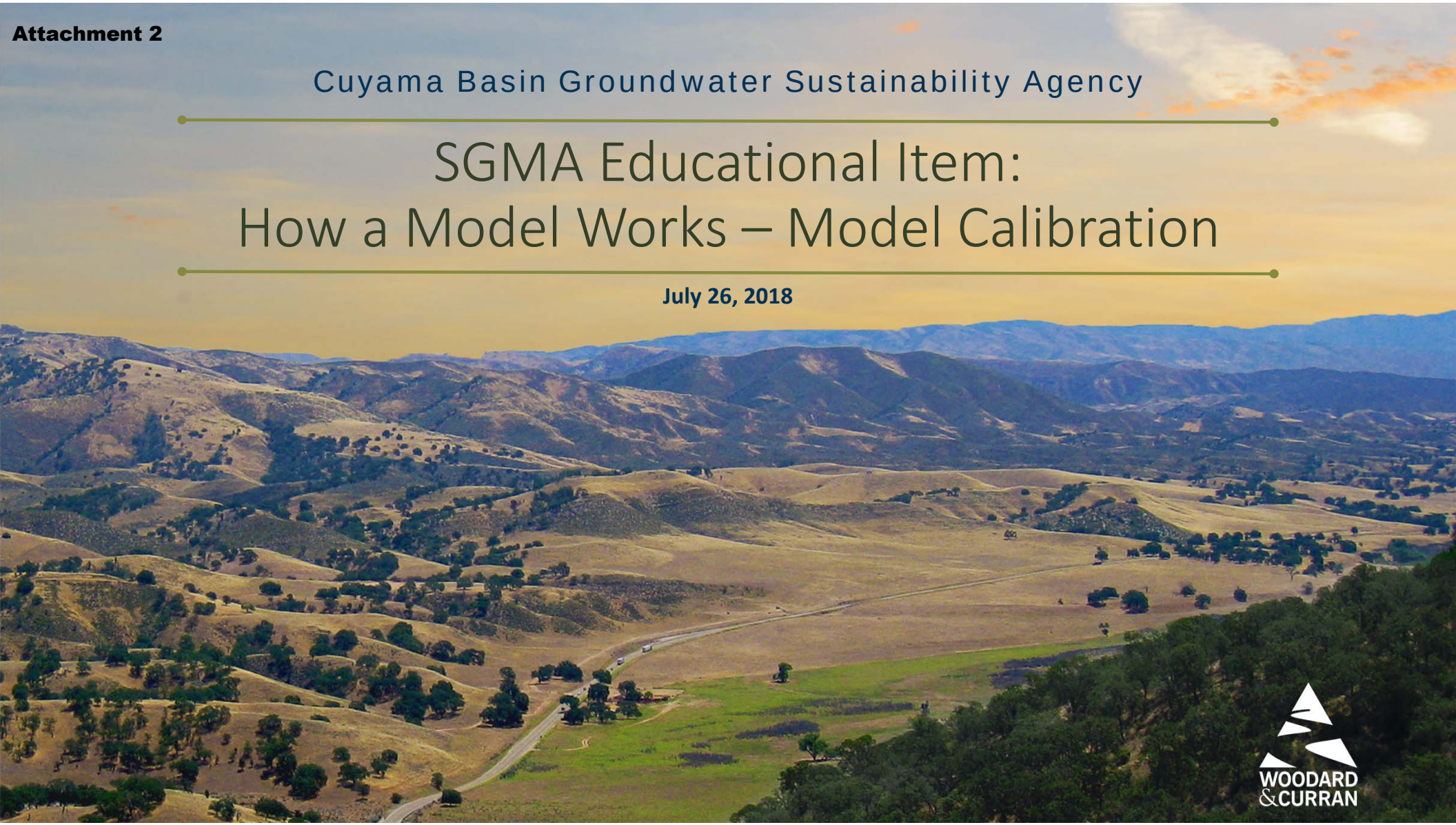
Attachment 2

Cuyama Basin Groundwater Sustainability Agency

SGMA Educational Item: How a Model Works – Model Calibration

July 26, 2018

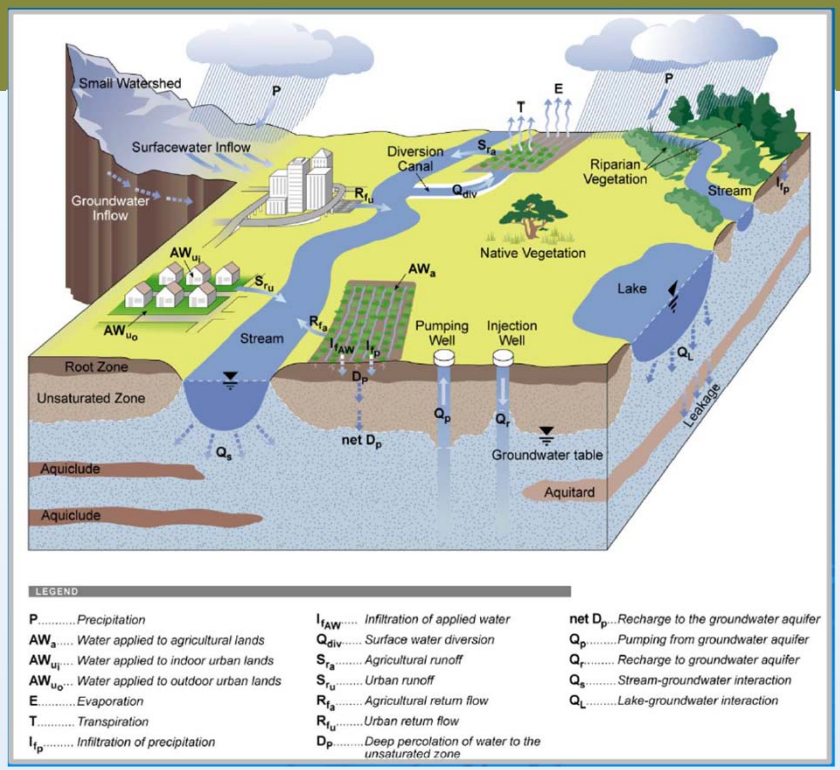


Introduction to Integrated Water Resources Models

Integrated Water Resources Models are computer models that simulate physical movement and use of water on the land surface, stream, and the groundwater system and the interaction among these systems. These models are used to represent the historical conditions of a basin, as well as to evaluate the physical conditions under projected land and water use and groundwater conditions for planning and management purposes.

Integrated Water Flow Model (IWFM)

- An open-source regional-scale integrated water resources model that simulates groundwater flow, surface flows, and surface-groundwater interactions, developed by the California Department of Water Resources.
- A planning and analysis tool that computes agricultural and urban water demands based on varied climatic, soil, land-use and agronomic conditions.
- Allows the user to represent agricultural and urban water management practices, and their effects on the complete water cycle.



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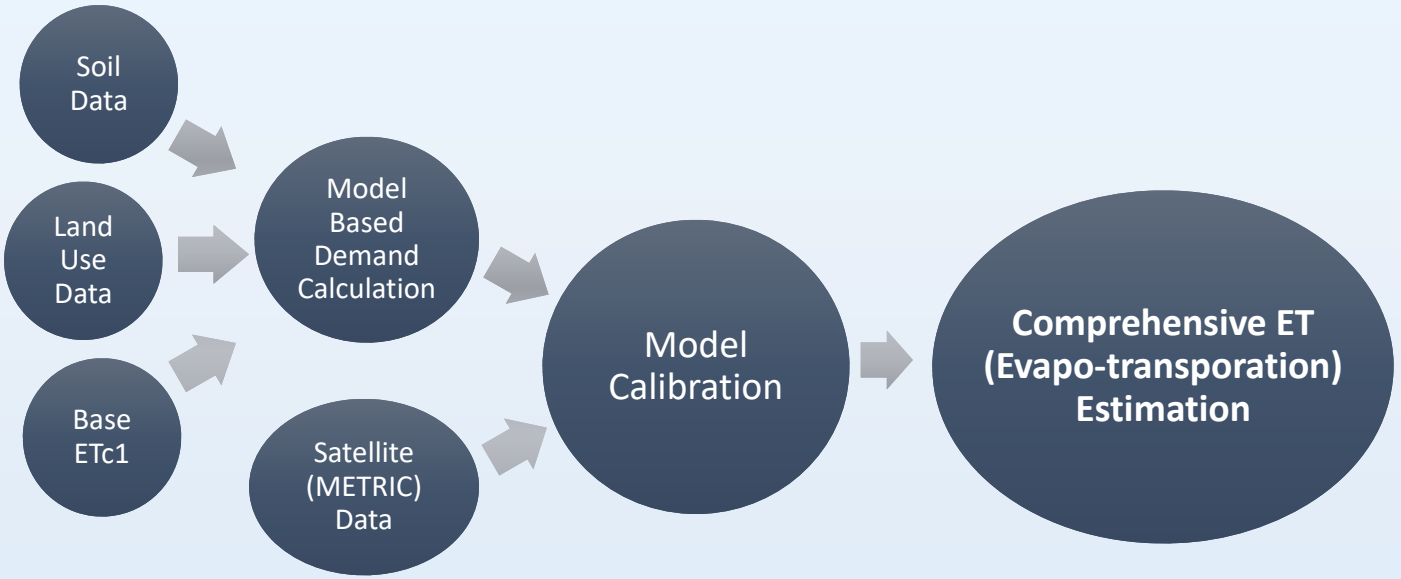
Agricultural Demand and GW Pumping Estimation

$$Agricultural\ Irrigation\ Demand = \frac{ET\ from\ Applied\ Water}{Irrigation\ Efficiency}$$



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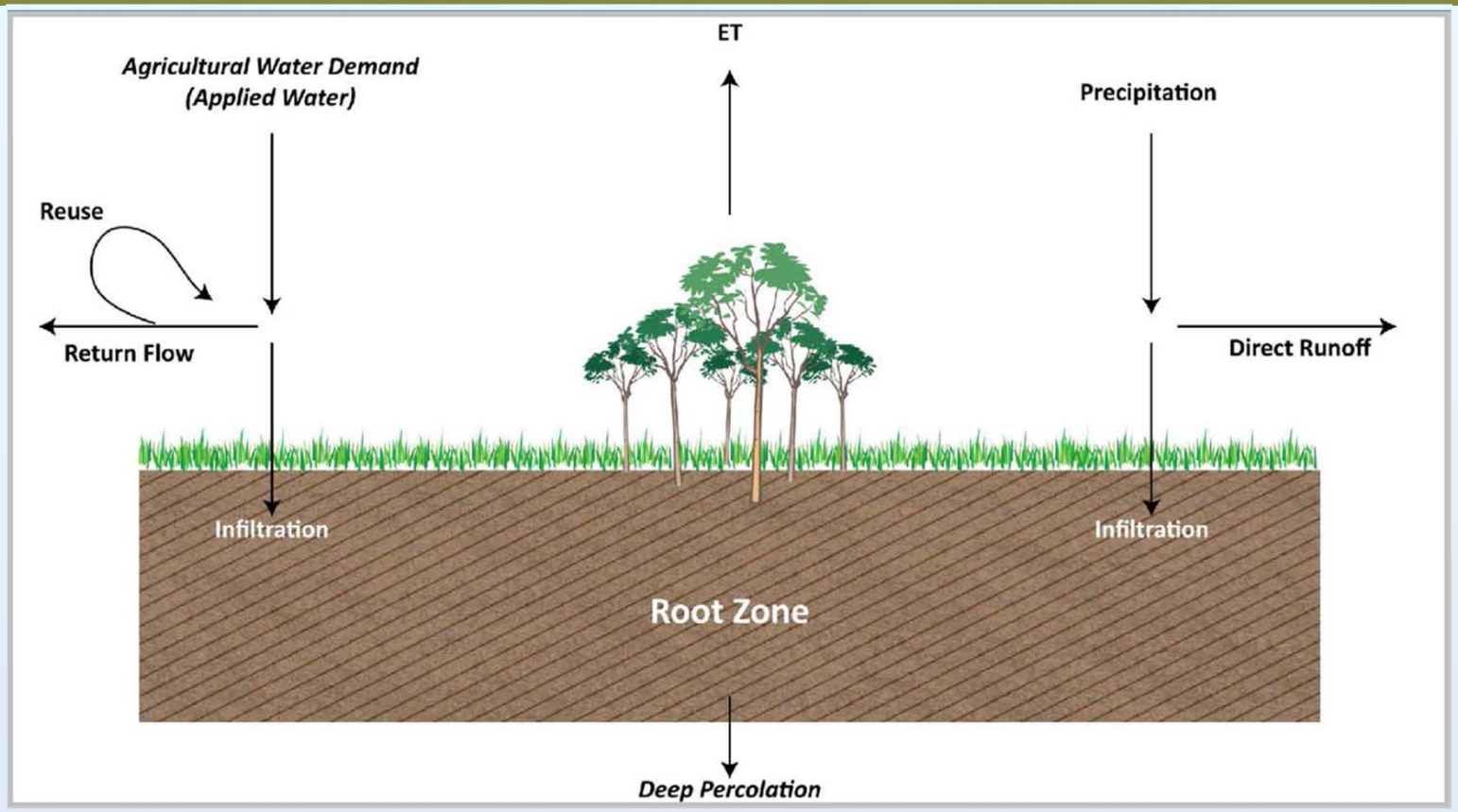
Estimation of Agricultural Water Demand (Applied Water)



Agricultural Demand and GW Pumping Estimation

$$Agricultural\ Irrigation\ Demand = \frac{ET\ from\ Applied\ Water}{Irrigation\ Efficiency}$$

Factors Influencing Irrigation Efficiency:

- Irrigation Practices
- Soil Conditions
- Conveyance & Distribution Systems
- Land Leveling

Typical Range
on the regional scale:
65-75%

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Urban Demand Estimation

- Based on historical population records

  and

- Average estimate of unit water use (GPCD)

- Existing Urban Water Use = Existing Population x GPCD
- Future Urban Water Use = Projected Population x GPCD

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GW Pumping Estimation

Groundwater Pumping = Agricultural Demand
+ Urban Demand
+ Frost Protection
+ Dust Control
+ Other

Model Calibration is the process of adjusting model parameters so that the model properly represents the observed data as closely as possible

- Typical areas for which the model is calibrated are:
  - Water Budget
    - Land surface system
    - Groundwater system
    - Stream system
  - Groundwater Levels
  - Stream Flows

Typical Parameters Considered for Calibration:

- Land Surface Processes – Soil Parameters and Deep Percolation
- Boundary Flows from the Small Watersheds
- Aquifer Hydraulic Parameters – K, S_y, S_s
- Stream-Aquifer Interaction – C_b

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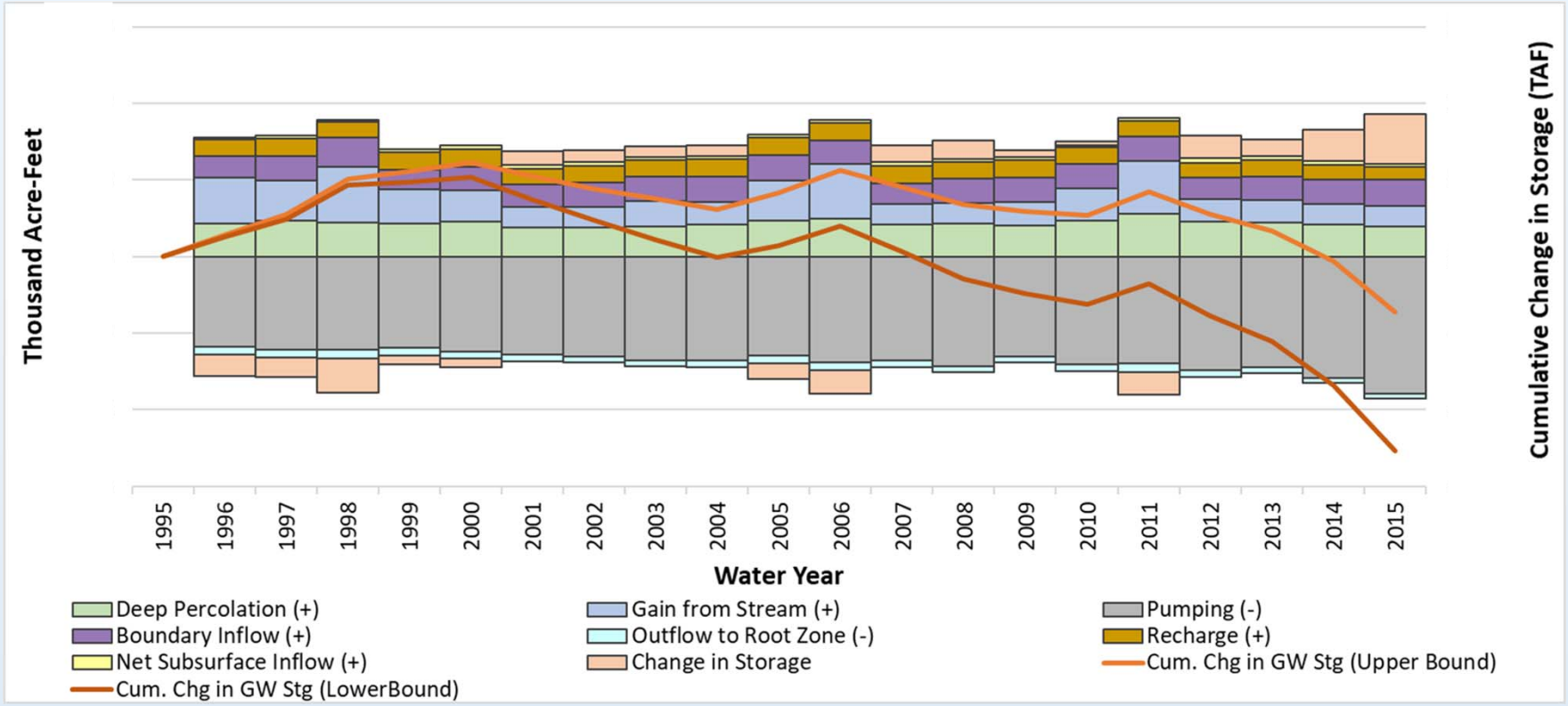
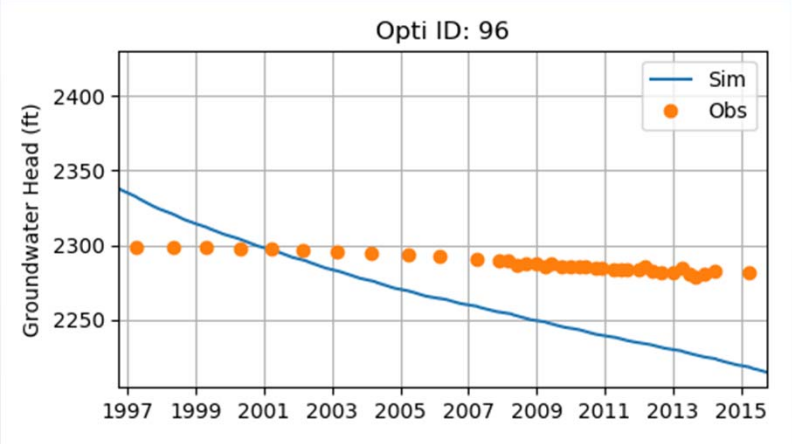
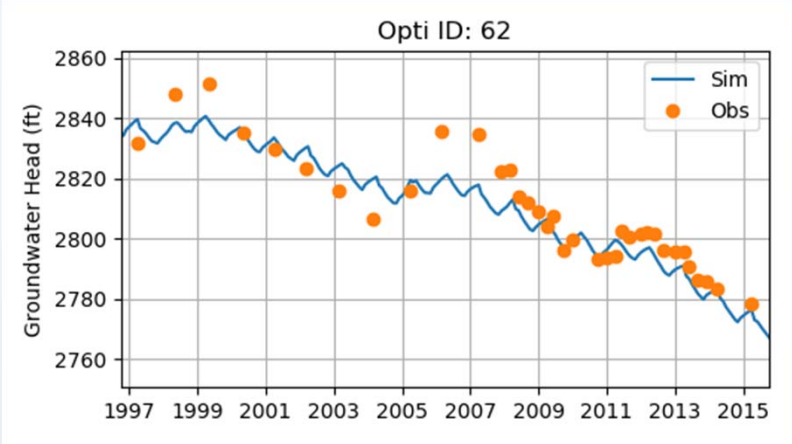
Model Calibration – Groundwater Budget



Model Calibration – Groundwater Levels



Poor Calibration



Good Calibration

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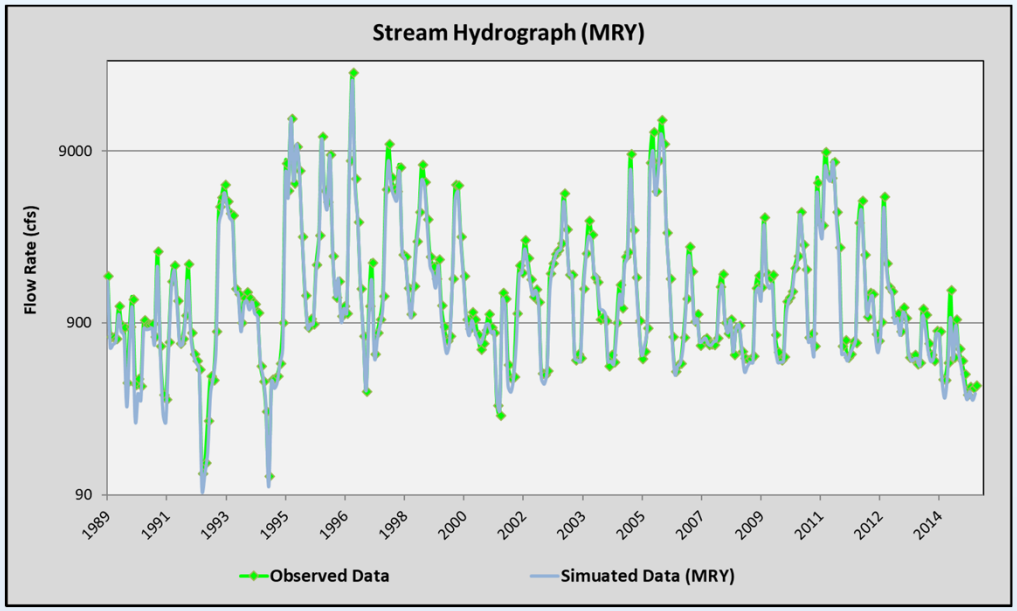
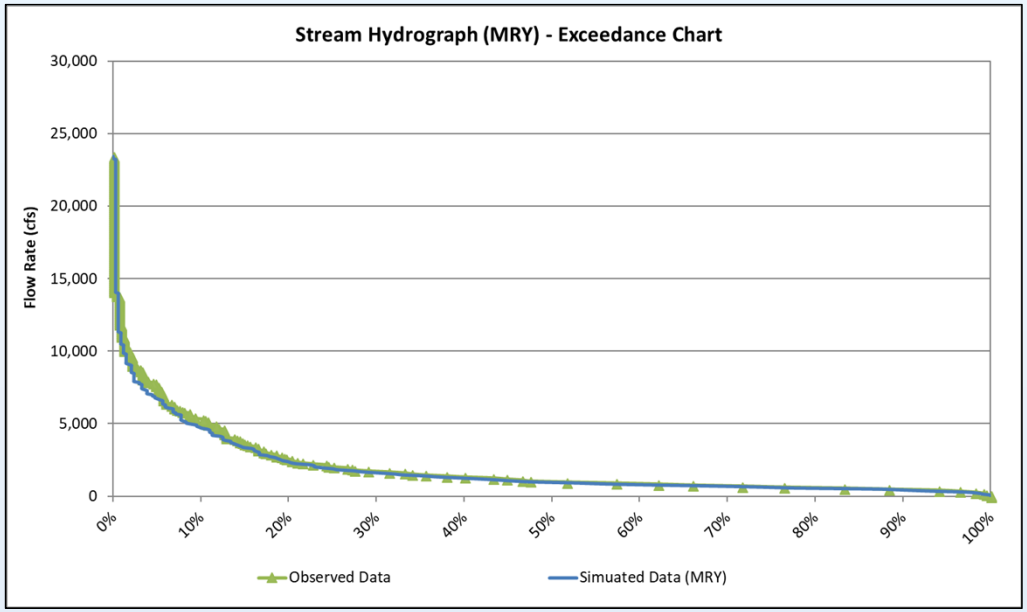
Model Calibration – Stream Flows





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