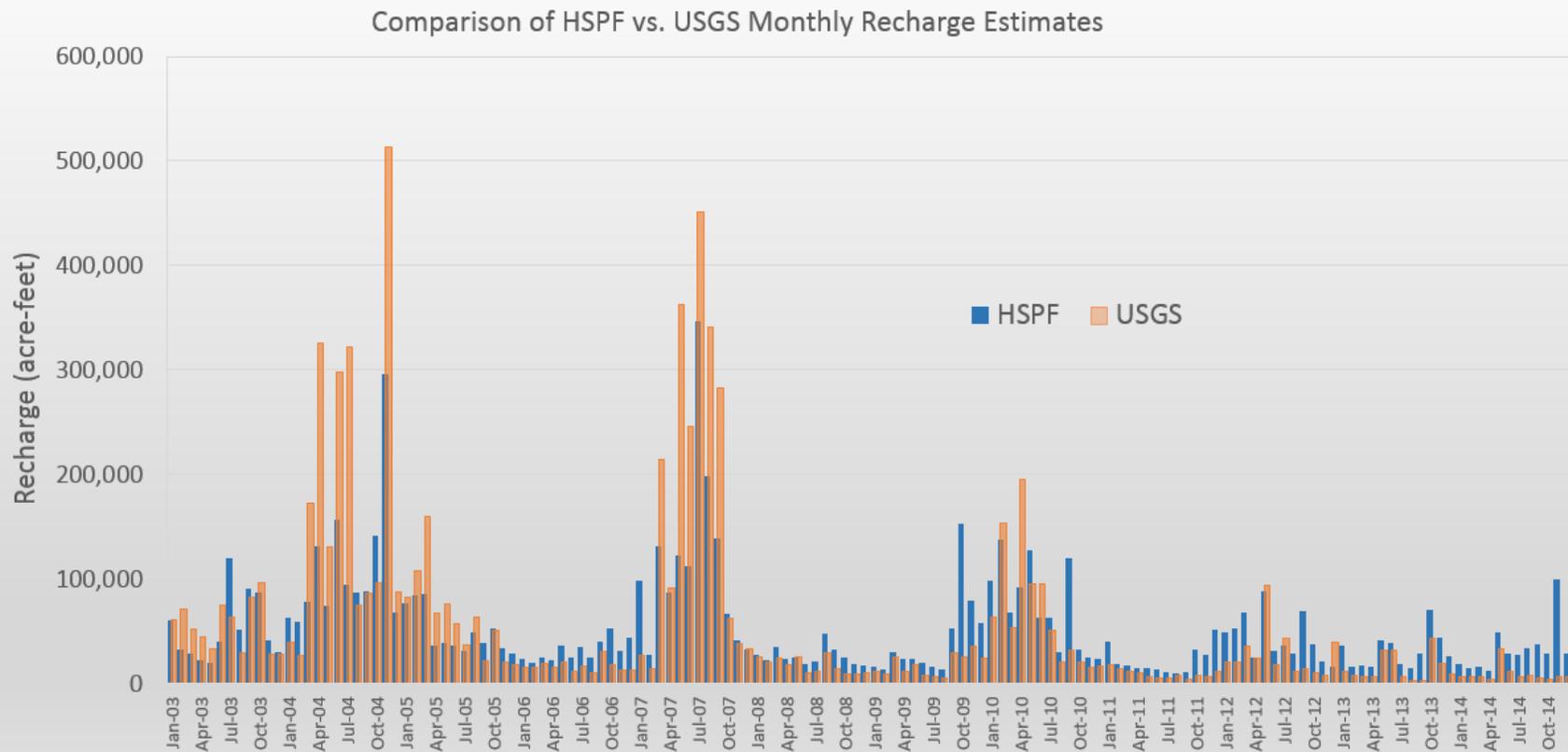
Figure 5.1: General Functional Flow of the WPM-GUI

Groundwater Model Uncertainty Analysis

- EAA goal is to understand effects of uncertainty in predicting the effects of conservation measures on sustaining aquifer levels and spring flows
- Currently pursuing “Ensemble Approach” recommended by National Academies’ Science Review Panel
- Develop a set of MODFLOW groundwater models that can be reasonably calibrated with different assumptions about amount and distribution of recharge as well as other conceptual and parameter uncertainties
- Use the ensemble set of models to re-run HCP-style analyses to evaluate the effect of conservation measures with modern pumping imposed on drought-of-record scenarios
- Goal is to complete this round of uncertainty analyses by end of 2016

Backup Slides

Comparison of HSPF and USGS Recharge Estimates



Comparison to Water Balance Approach

Comparison of Cumulative Recharge for Various Estimation Methods

