

Republican River Ground Water Model 1940 to 2000  
(aka RRGWM for Dummies)

**Basic Conceptual Question:**

1. What does the historical model tell us about the physical system?

**Specific Questions:**

2. What do the negative stream flow impact numbers mean, both in the state on/off scenarios and the NRD on/off scenarios?
3. Why is the mound credit decreasing? Is it due to interception by new ground water wells? Is increased well development in any specific geographic/political boundary areas impacting the mound water more than other areas?
4. Can we quantify the lag effect by geographic area?
5. How legitimate is it to estimate the impacts of the pumping of one NRD by turning off that NRD as we have been doing?
6. a) Can we estimate the impacts of conservation practices on recharge and run model scenarios to test the impacts on stream flow? b) How will CREP/EQIP affect the model?
7. How does the water table surface change when we run the NRD on/of scenarios? Is there a significant shift in ground water divides or flow patterns?
8. According to current model runs the state has 62,000 ac-ft more depletions than allocation. How much would pumping need to be reduced to get out of the deficit?  
QRW wells versus upland?  
Other differences?
9. During model construction there was discussion regarding the impact of the low K/T ridge to the north of the river valley and its impact on ground water flow. Does the model reflect the idea that some ground water backs up behind the low K/T area and flows toward the tributaries rather than into the valley aquifer?

**How do we begin answering these questions?**

1. Formal sensitivity analysis would help tell us about the physical system. From old versions of model documentation we know that the initial conditions were sensitive to precipitation recharge, evapotranspiration and stream-aquifer interaction. Additionally, the mound area was found to be sensitive to irrigated and non-irrigated precipitation recharge curves as well as canal leakage.

*MM - wants to wait on this*

2. Investigating the relations between the elevation of the stream and the water table in locations where the negative values occur as well as looking at the details of the water budget in these locations could answer this question.
3. Running model scenarios where the ground water development is held steady from say 1990 to present in a given political/geographic area and comparing that with a model run that includes all development could give an idea about what is impacting the mound water.
4. ??
5. ??
6. a) Develop scenarios where: We estimate the change in recharge due to conservation practices on both irrigated and dryland then complete model runs with 25/50/75/100 % of an area developing conservations practices and see what the model tells us. b) Turn off pumping in CREP/EQIP acres.
7. Run the NRD scenarios and contour the resulting head files.
8. Run model scenarios while reducing pumping both statewide and varying by upland/quick response areas.
9. Do some particle tracking runs to see where the water flows, also could contour the head files.

**Other questions that came up but may not be within the scope of this project:**

How is the model doing currently?

We should put together 2000-2004 water level and streamflow/baseflow data to compare to 2000-2004 model output.

*MM - wait on this*

How well does the model predict the headwaters of streams?

**Other Scenarios Requested by the NRDs**

**1. Drought Scenarios with actual data up to 2004, drought until 2010**

All pumping off., upland off, QRW off. (Some we may have already run been run, need to check and analyze.)

**2. What is impact of CNPPID only delivering 6.7 inches per acre.**

*- That is what is happening in 2005*