

Groundwater Modeling Update Santa Margarita Basin

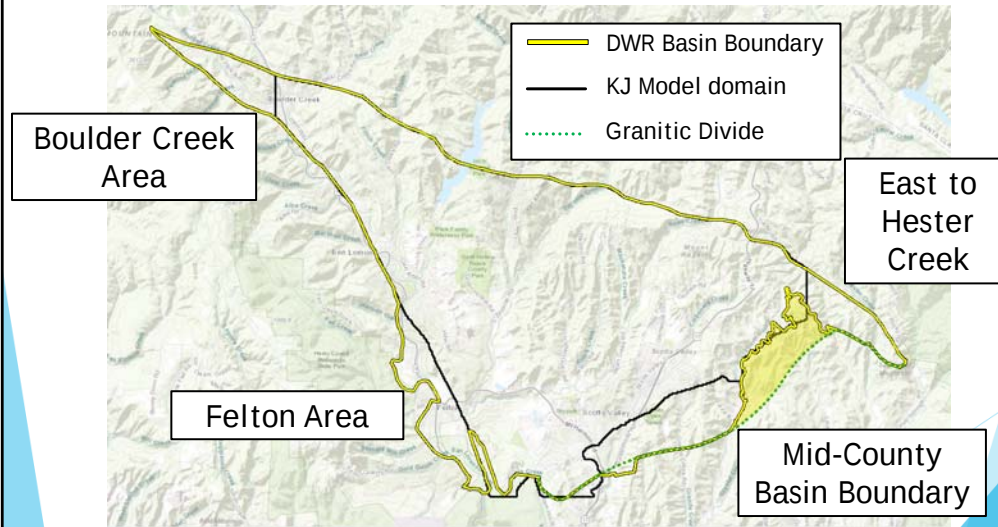
Presented by Cameron Tana, Montgomery & Associates
Santa Margarita Groundwater Agency
August 26, 2020

Objectives

1. Review and provide update on model improvements
2. Provide update on model calibration
3. Preview next steps

Review and Update on Model Improvements

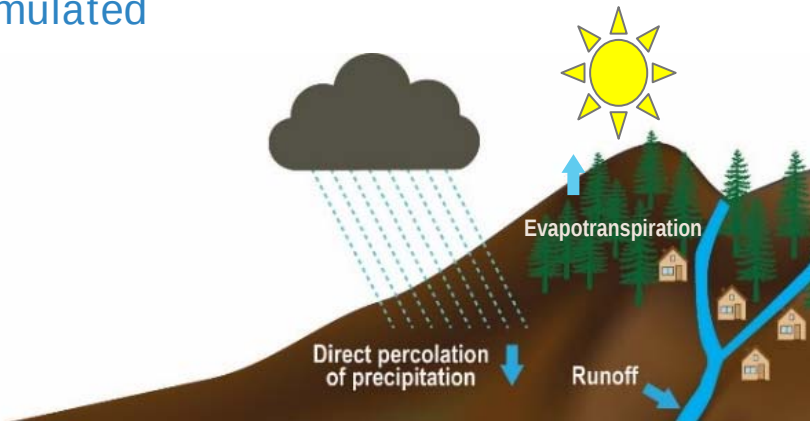
Model Expanded to Cover Basin and Consistency with Boundary Modification



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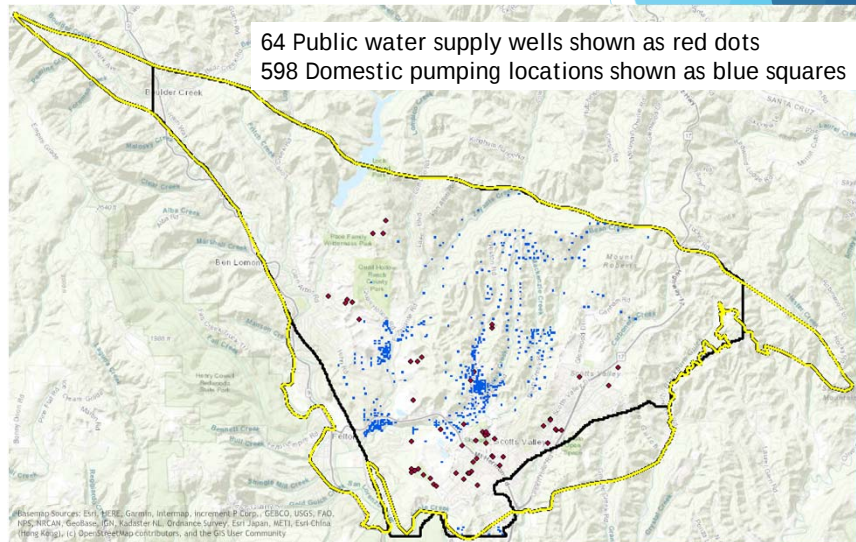
Groundwater level data and results from Santa Cruz Mid-County Basin model are consistent with no-flow boundary along the granitic divide
Model extended east of basin boundary to granitic divide

Revised Rainfall, ET Estimates and Recharge Calculation so Climate Change can be Simulated



Improved estimates for groundwater pumping

- ▶ Incorporated additional data for public water supply wells
- ▶ More comprehensive mapping of domestic pumping

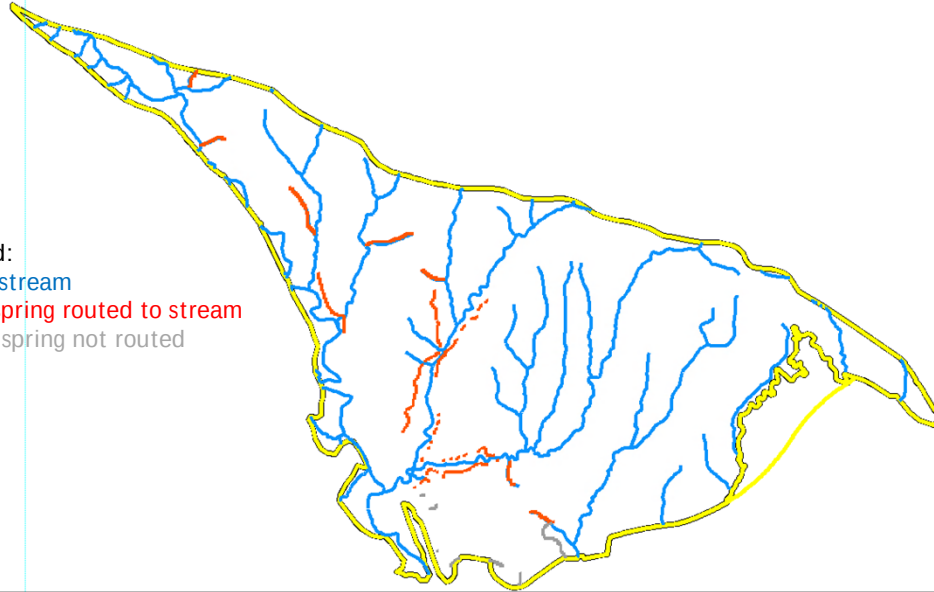


Add graphic of old basin and new basin

What was issue with pumping before? – KJ's private pumping locations were just from well permits which underestimates. We used residential zoned parcels and building footprints

Stream Network Expanded, Runoff Calculation Revised, and Spring Flows Routed to Streams

Legend:
Blue - stream
Red - spring routed to stream
Gray - spring not routed



7

11A pre-MAW better
TW-19 pre-MAW better
Where is TW-19?

Update on Model Calibration

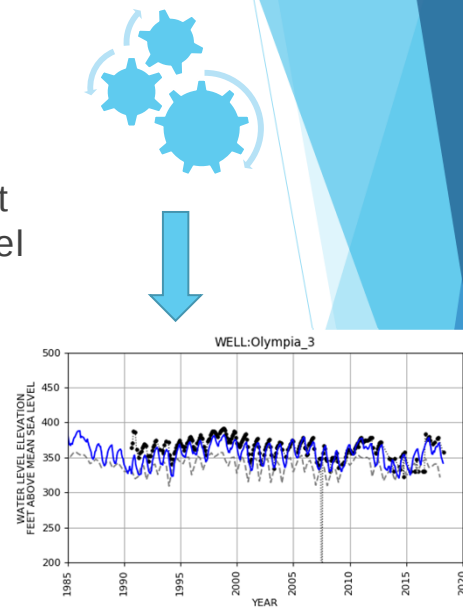
Model Calibration

WHY?

to be used for predictive purposes, it must be demonstrated that the model can successfully simulate observed aquifer behavior

HOW?

adjust aquifer properties and model boundaries to match observed groundwater levels / surface water flows



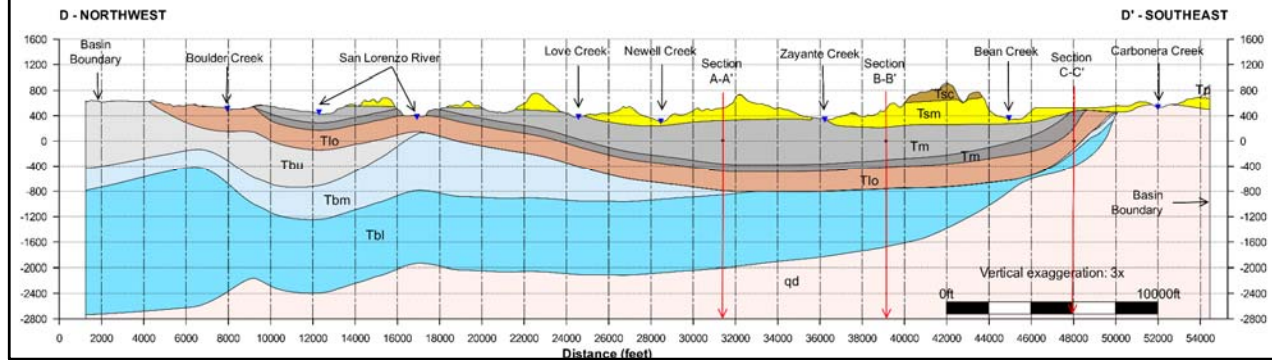
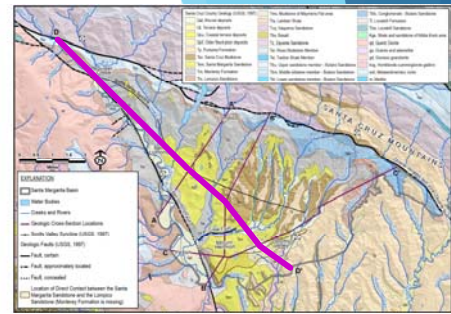
Calibration Results are Presented by Principal Aquifer

Santa Margarita Sandstone

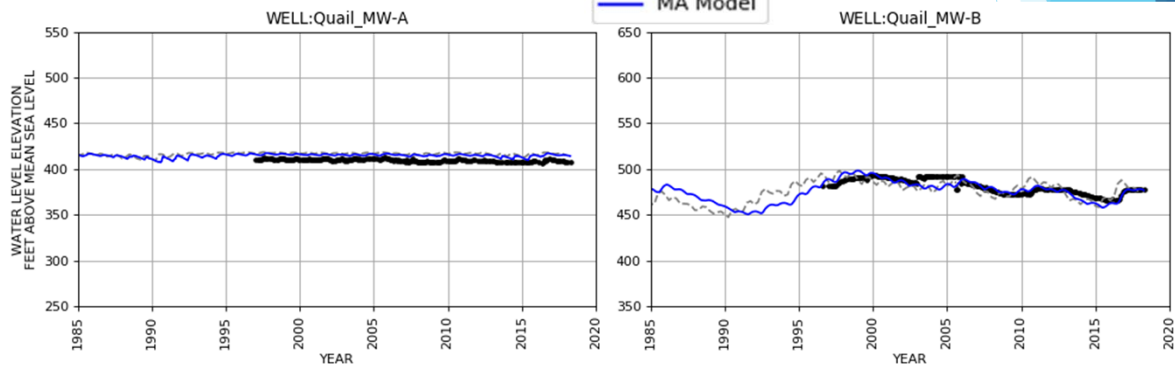
Monterey

Lompico

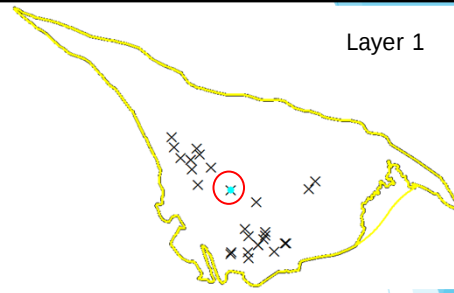
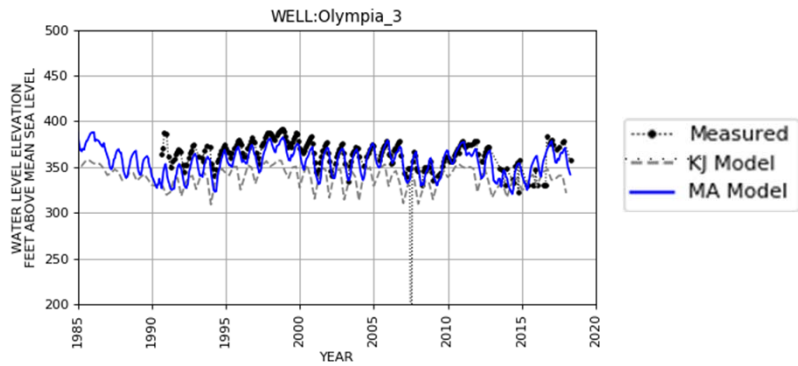
Butano

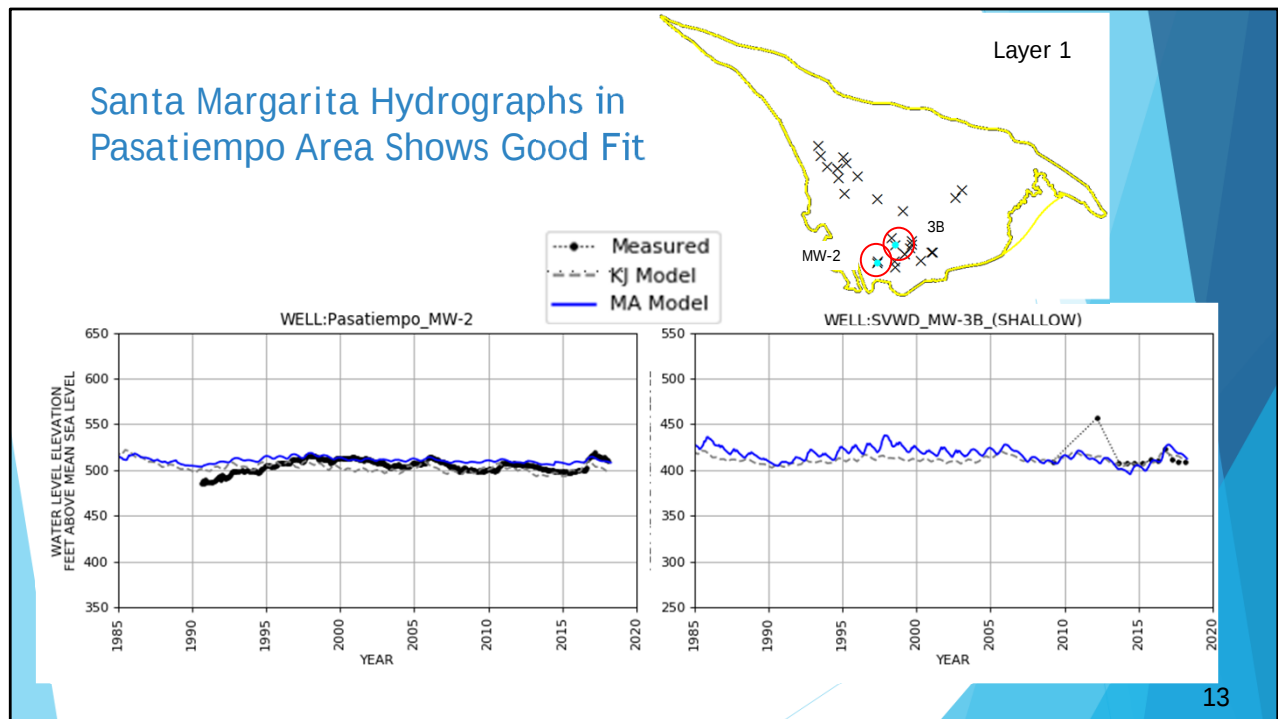


Santa Margarita Hydrographs in Quail Hollow Area Show Good Fit



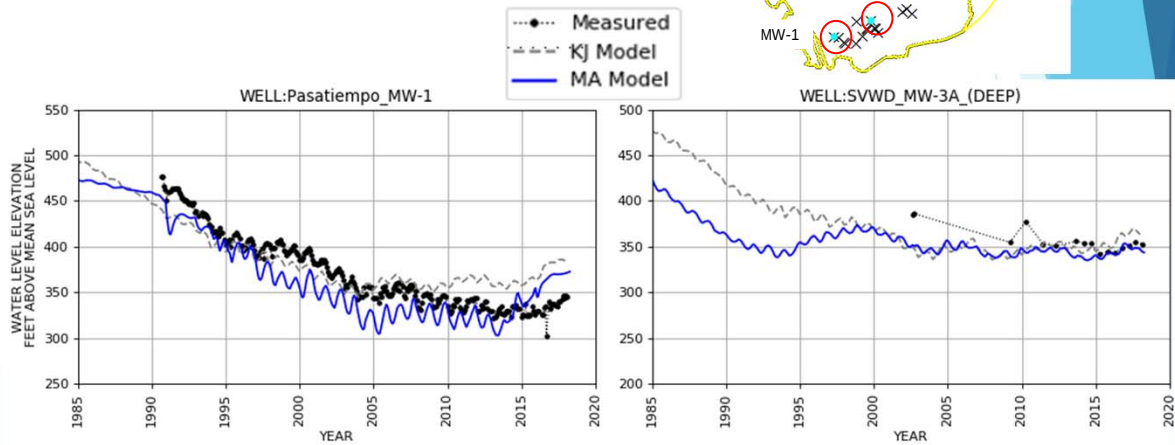
Santa Margarita Hydrograph in Olympia/Mission Springs Area Shows Improved Fit





MW-2 pre MAW was better: not as flat

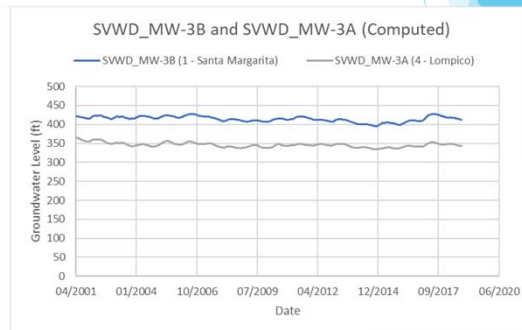
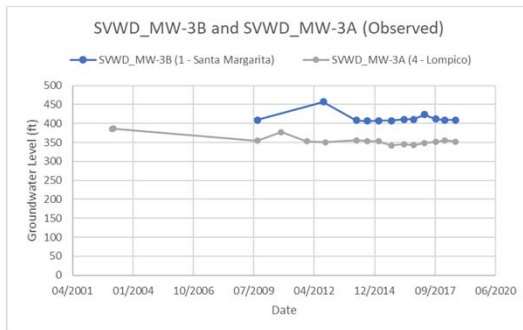
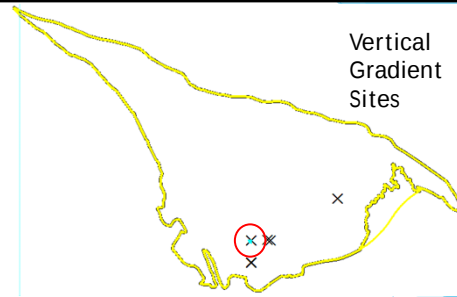
Lompico Hydrographs in Pasatiempo Area Simulate Long Term Trends



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MW-1 and MW-3A much better

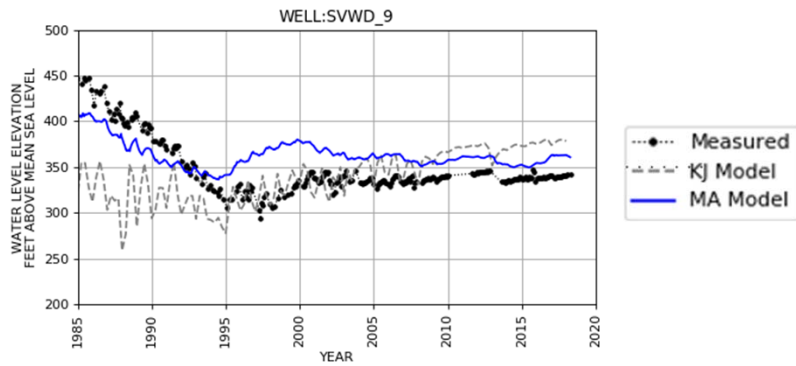
Simulated Vertical Gradients between Santa Margarita and Lompico in Pasatiempo Area Consistent with Observed



15

11A pre-MAW better
TW-19 pre-MAW better
Where is TW-19?

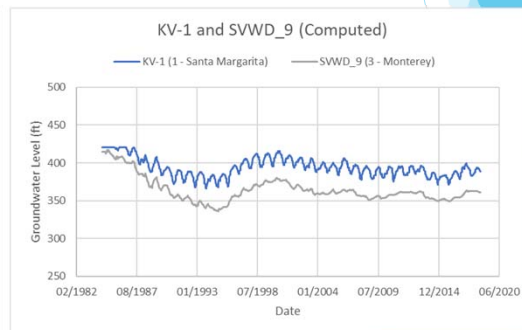
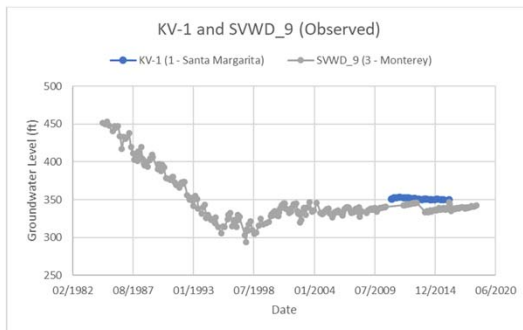
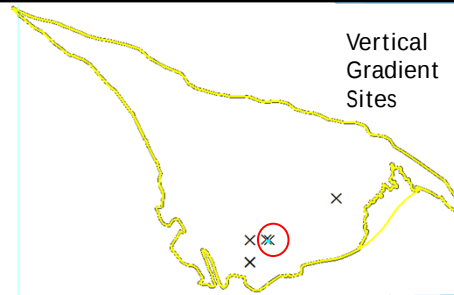
Monterey Hydrographs for Camp Evers Area Simulates Long Term Pattern



Layer 3

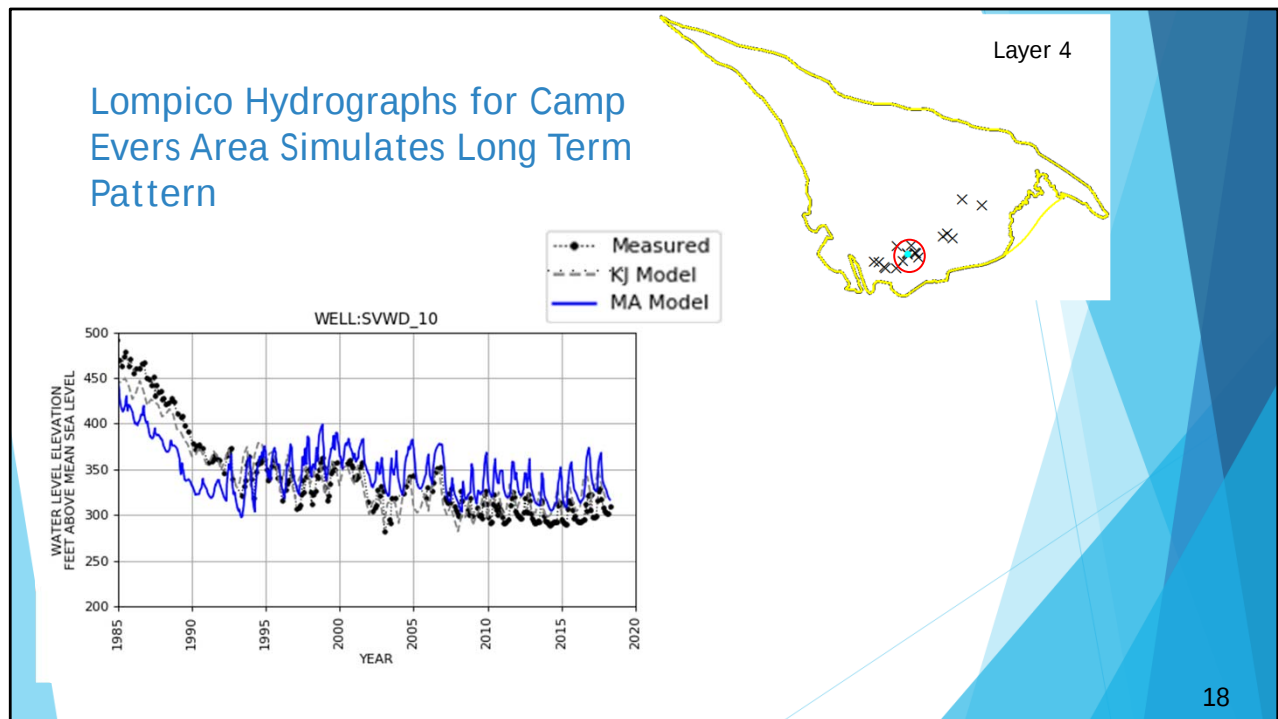
SVWD_9 pre-MAW was better

Simulated Vertical Gradients between Santa Margarita and Monterey in Camp Evers Area Greater than Observed



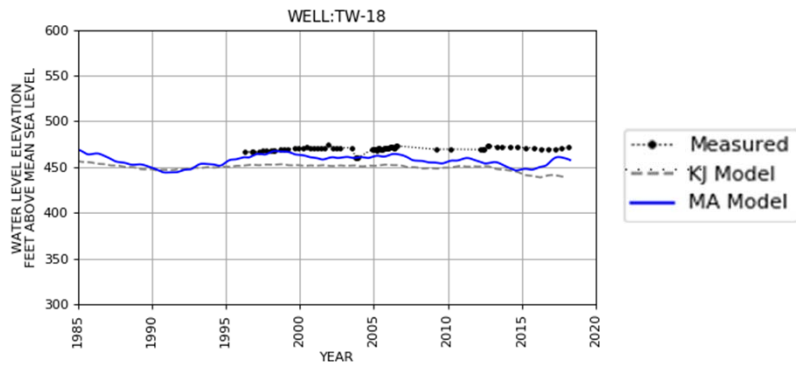
17

11A pre-MAW better
TW-19 pre-MAW better
Where is TW-19?



SVWD_10 better pre-MAW

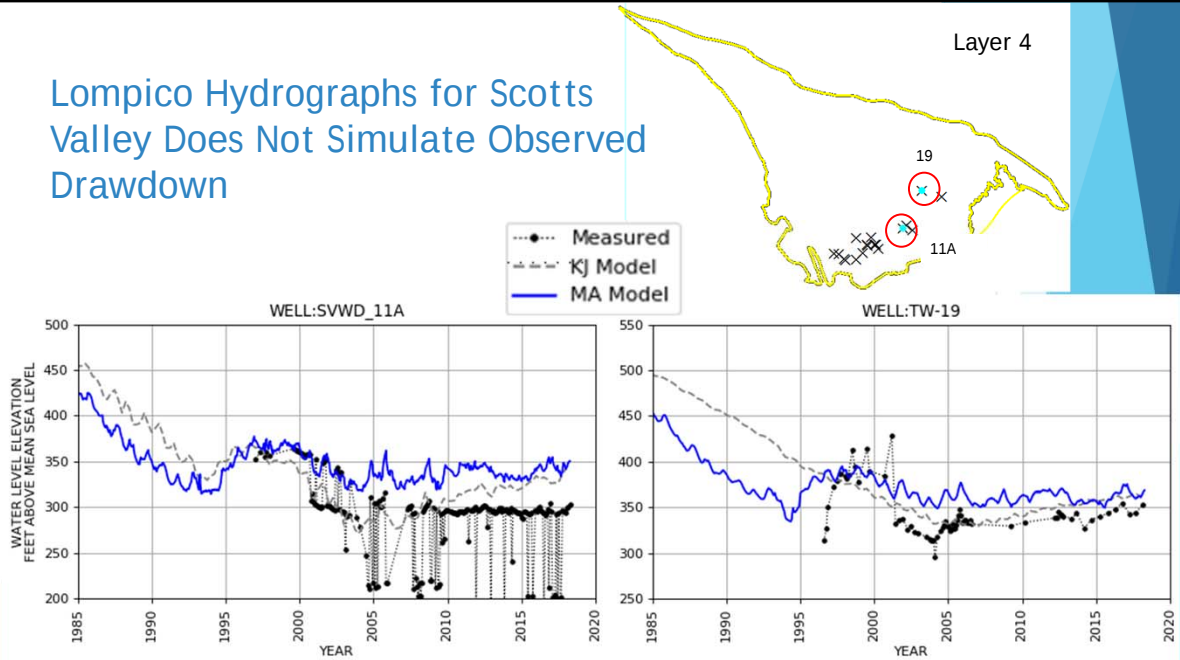
Santa Margarita Hydrographs for Scotts Valley Shows Improved Fit



Layer 1

Where is TW-18?

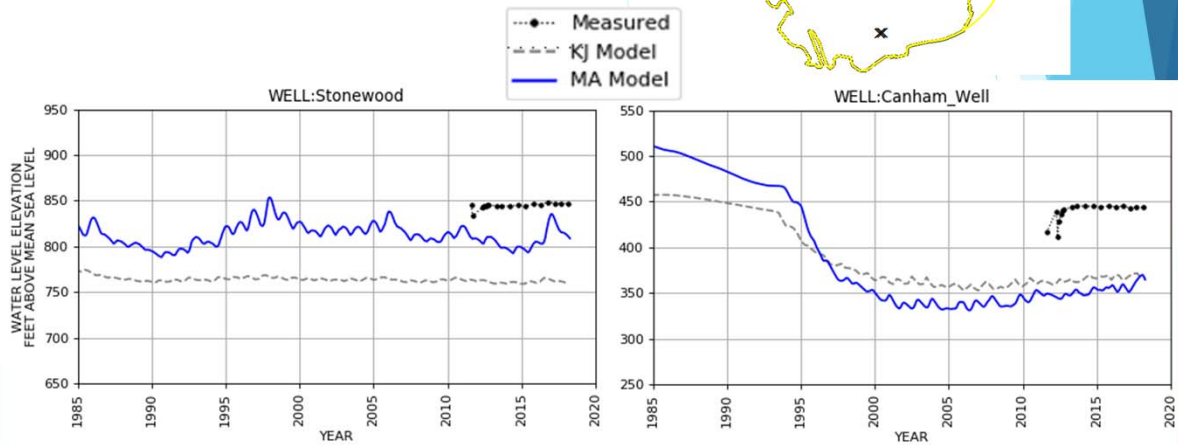
Lompico Hydrographs for Scotts Valley Does Not Simulate Observed Drawdown



20

11A pre-MAW better
 TW-19 pre-MAW better
 Where is TW-19?

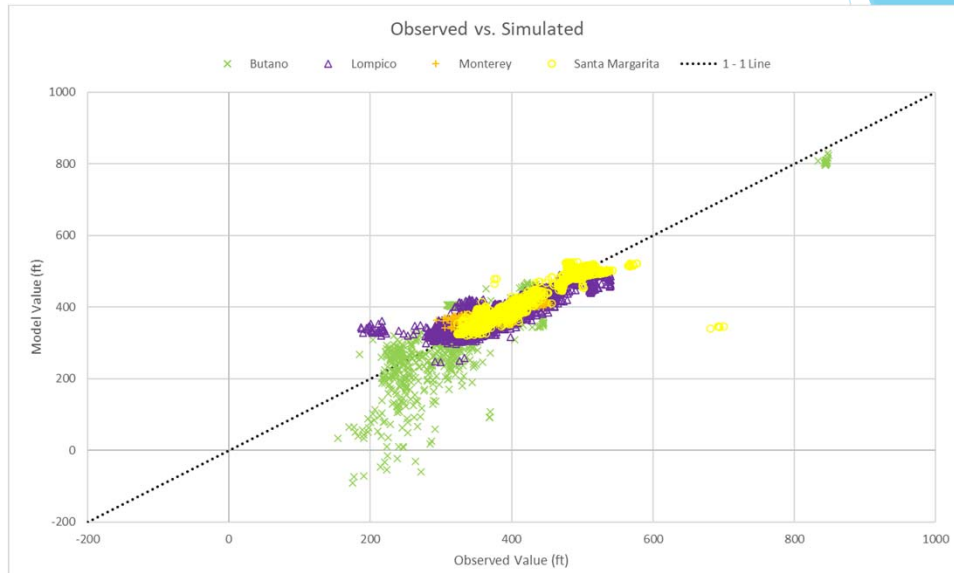
Butano Hydrographs Simulate Below Observed



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Canham better than pre-MAW

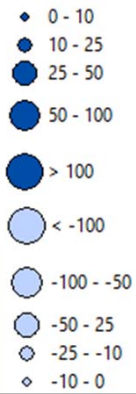
Summary of Observed vs. Simulated



Average Calibration in Santa Margarita

Residual:
Observed - Simulated
+ values: obs > sim
- values: obs < sim

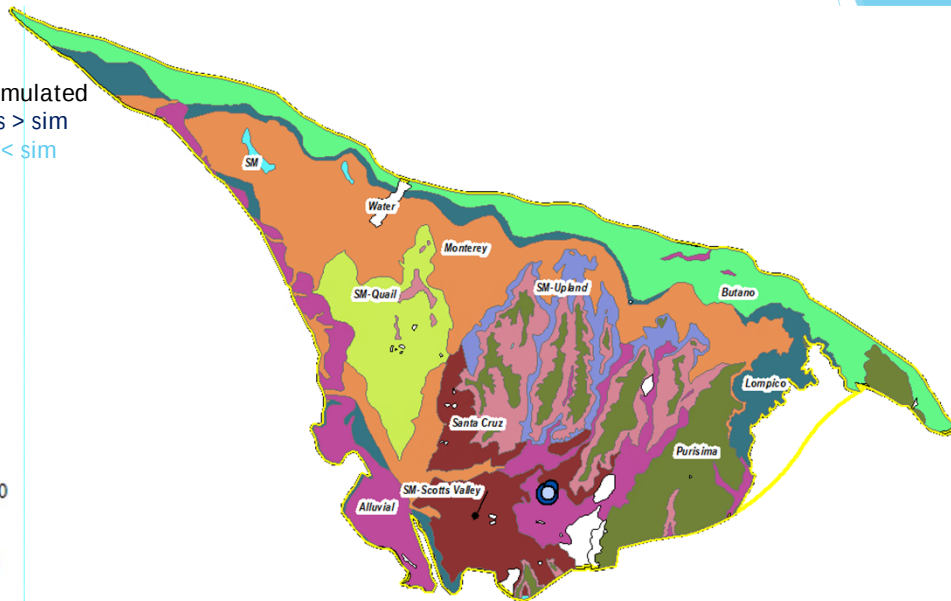
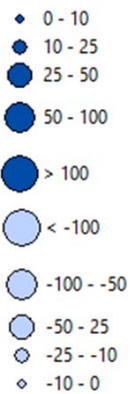
Residual (ft)



Average Calibration in Monterey

Residual:
Observed - Simulated
+ values: obs > sim
- values: obs < sim

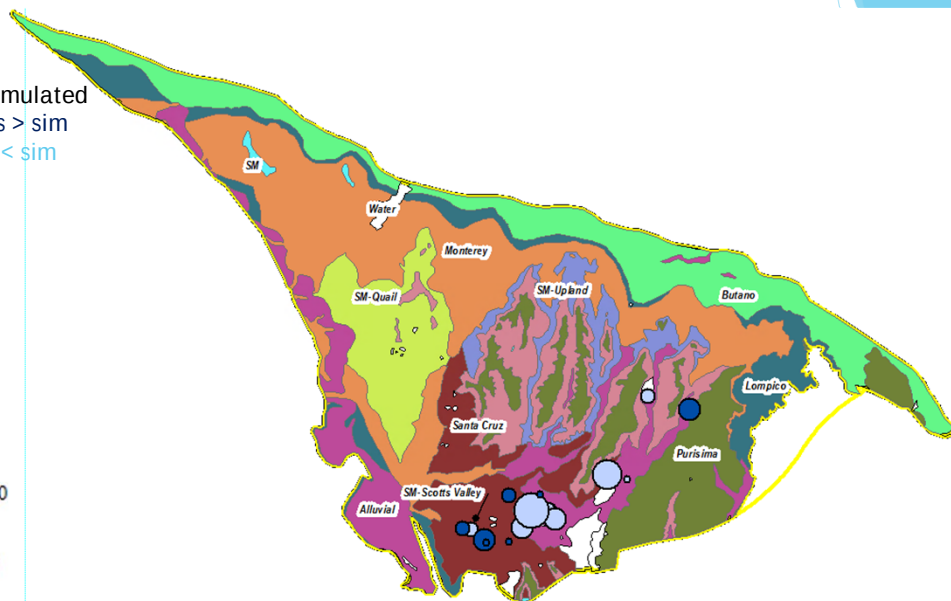
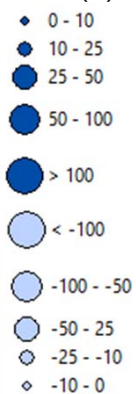
Residual (ft)



Average Calibration in Lompico

Residual:
Observed - Simulated
+ values: obs > sim
- values: obs < sim

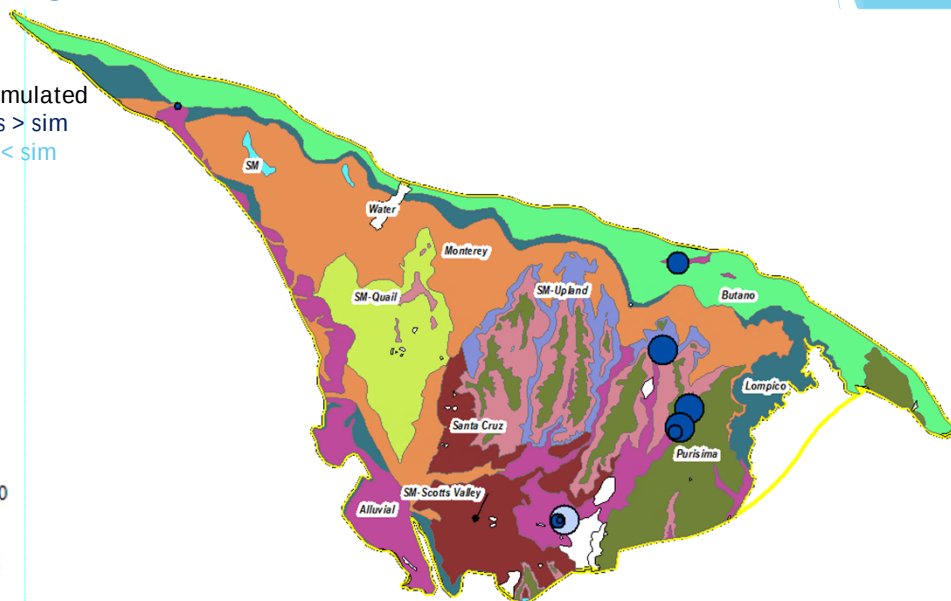
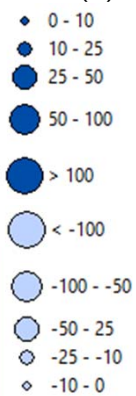
Residual (ft)



Average Calibration in Butano

Residual:
Observed - Simulated
+ values: obs > sim
- values: obs < sim

Residual (ft)



Calibration Comparison with K/J Model

MA - KJ

+ values: worse

- values: improved

Residual Difference(ft)

◊ 0 - 10

● 10 - 25

● 25 - 50

● 50 - 100

● > 100

● < -100

● -100 - -50

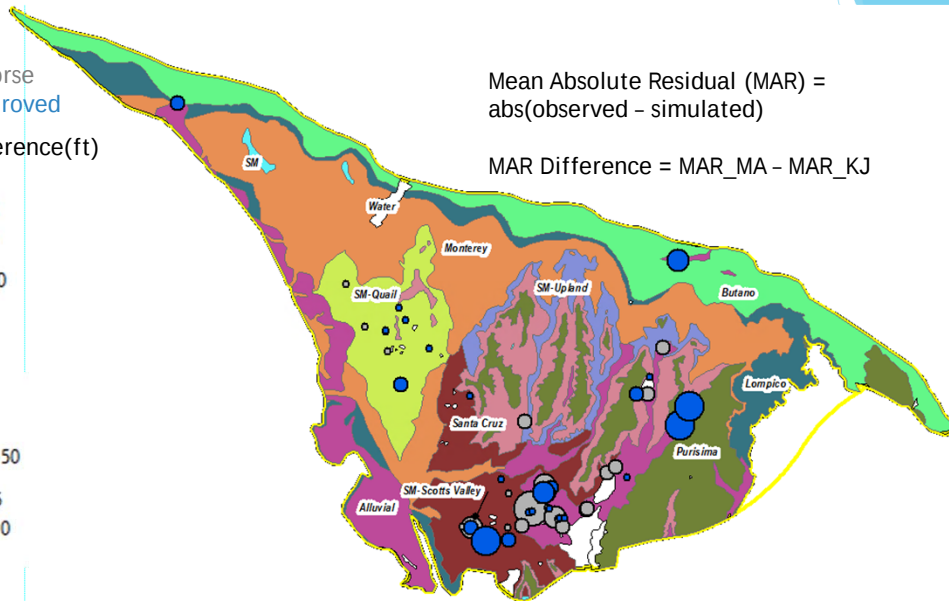
● -50 - -25

● -25 - -10

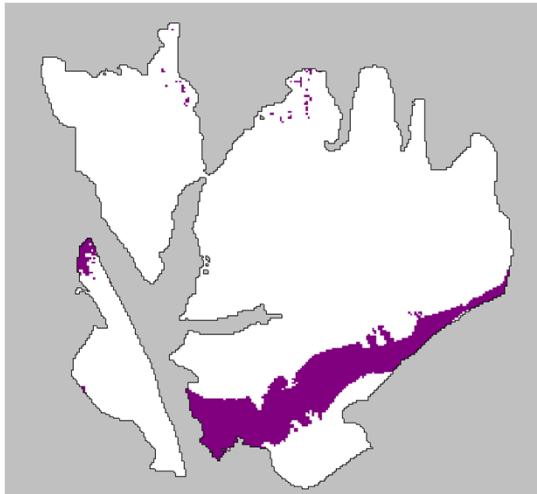
● -10 - 0

Mean Absolute Residual (MAR) =
abs(observed - simulated)

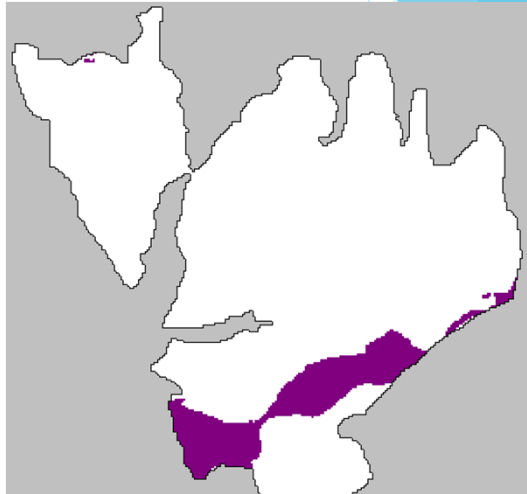
MAR Difference = MAR_MA - MAR_KJ



Increased Dry Extent of Santa Margarita Simulated at End of WY2018 Compared to K/J Model

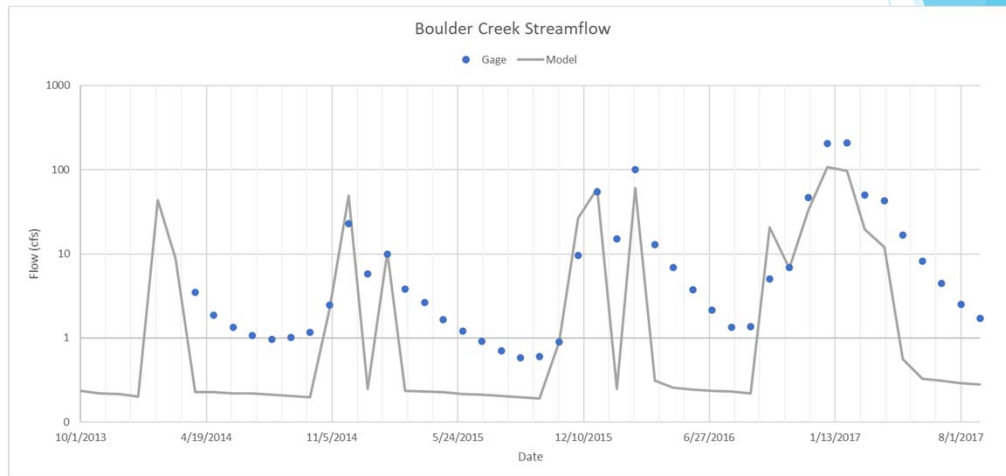


MA Model

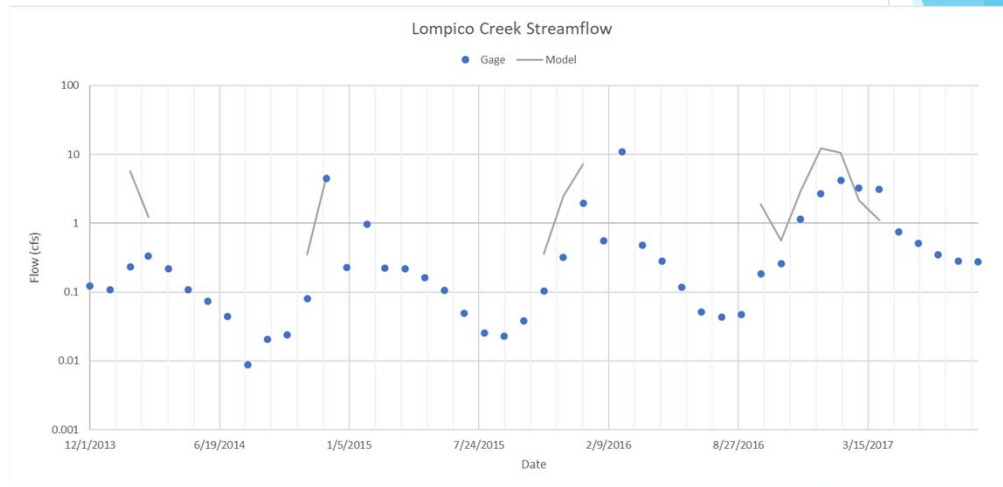


KJ Model

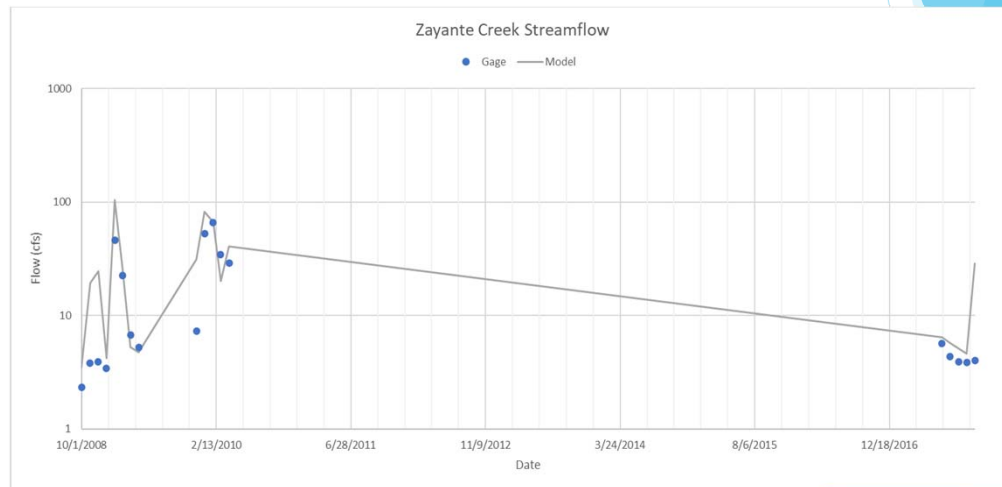
Streamflow – Boulder Creek upstream of San Lorenzo River



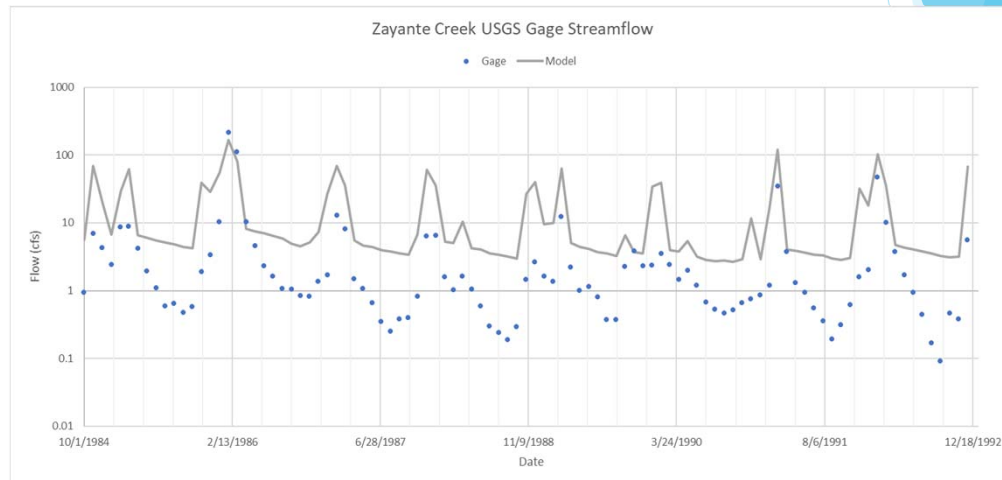
Model Simulates Streamflow in Lompico Creek (below diversion) above ~0.4 cfs



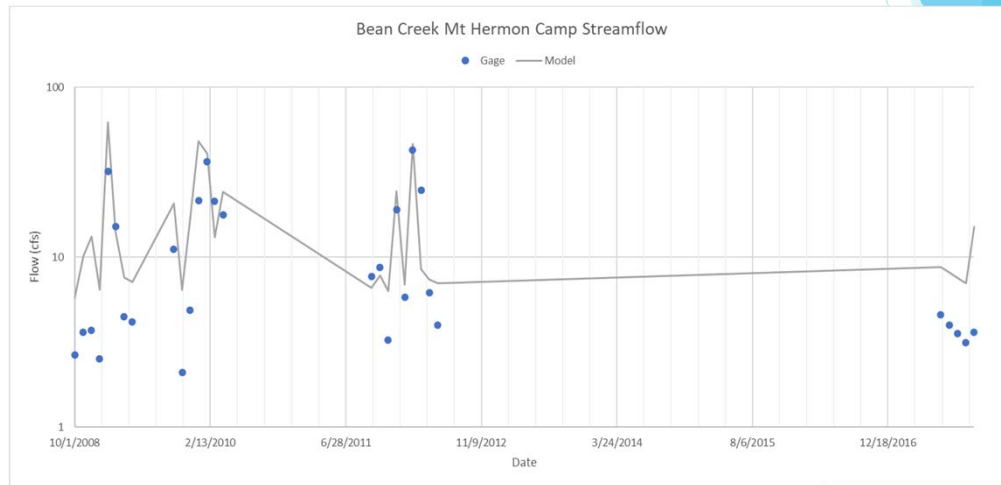
Good Fit for Streamflow for Zayante Creek at Woodwardia



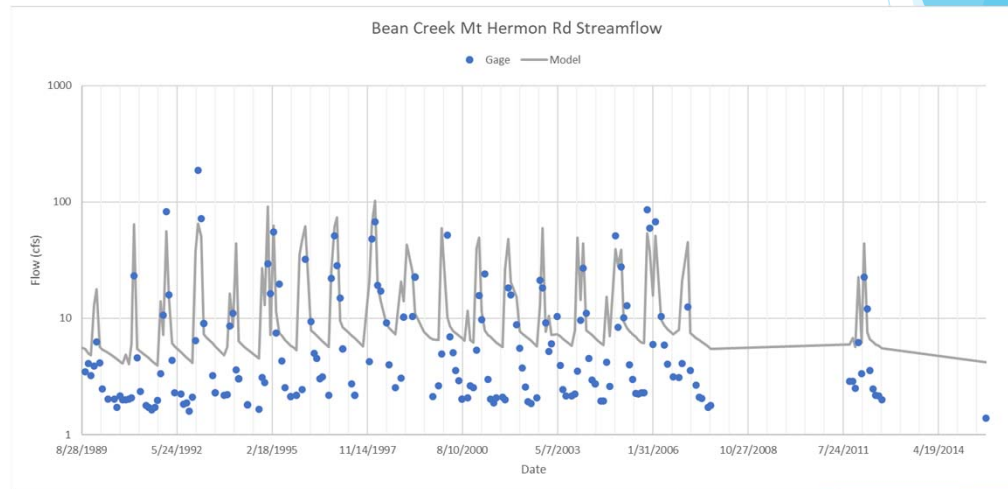
Low Flows not Simulated for Zayante Creek USGS Gage



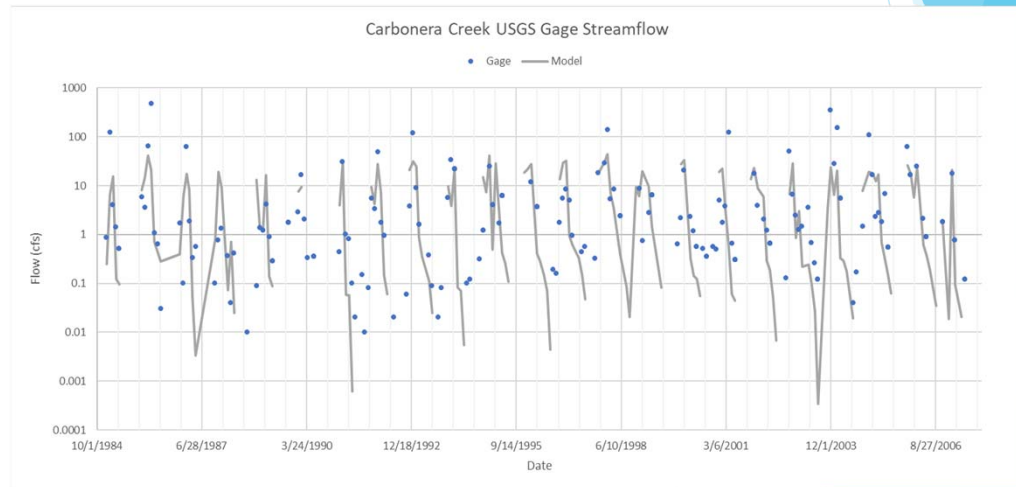
Good Fit of Streamflow for Bean Creek at Mt Hermon Camp



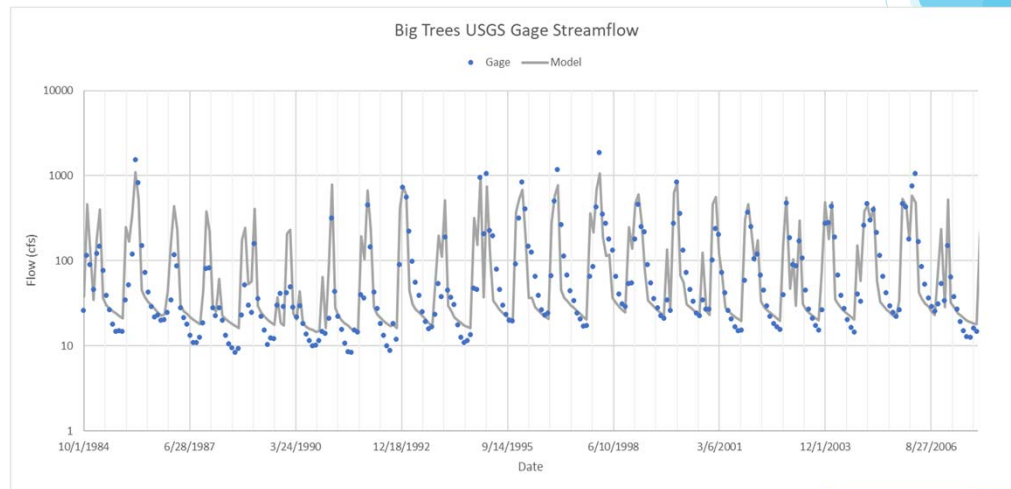
Low Flows not Simulated for Bean Creek at Mt Hermon Rd



Good Fit for Streamflow at Carbonera Creek USGS



Good Fit for Streamflow for San Lorenzo River at Big Trees

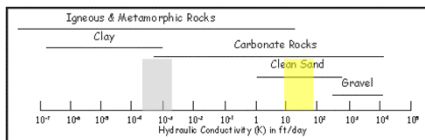


High Hydraulic Conductivity in Santa Margarita

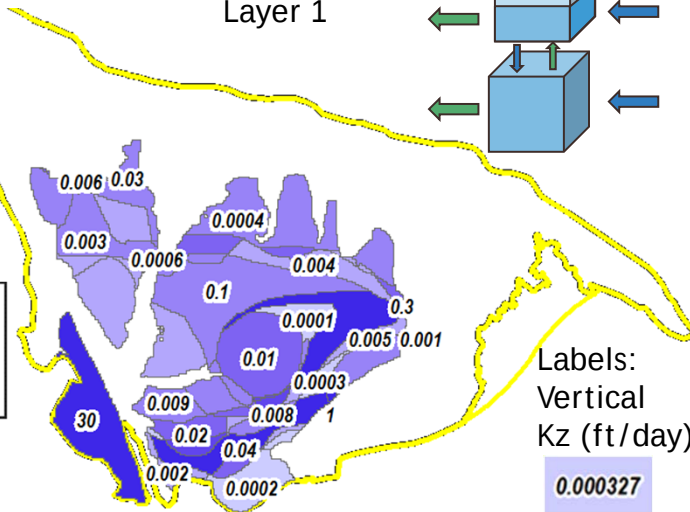
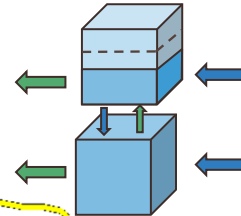
Horizontal Hydraulic Conductivity

Colors:
Horizontal
Kx (ft/day)

- <1
- 1-5
- 5-10
- 10-25
- 25-50
- >50



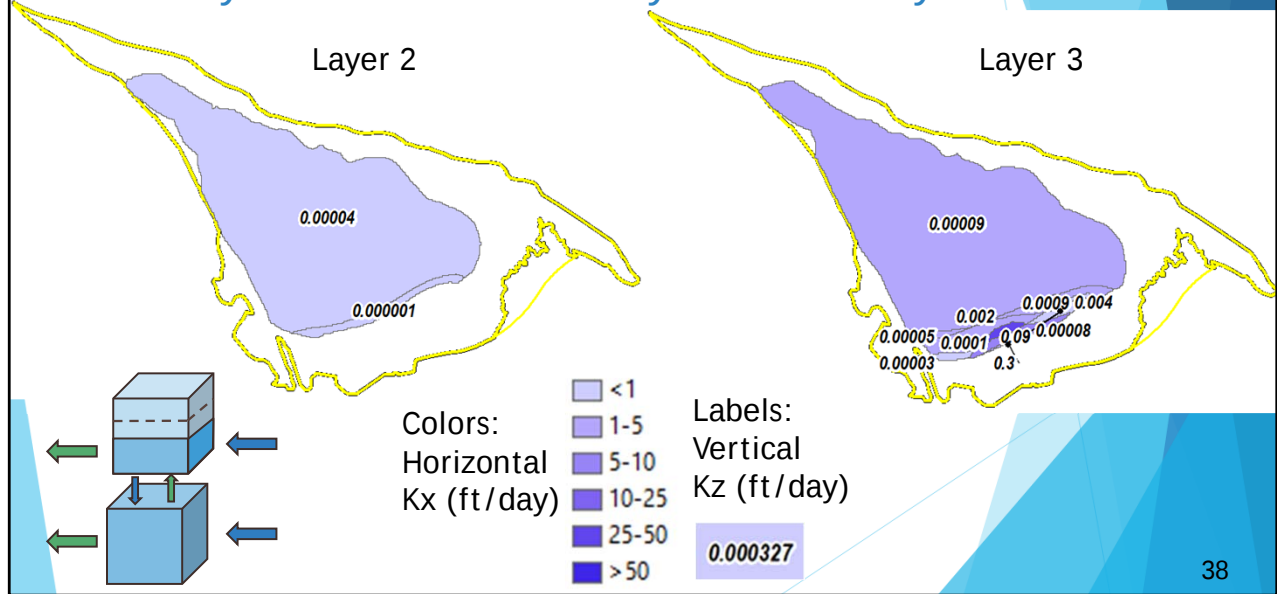
Layer 1



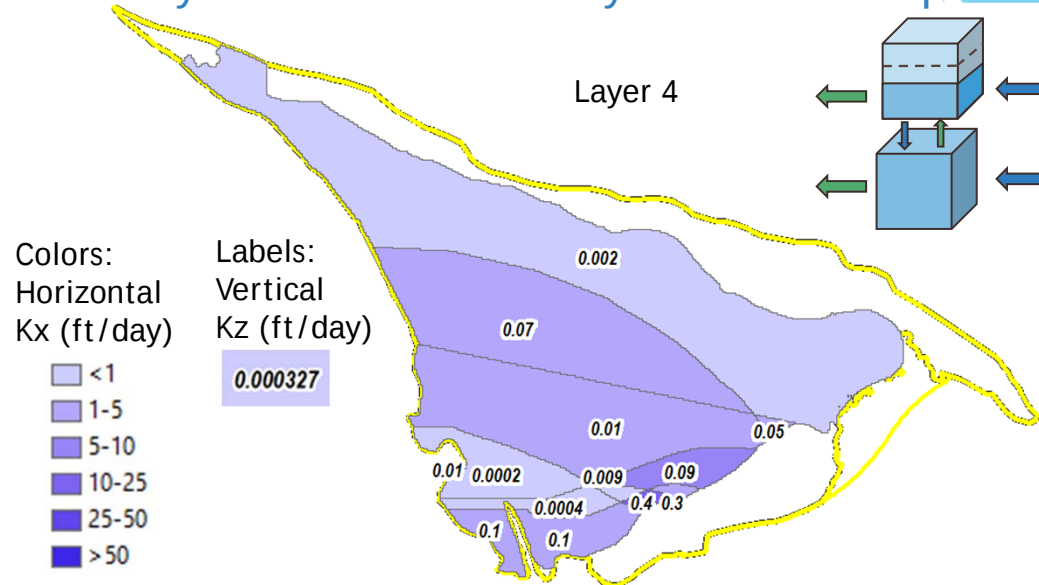
Labels:
Vertical
Kz (ft/day)

0.000327

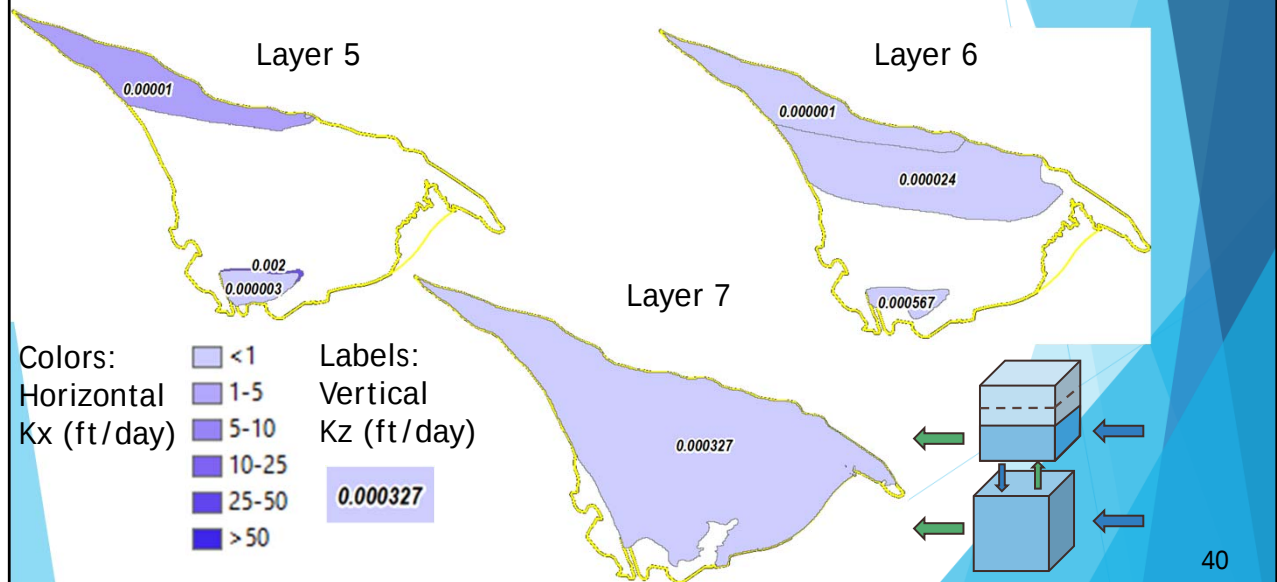
Low Hydraulic Conductivity in Monterey



Medium Hydraulic Conductivity Zones in Lompico



Low Hydraulic Conductivity in Butano



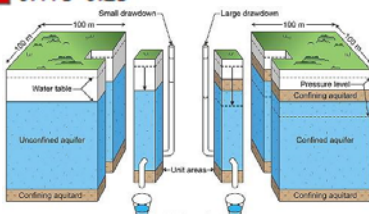
Variable Specific Yield Values in Santa Margarita

Colors:
Specific
Yield
Unconfined

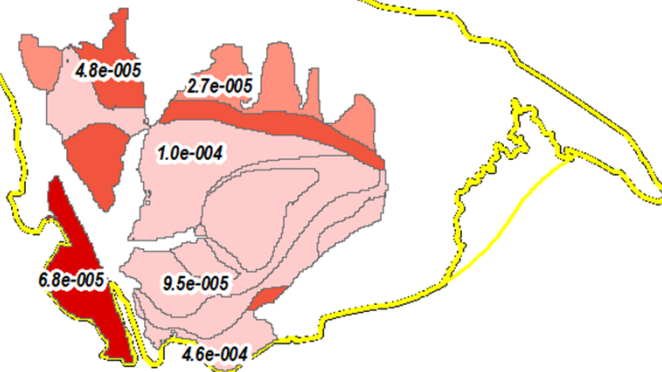
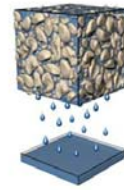
0.01-0.05
0.05-0.1
0.1-0.175
0.175-0.25

Labels:
Specific
Storage
Confined
(1/ft)

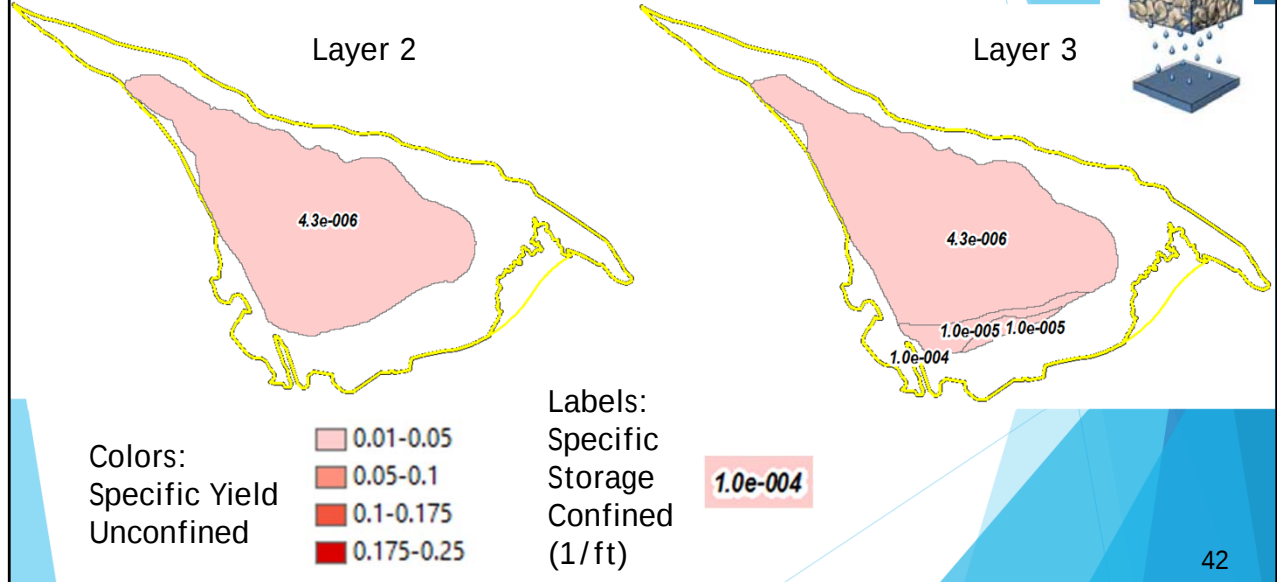
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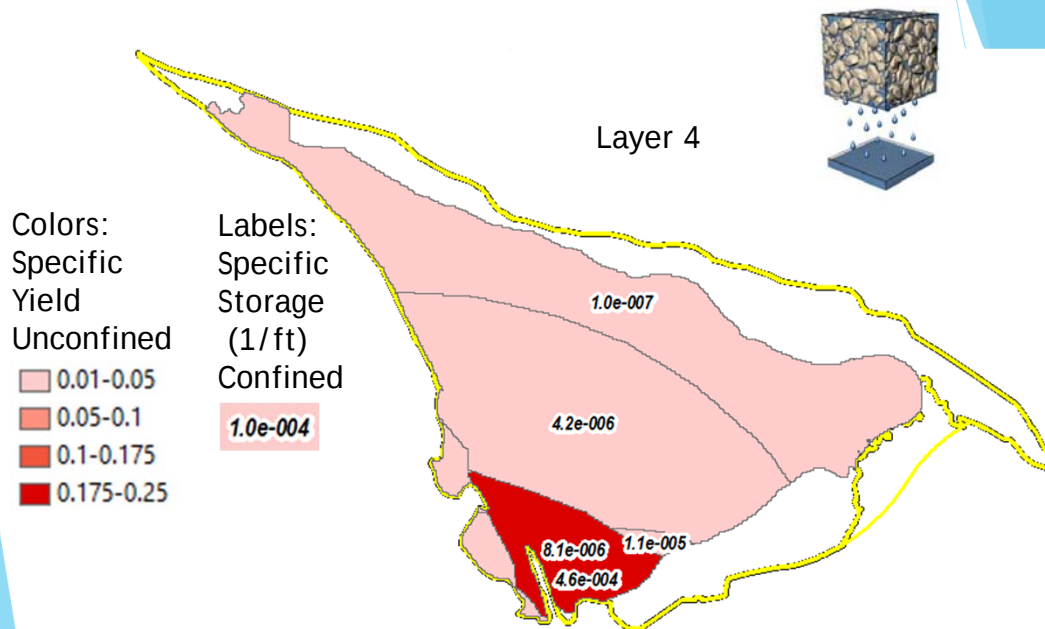
Layer 1



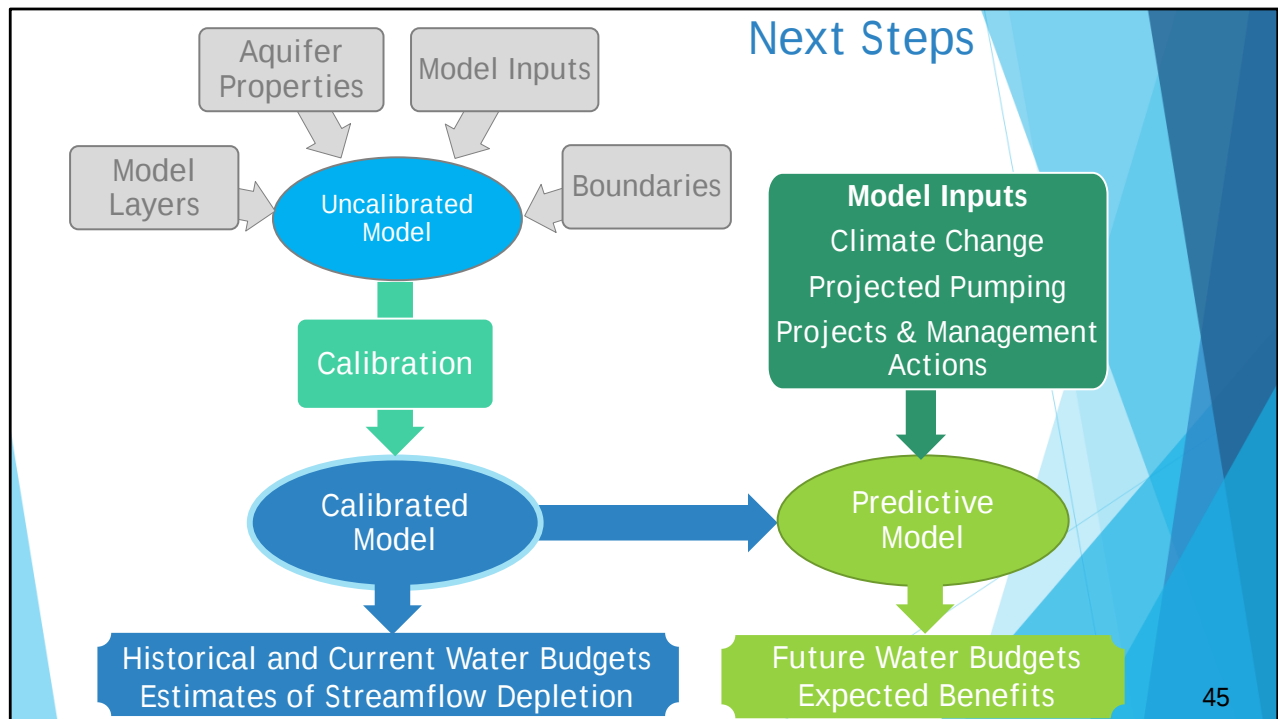
Low Specific Yield Values in Monterey



Variable Specific Yield Values in- Lompico



Next Steps



Questions