RECLAMATION

Managing Water in the West

Hood River Basin Study

Groundwater Modeling

19AUG2013

U.S. Department of the Interior

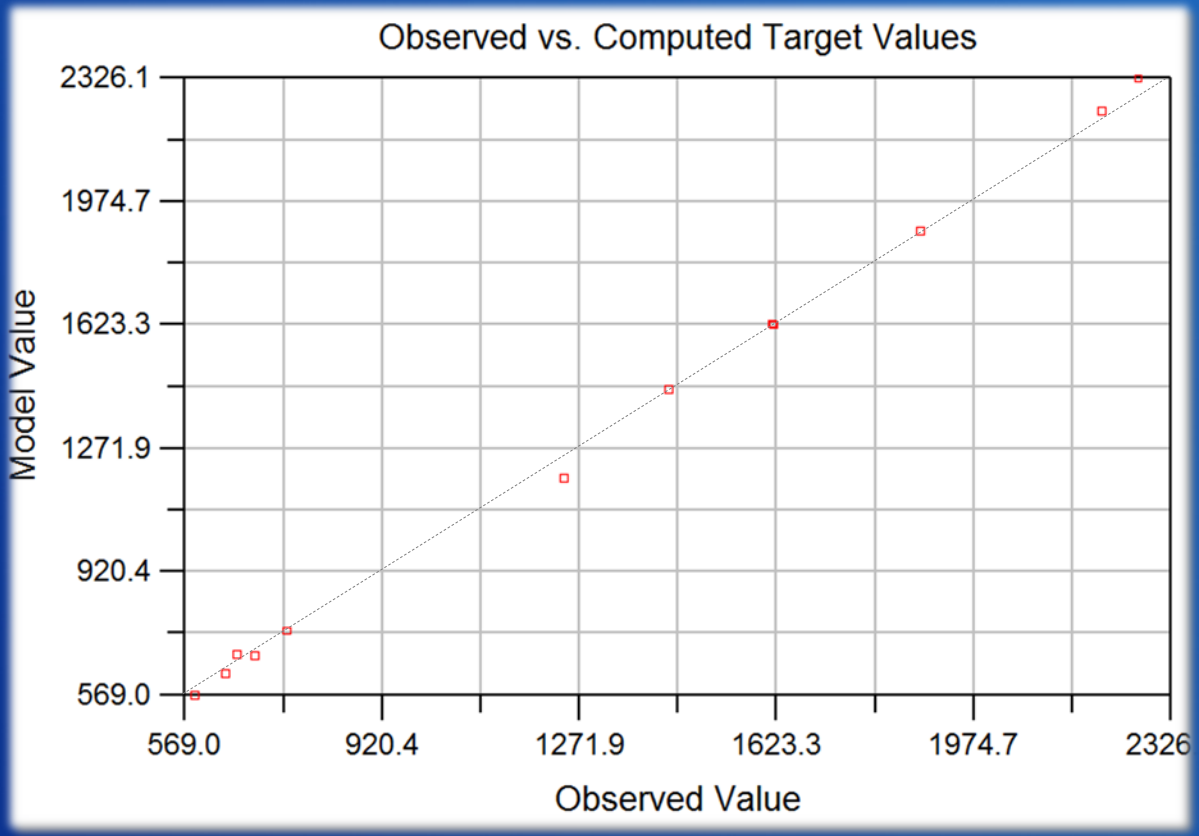
Bureau of Reclamation

Model Calibration

- **PEST Pilot Points**
  - **Hydraulic Conductivity (Steady State)**
  - **Storativity (Steady State & Transient)**

Model Calibration: Steady State

Residual Mean	= -3.99
Residual Standard Dev.	= 27.08
Absolute Residual Mean	= 20.32
Residual Sum of Squares	=8.99e+003
RMS Error	=27.37
Minimum Residual	= -58.15
Maximum Residual	= 58.09
Range of Observations	= 1682.00
Scaled Res. Std. Dev.	= 0.016
Scaled Abs. Mean	= 0.012
Scaled RMS	= 0.016
Number of Observations	= 12



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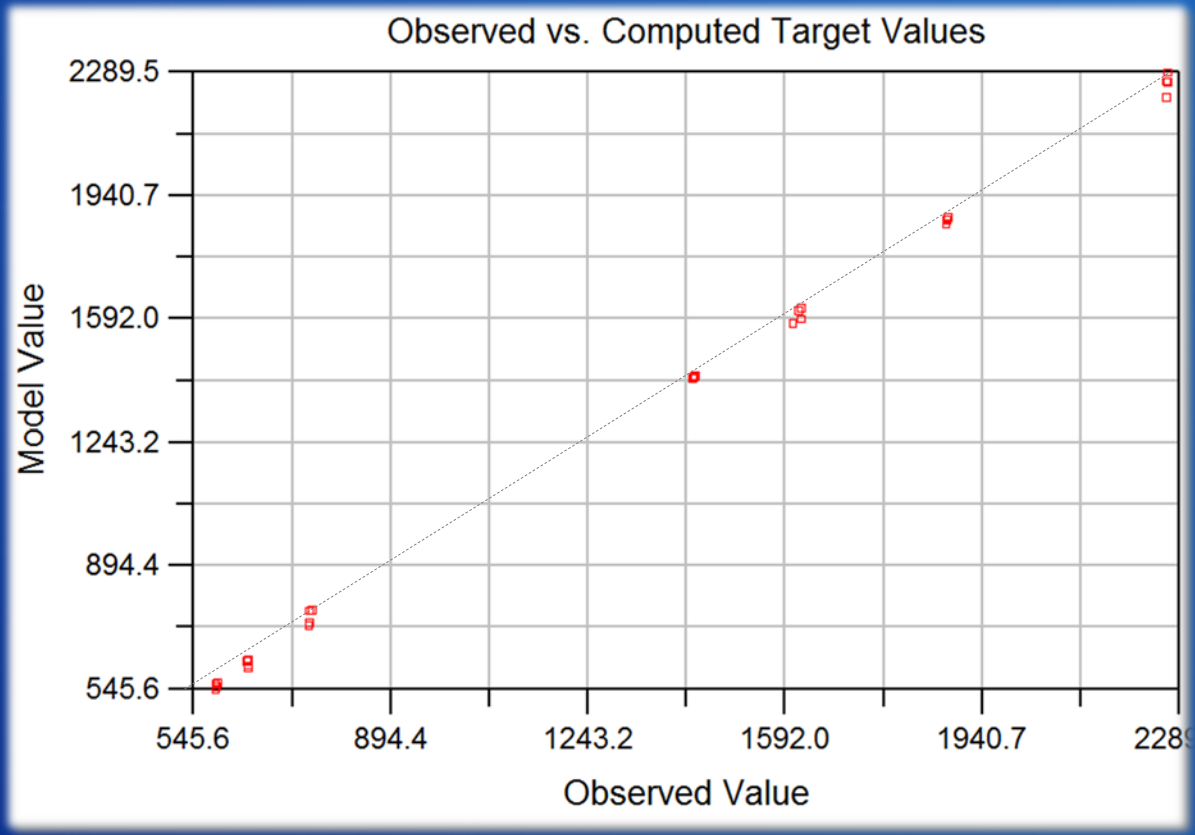
Model Calibration: Transient

Residual Mean	= 12.97
Residual Standard Dev.	= 16.81
Absolute Residual Mean	= 16.80
Residual Sum of Squares	=6.31e+004
RMS Error	=21.23
Minimum Residual	= -20.55
Maximum Residual	= 47.45
Range of Observations	= 1686.00
Scaled Res. Std. Dev.	= 0.010
Scaled Abs. Mean	= 0.010
Scaled RMS	= 0.013
Number of Observations	= 140



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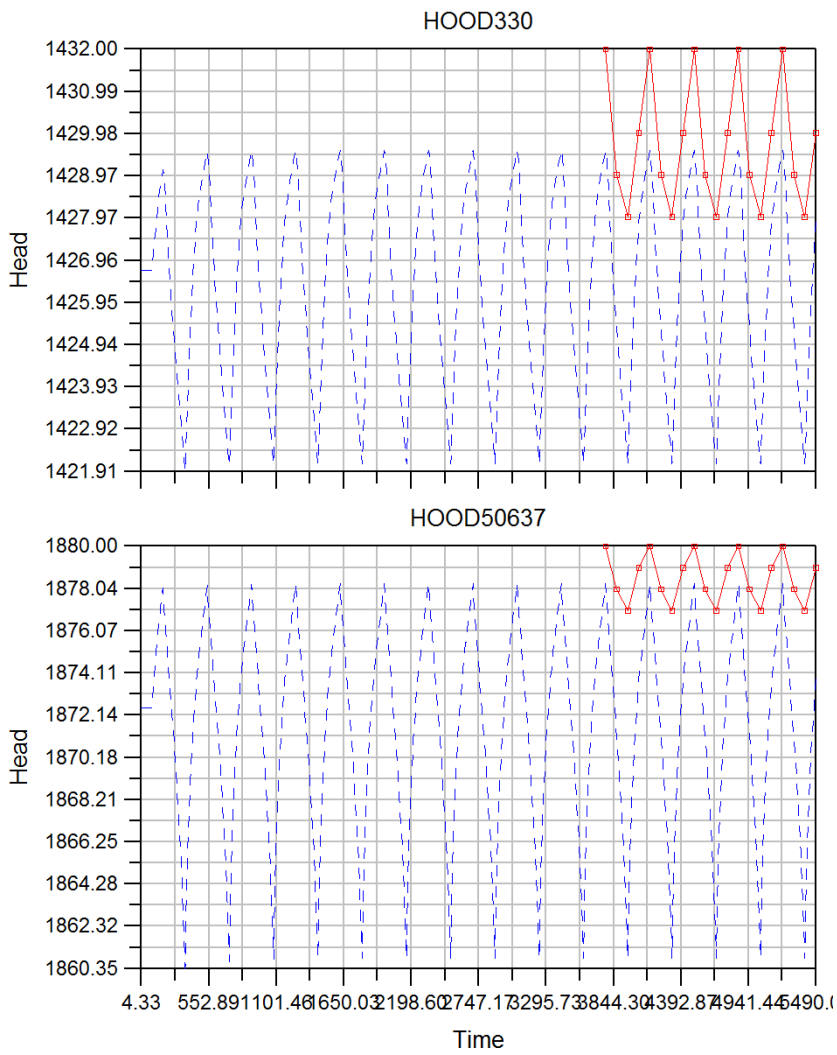
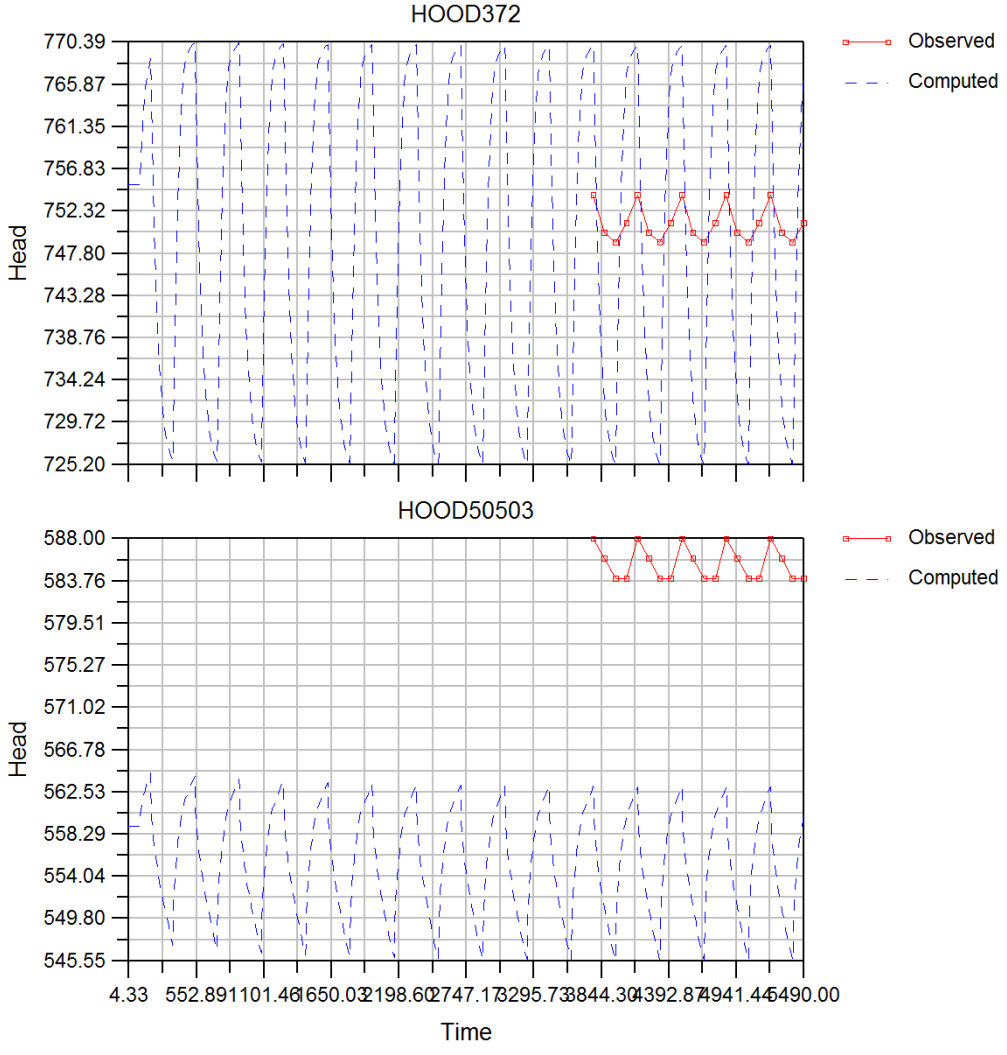
Model Calibration: Transient

Upper Valley

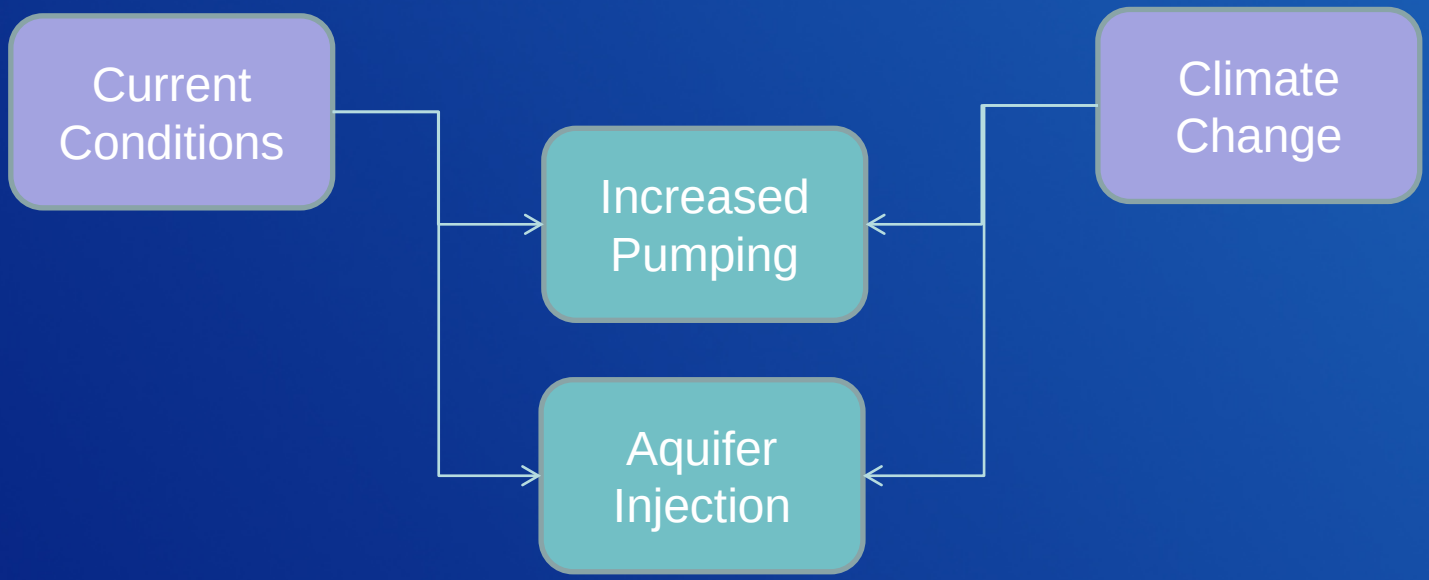
Lower Valley





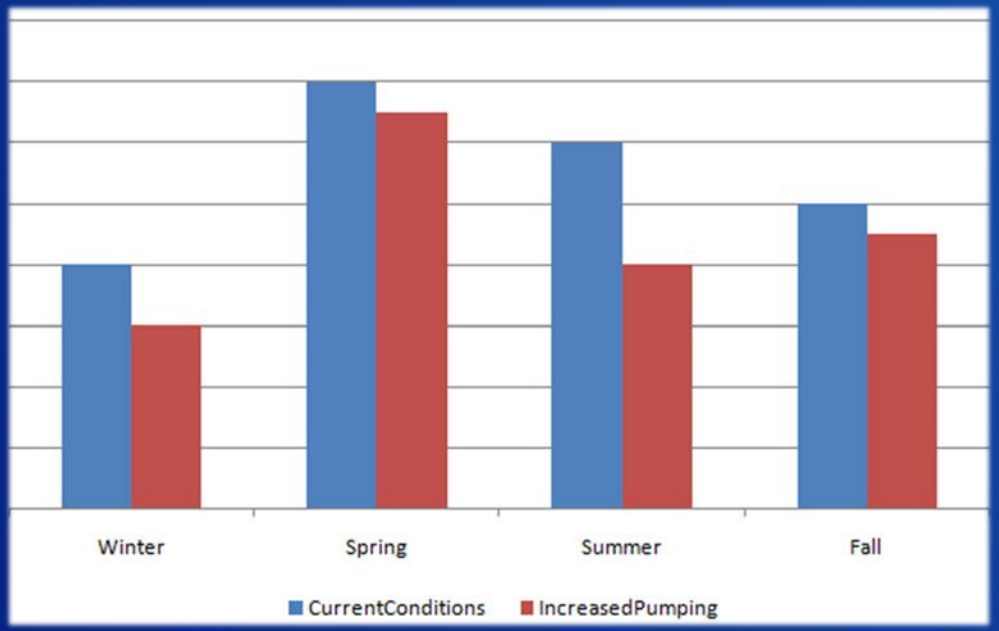
Model Scenarios

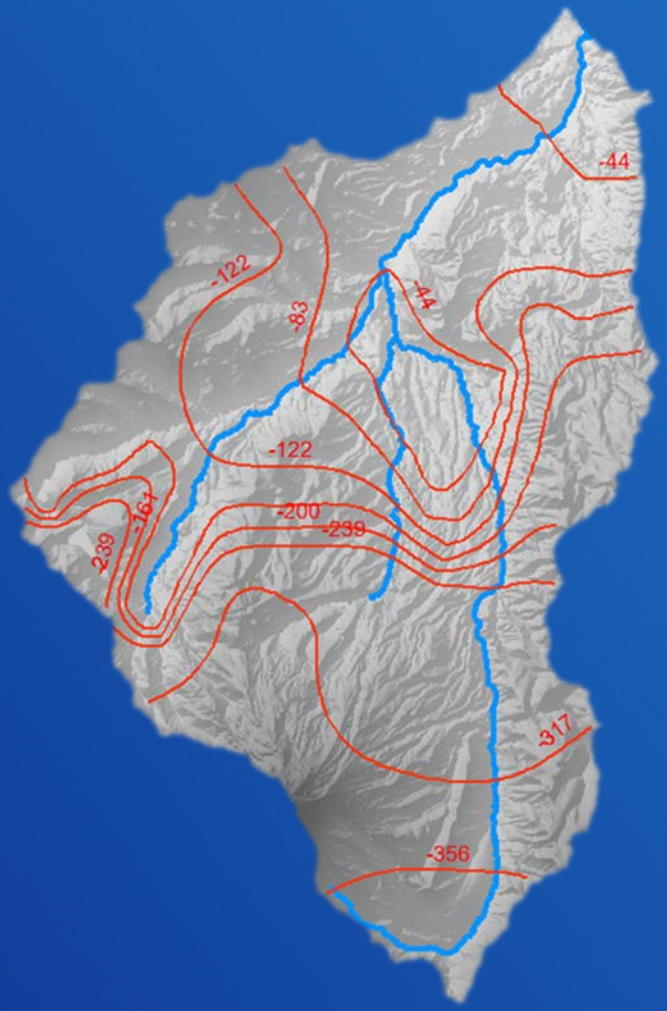
- **Two underlying conditions each with two different scenarios**
  - Conditions:
    - Current conditions
    - Climate change conditions
  - Scenarios:
    - Increased pumping
    - Aquifer injection



Scenario Output Reporting

- **The effects of each scenario will be evaluated and reported on a relative change basis using volumes and head changes.**





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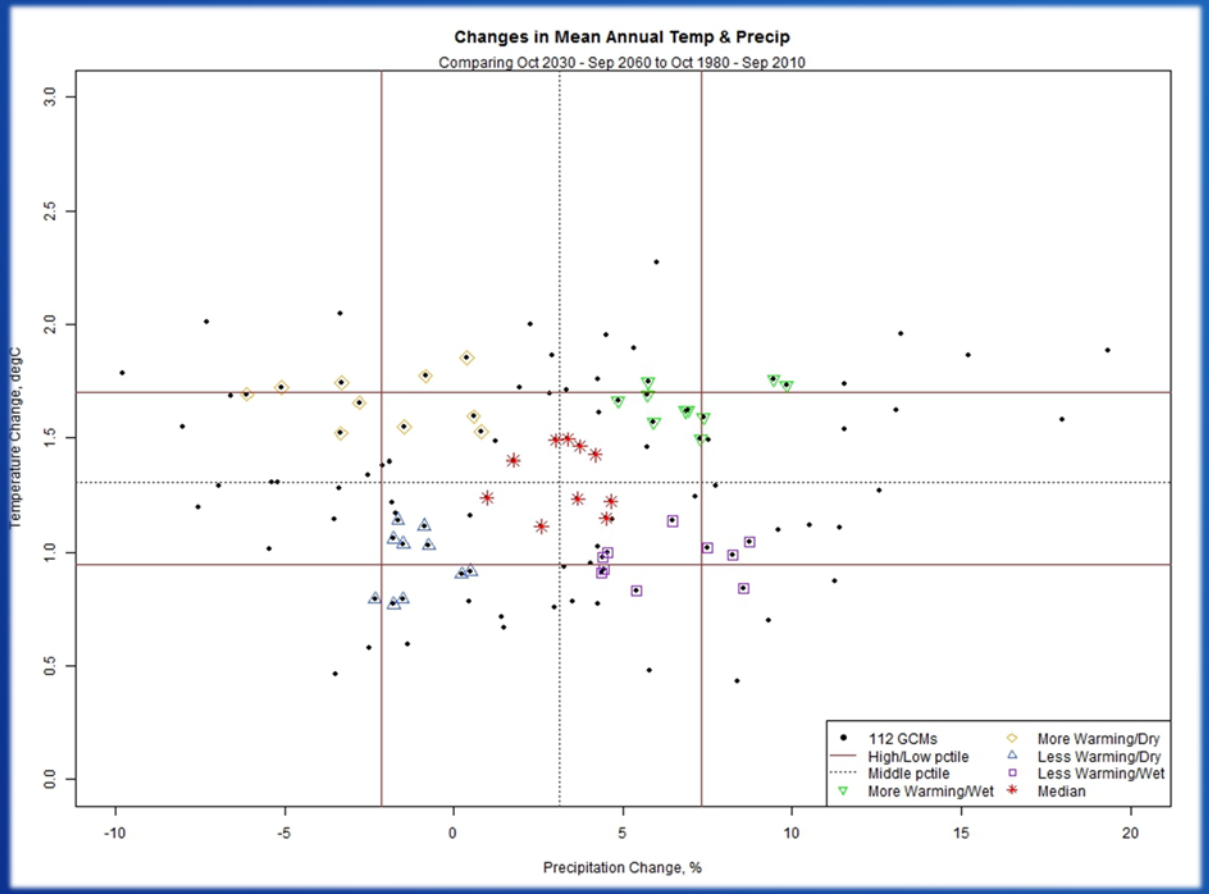
Climate Change Conditions

- **Simulation of climate change conditions mimic procedures and strategies used in other Reclamation studies.**
  - **Projection Selection & Characterization**
    - ***3 Climate Extremes with 10 Projections each using the 20^{th}, 50^{th}, and 80^{th} percentiles.***
  - **Temporal Extent Selection**
    - ***Period Change: 1980 – 2009 vs. 2030 – 2059 or 2010 - 2039***
  - **Projection Processing Methodology**
    - ***Hybrid Delta Ensemble***
  - **Dataset Selection**
    - ***CMIP3***

Projection Selection



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Temporal Extent Selection

- **Period Change**

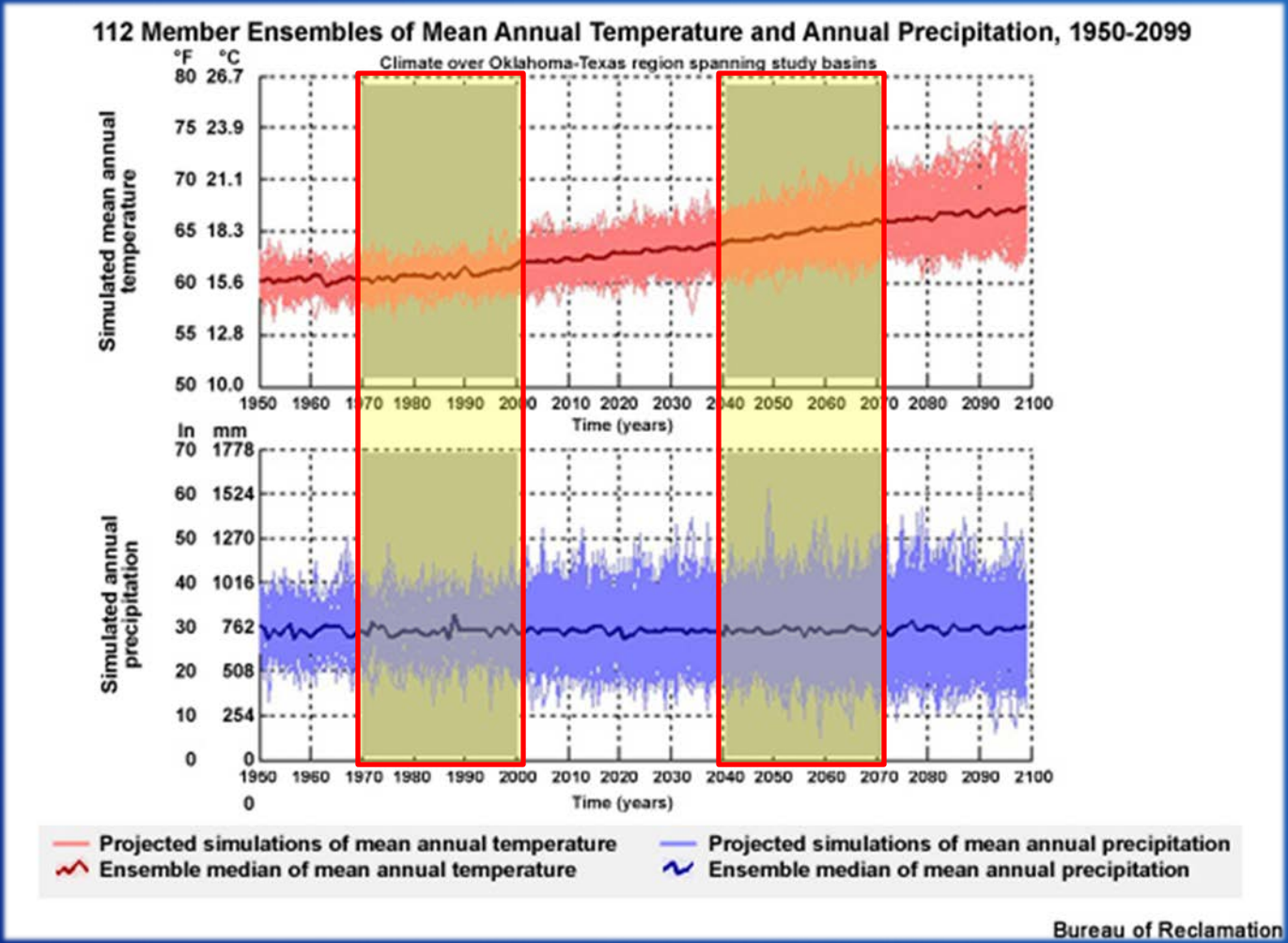

Image Source: *www.MetEd.org*

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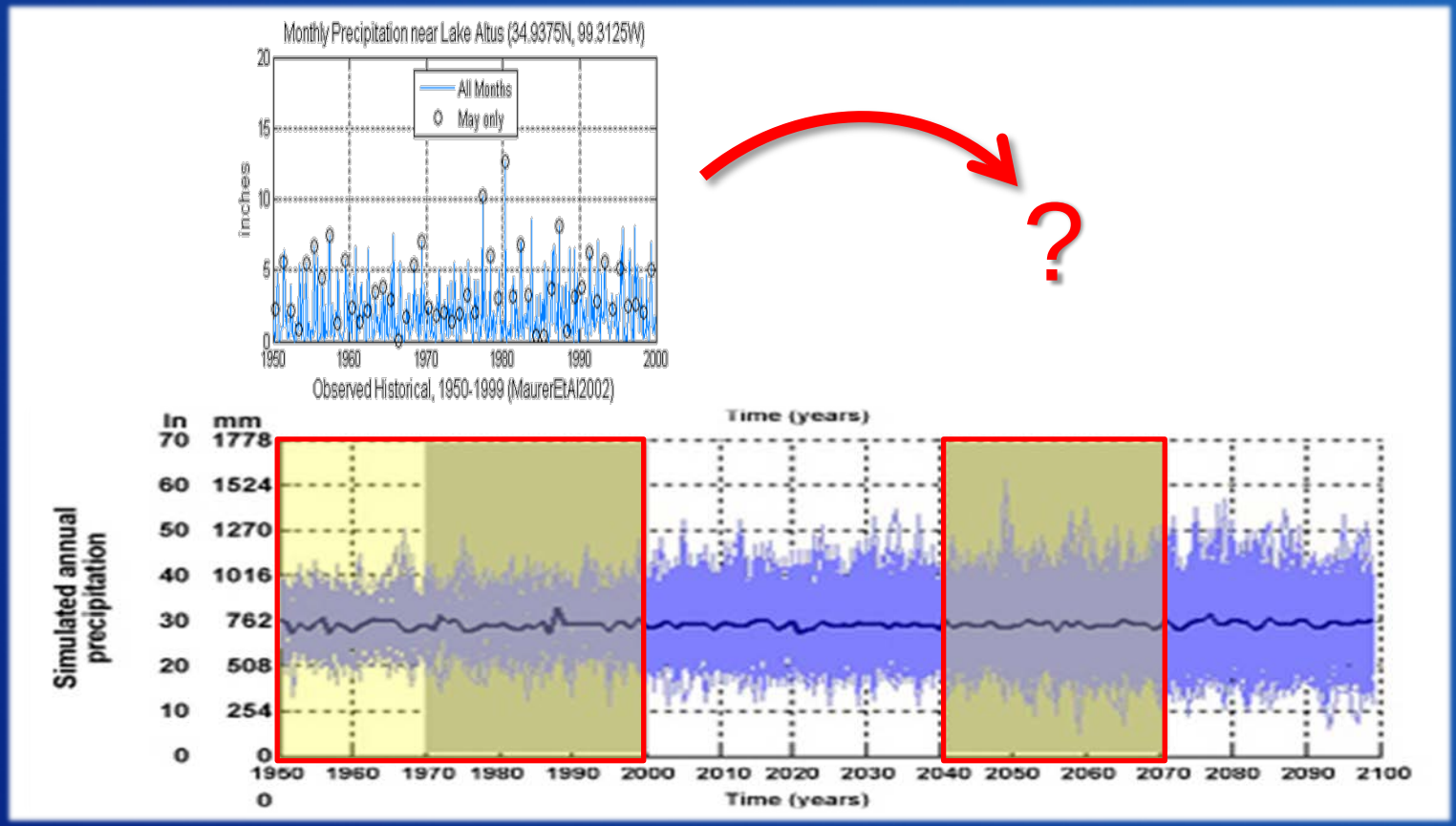
Projection Processing Methodology

- **Hybrid Delta Ensemble**



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Projection Processing Methodology

- **Hybrid Delta Ensemble**

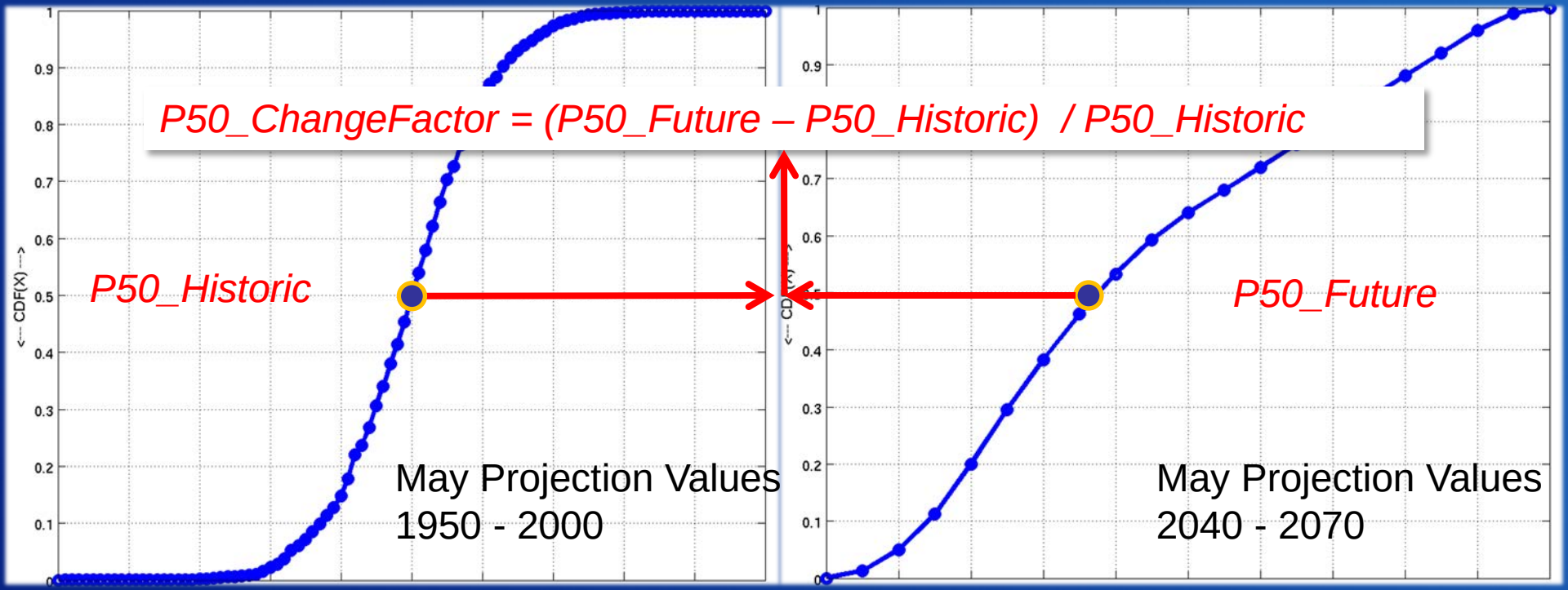

Image Source: *www.MetEd.org*

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Projection Processing Methodology

- **Hybrid Delta Ensemble**

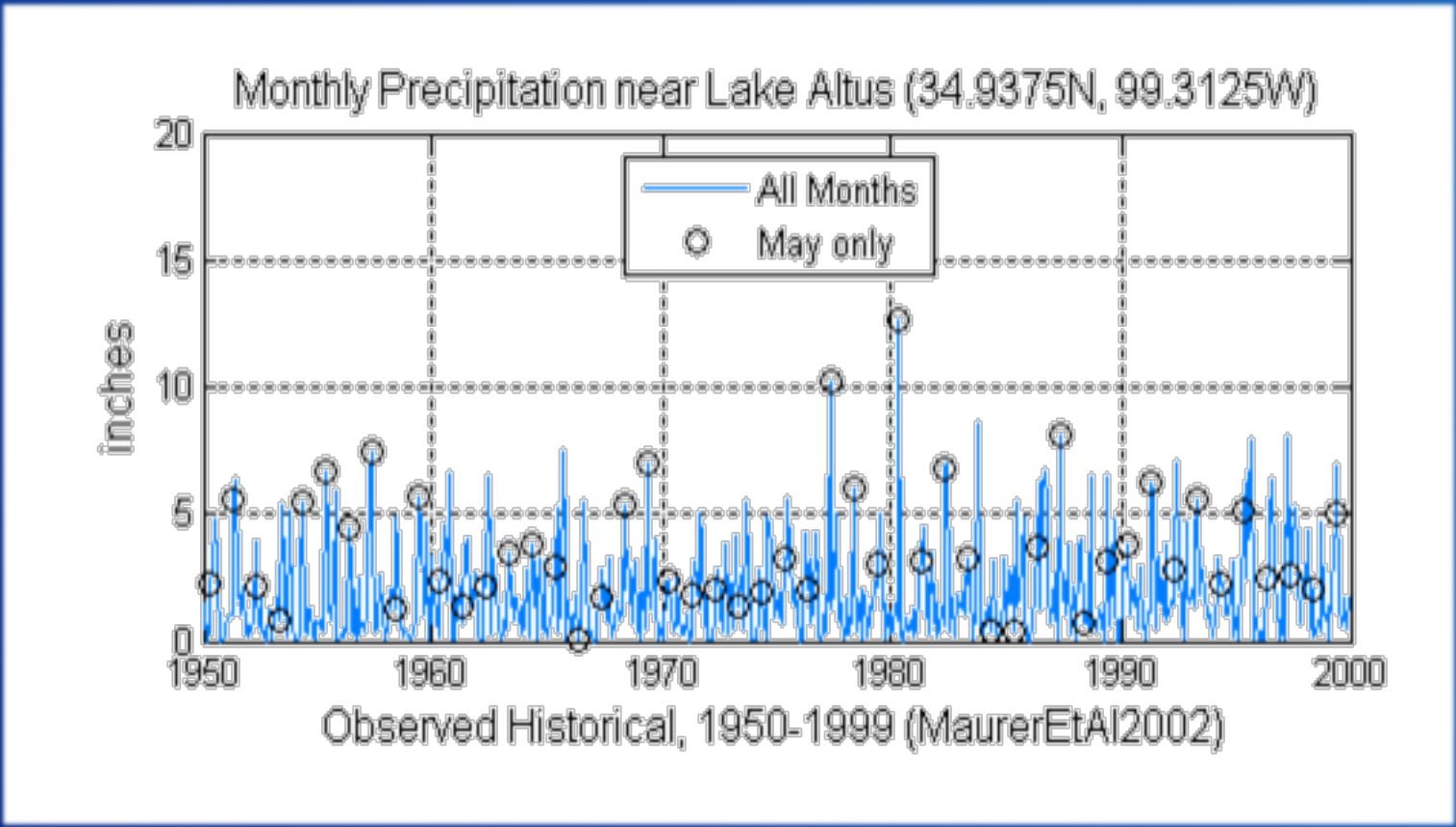

Image Source: *www.MetEd.org*

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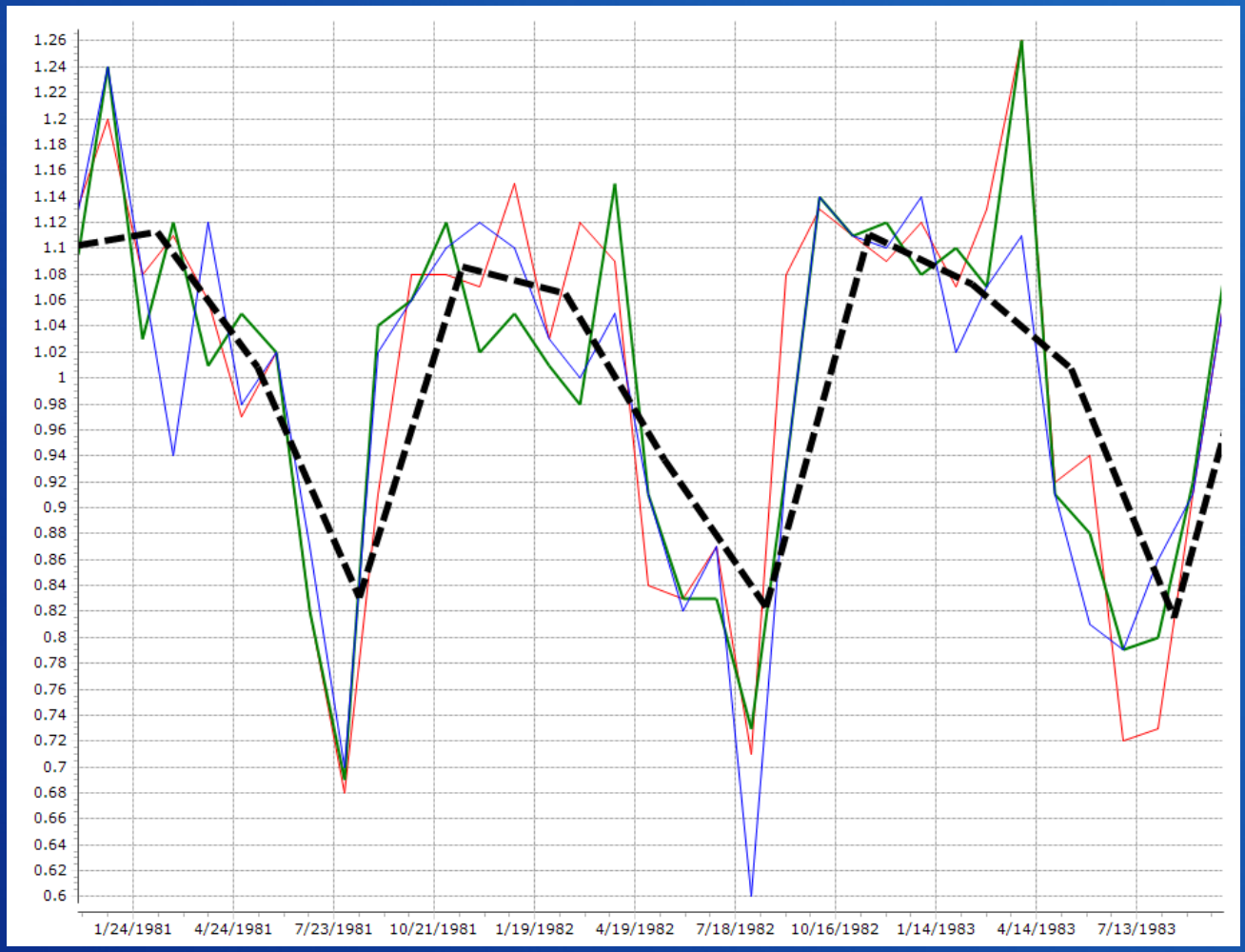
Climate Change Adjustment Factors



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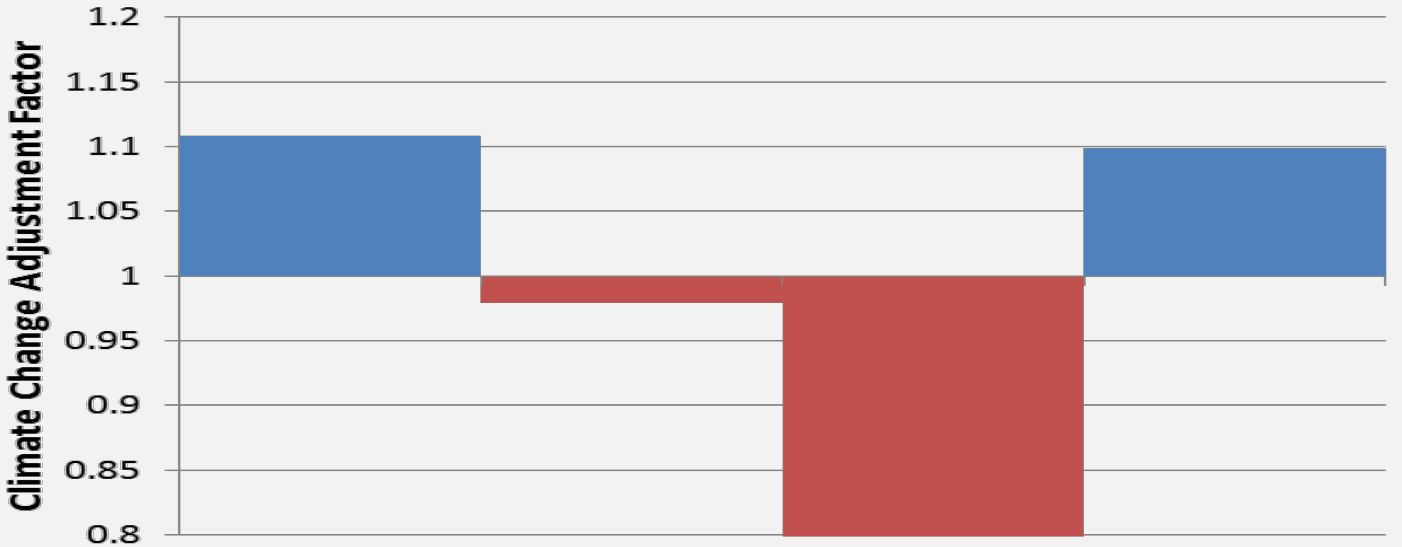
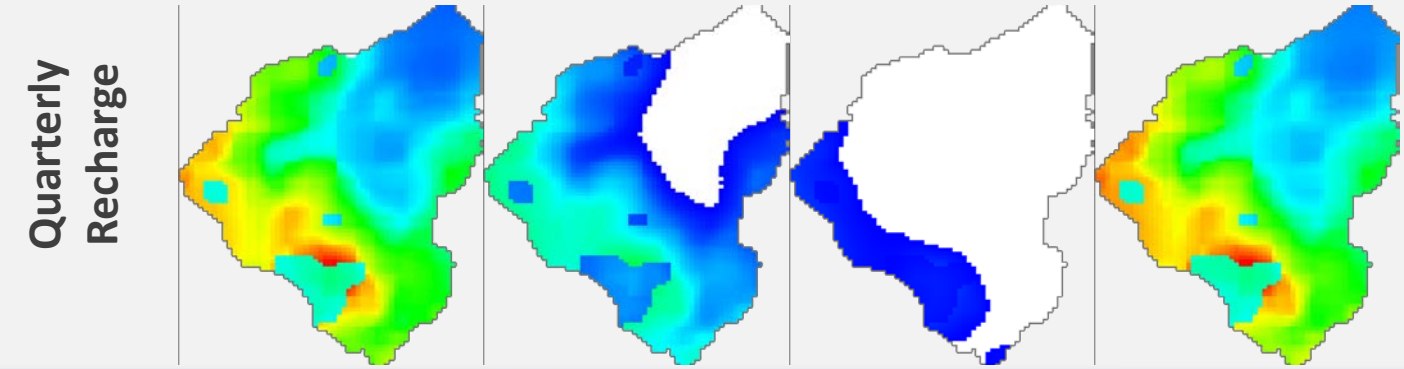
Modeled Recharge: Wet Conditions





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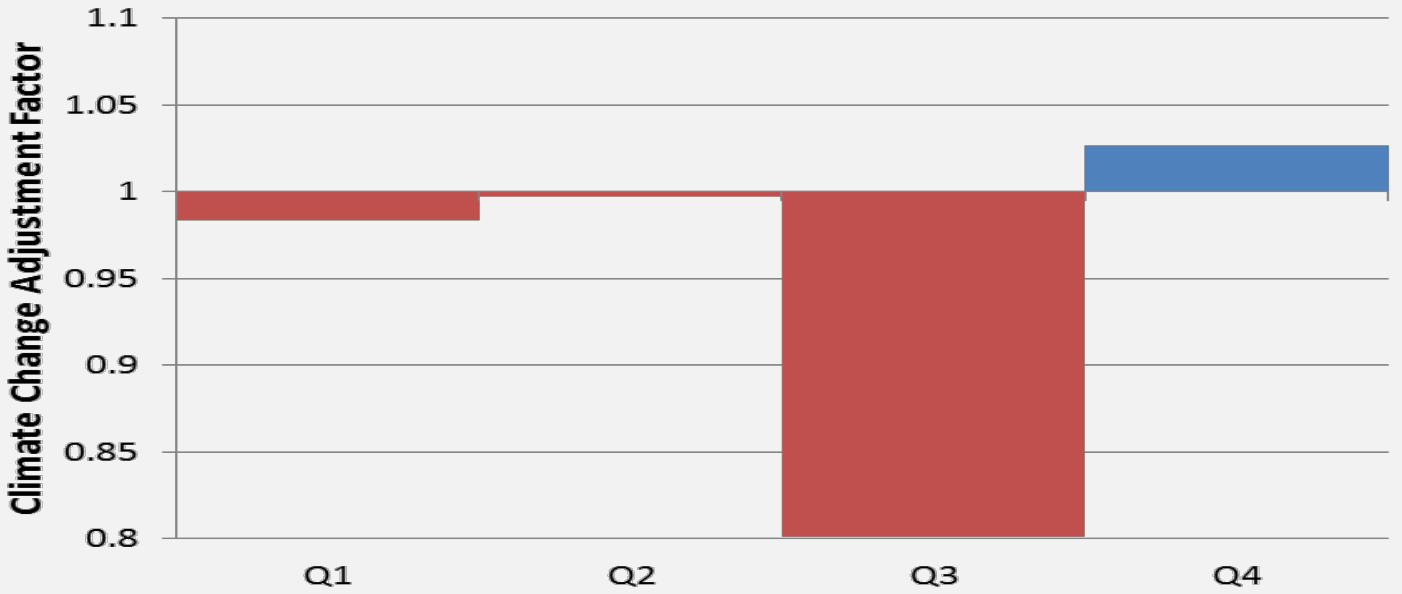
Modeled Recharge: Dry Conditions



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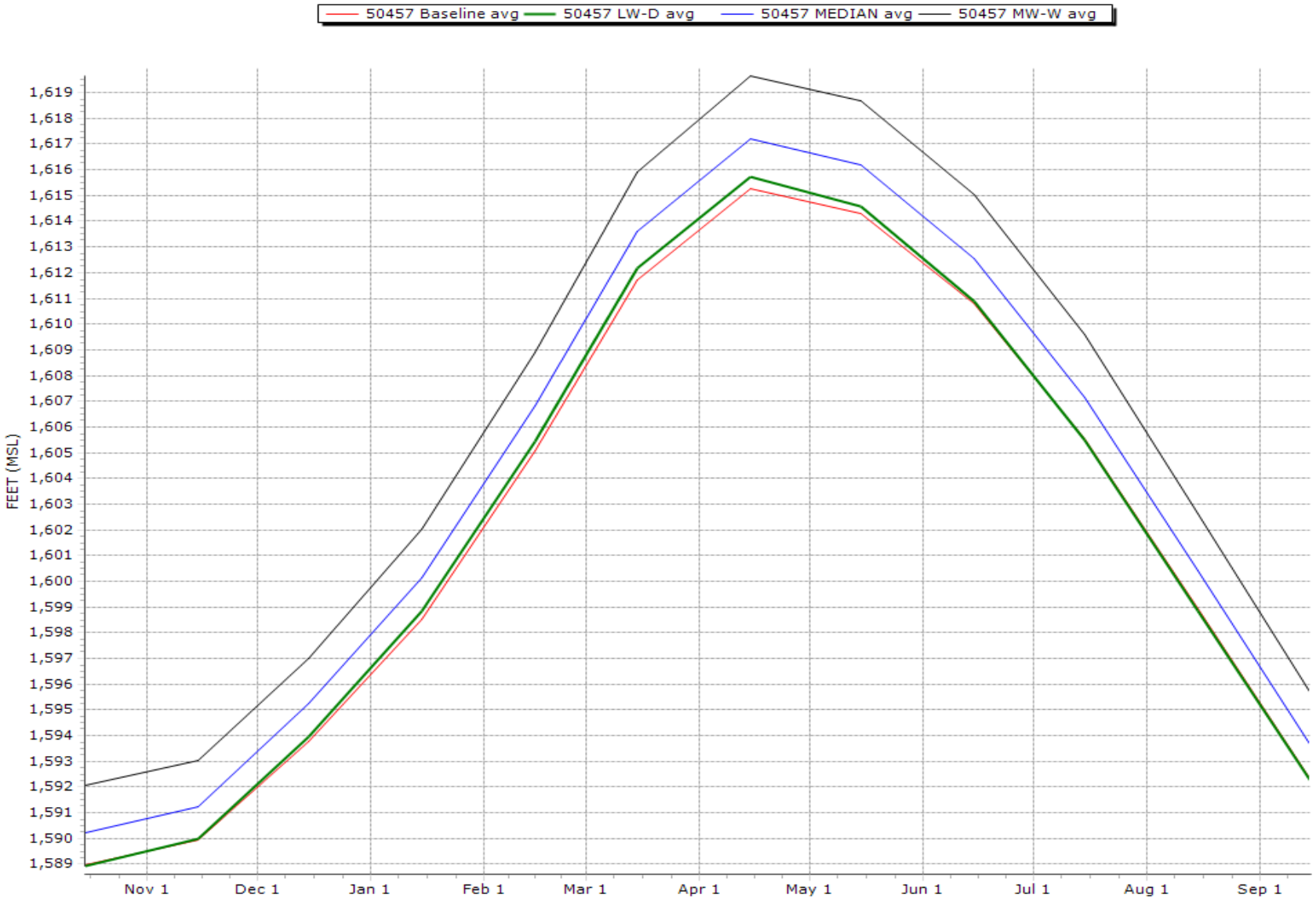
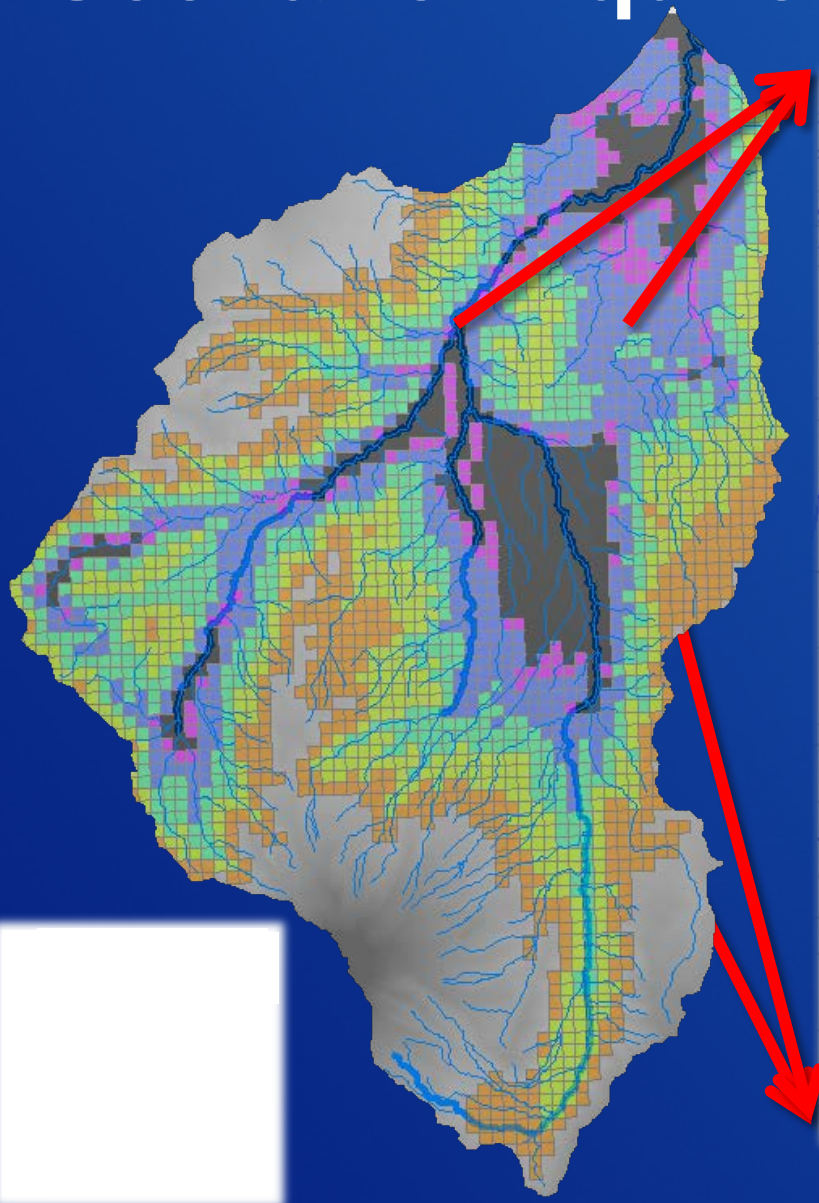
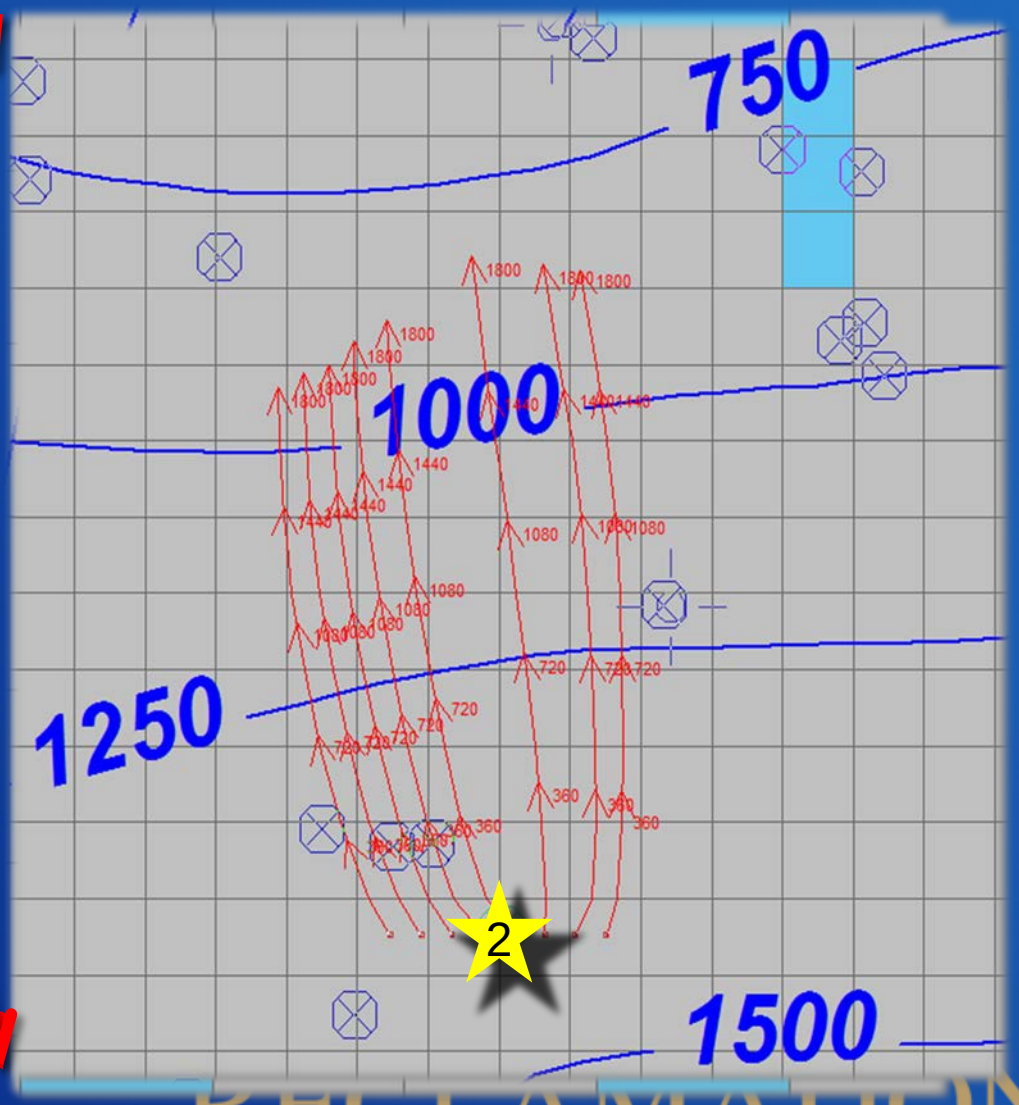
Modeled Head Change: Well 50457



Scenario: Aquifer Storage & Recovery





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Scenario: Increased Pumping

- Increase domestic and municipal use based on published population projections
  - Annually, 2% for incorporated areas, 0.8% otherwise
- Maintain commercial and industrial use
- Increase irrigation use on an incremental basis and report

Model Scenarios

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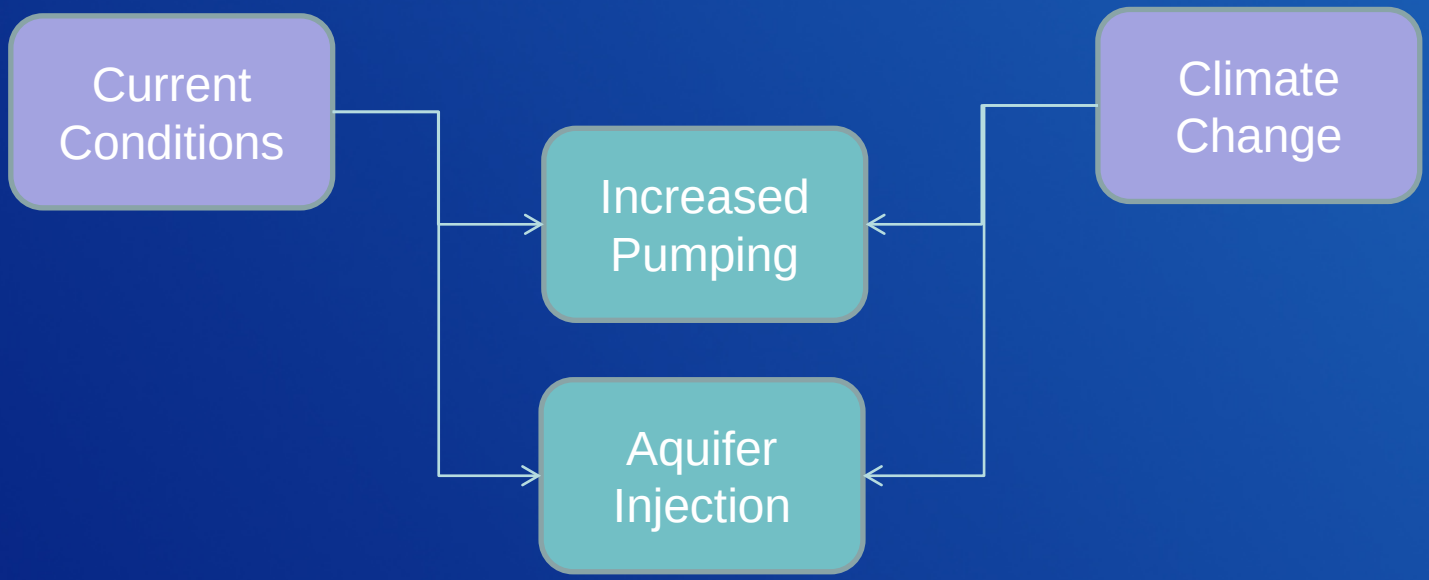
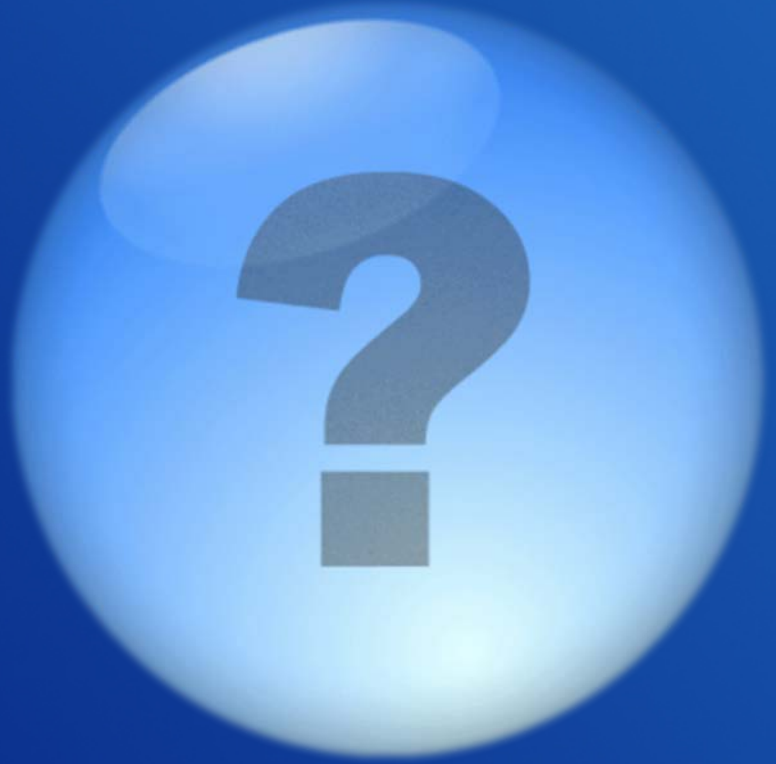


Questions



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