



# 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

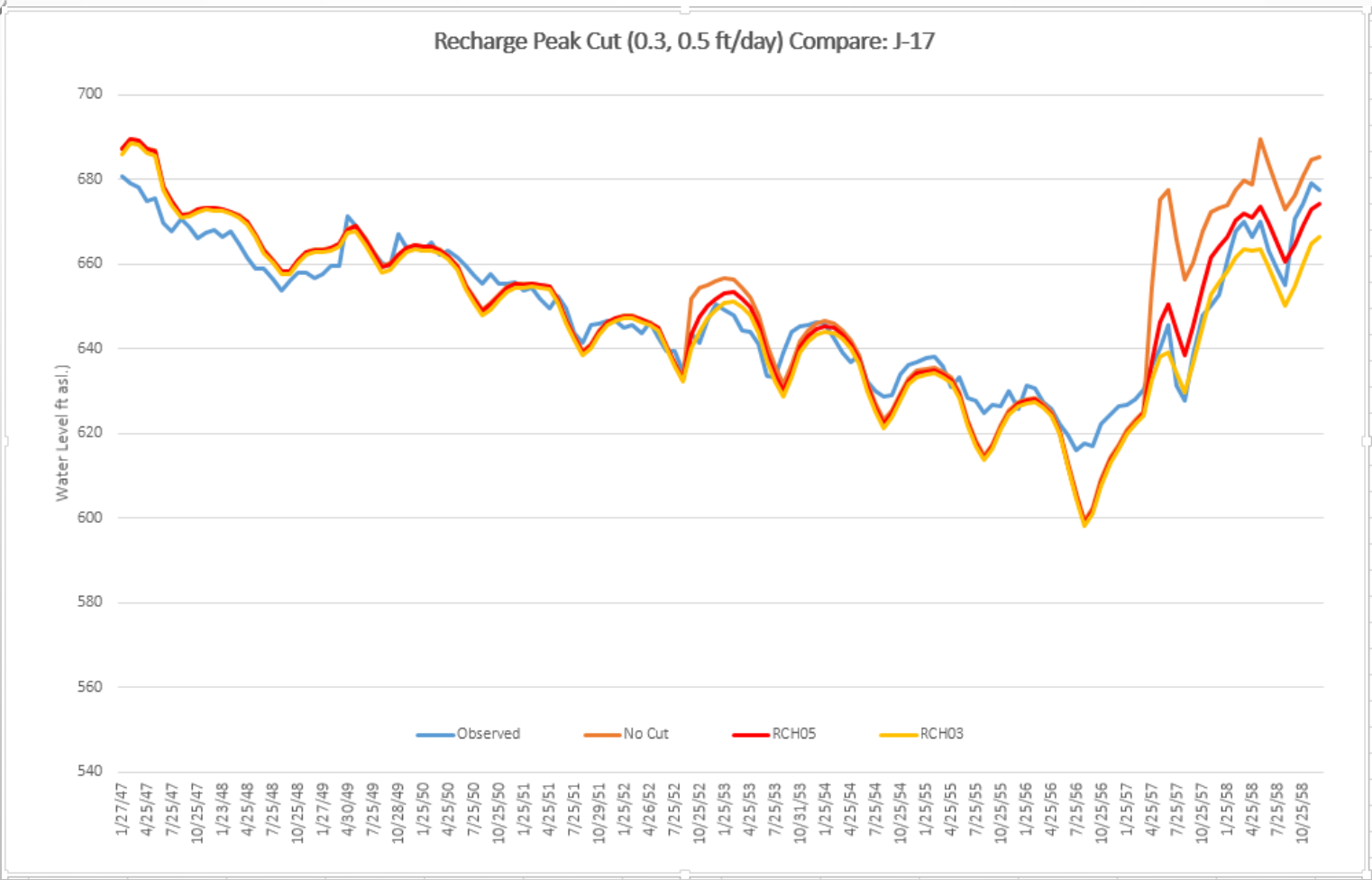
## Groundwater Modeling 5-Year Plan

- 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

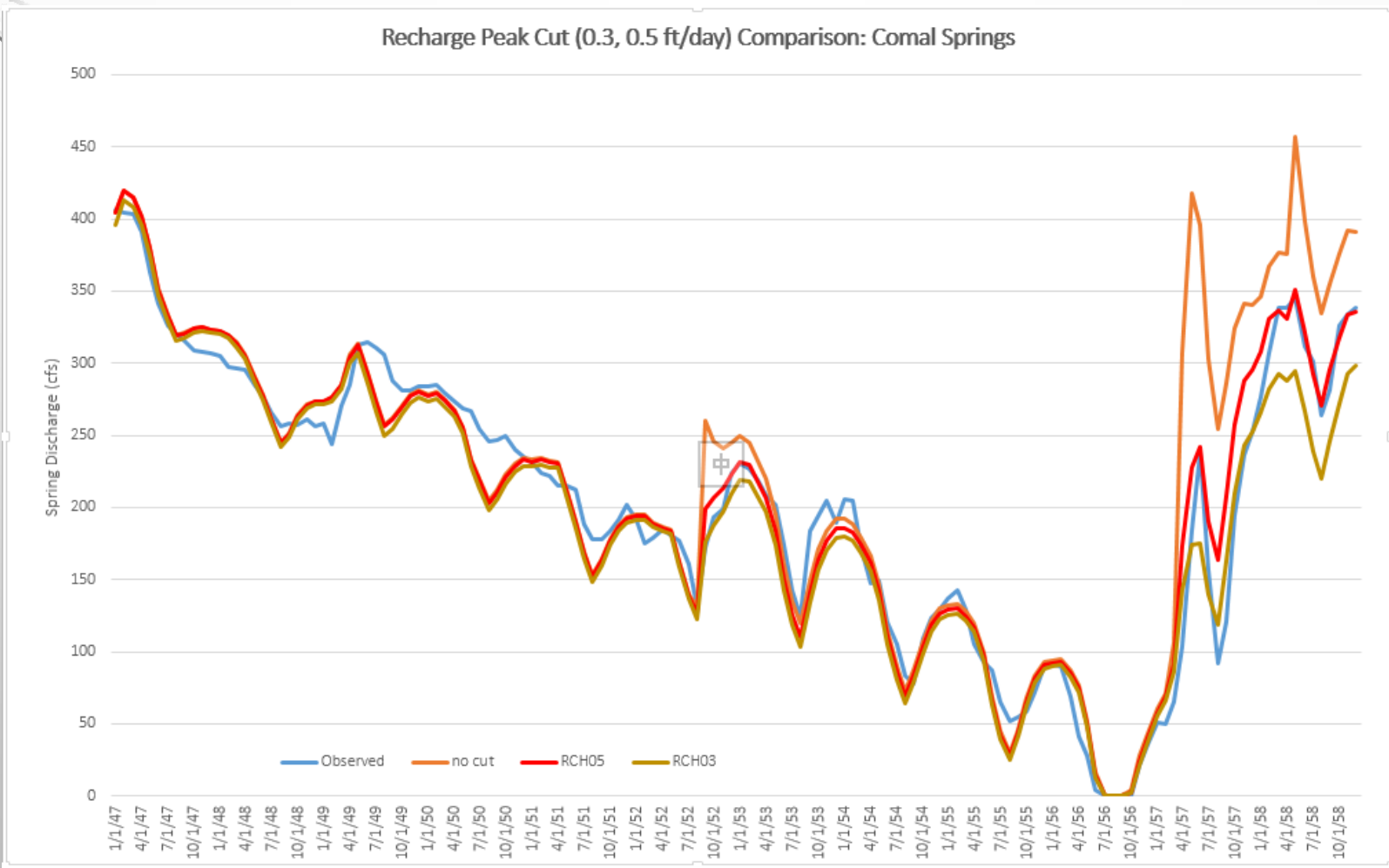


# Preliminary Drought-of-Record Simulations with Updated MODFLOW Models

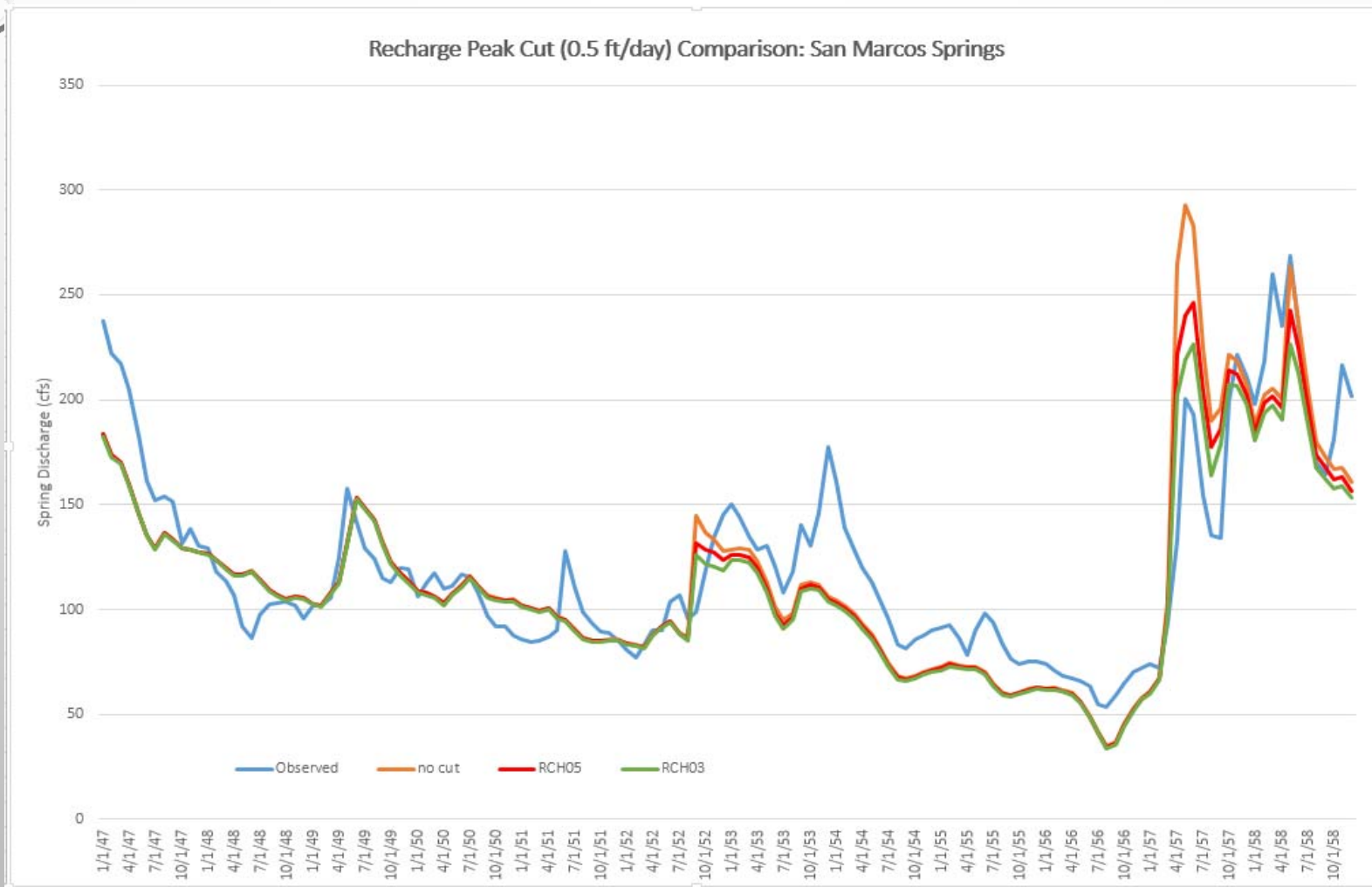
# MODFLOW Drought-of-Record Scenario: sensitivity to limiting peak recharge rate



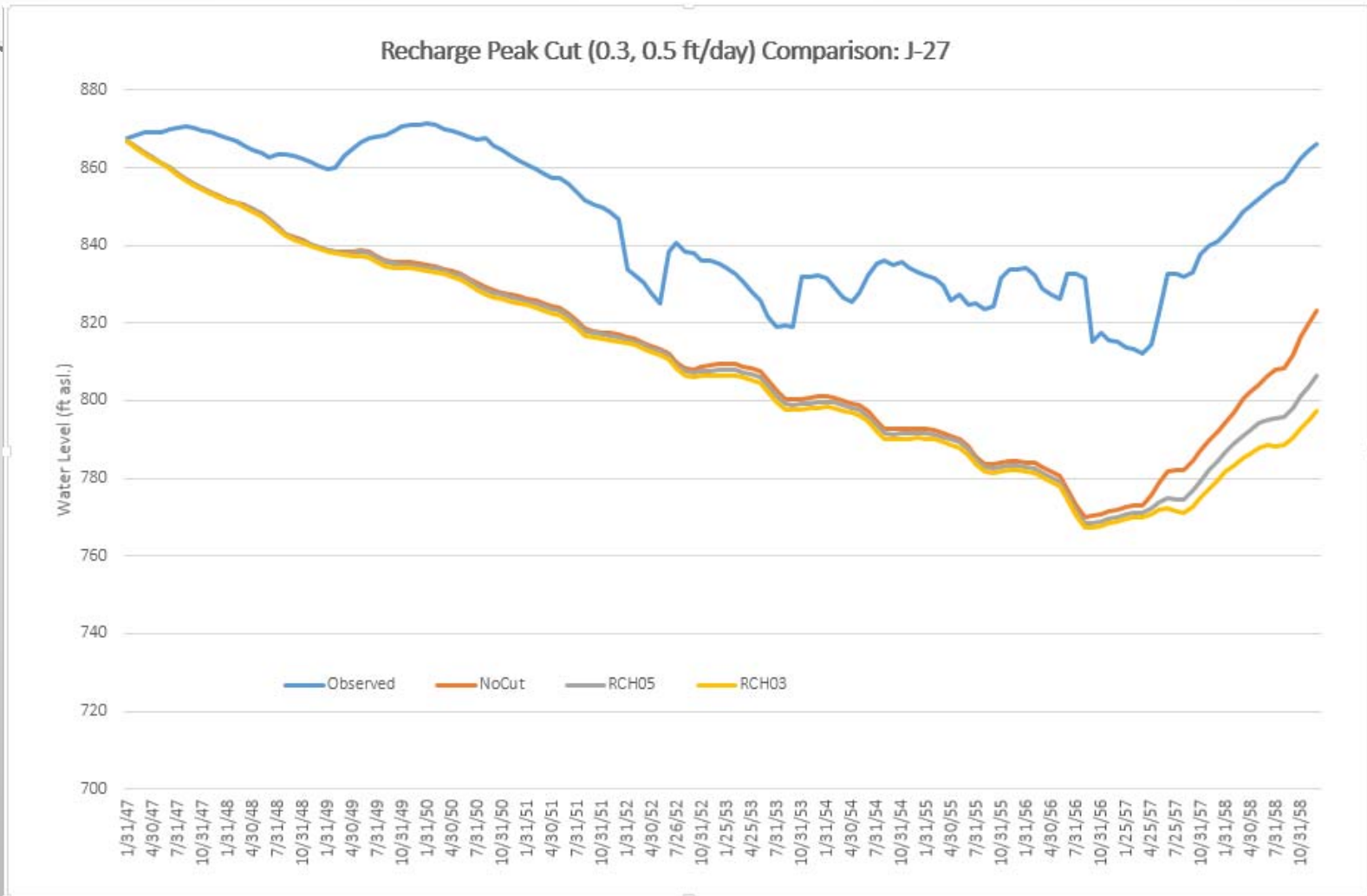
# MODFLOW Drought-of-Record Scenario: sensitivity to limiting peak recharge rate



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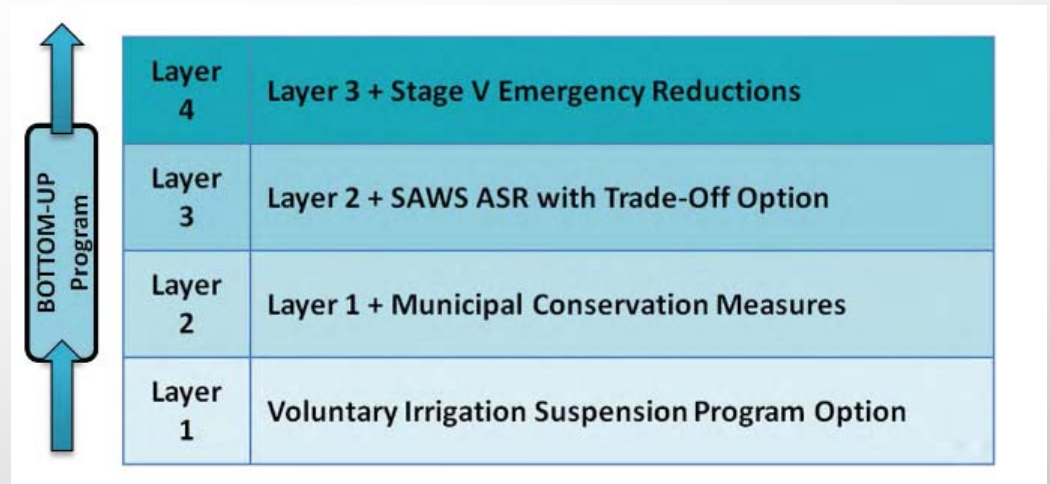






# Model Usage in Developing the HCP

- 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

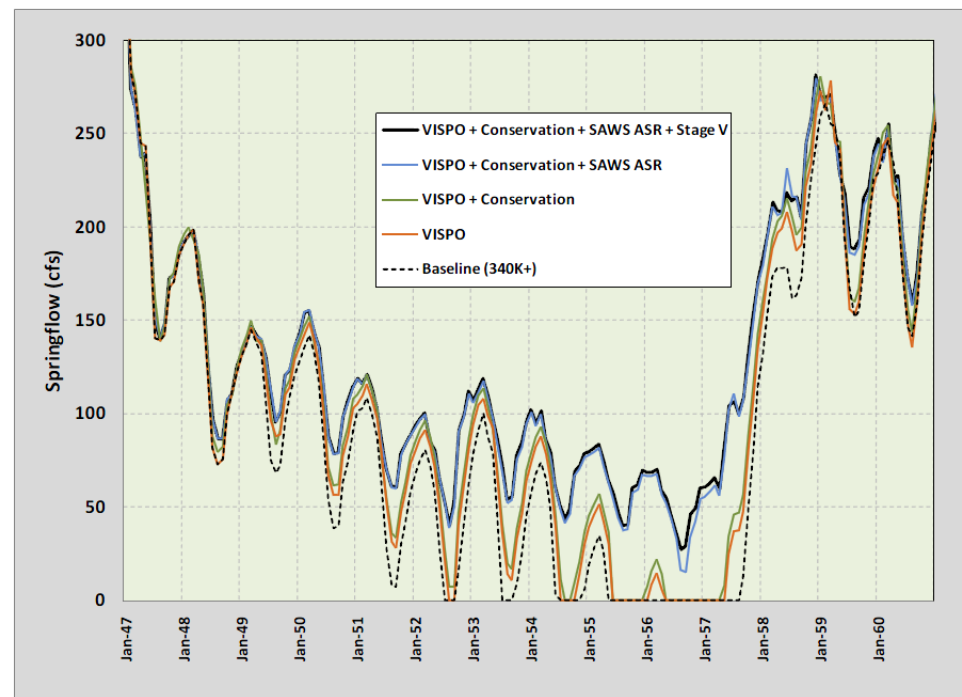


Figure 3-9. Simulated Springflow at Comal Springs (1947-1960)

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

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

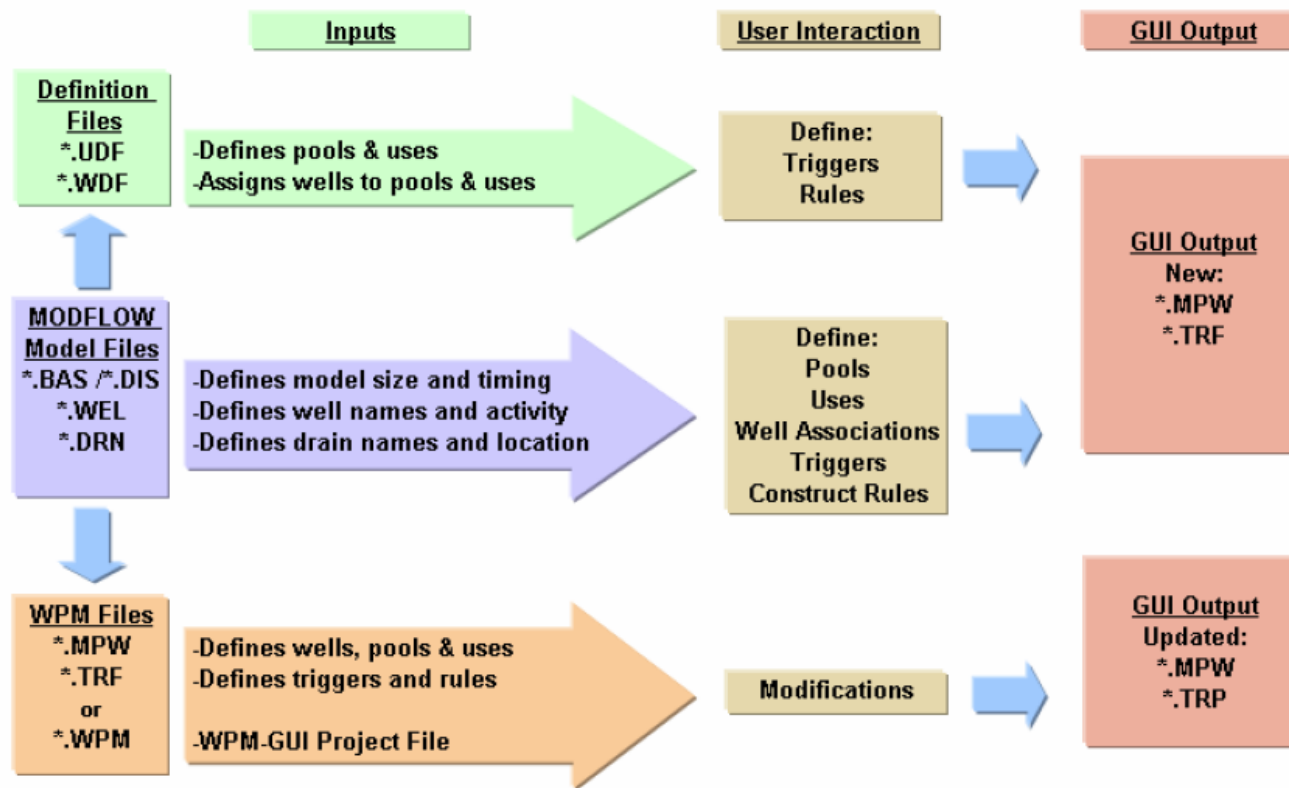


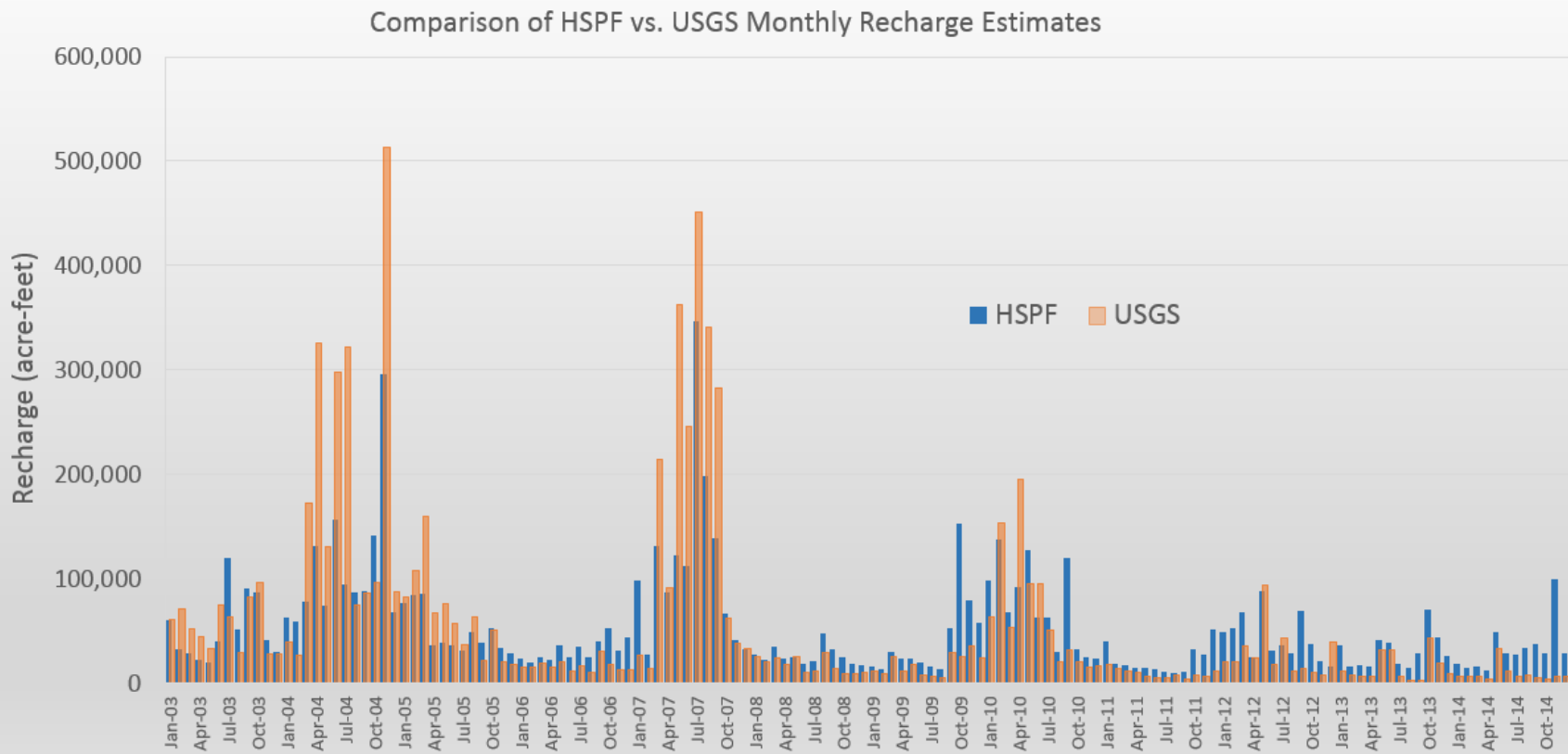
Figure 5.1: General Functional Flow of the WPM-GUI

# 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

