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HWRS 482
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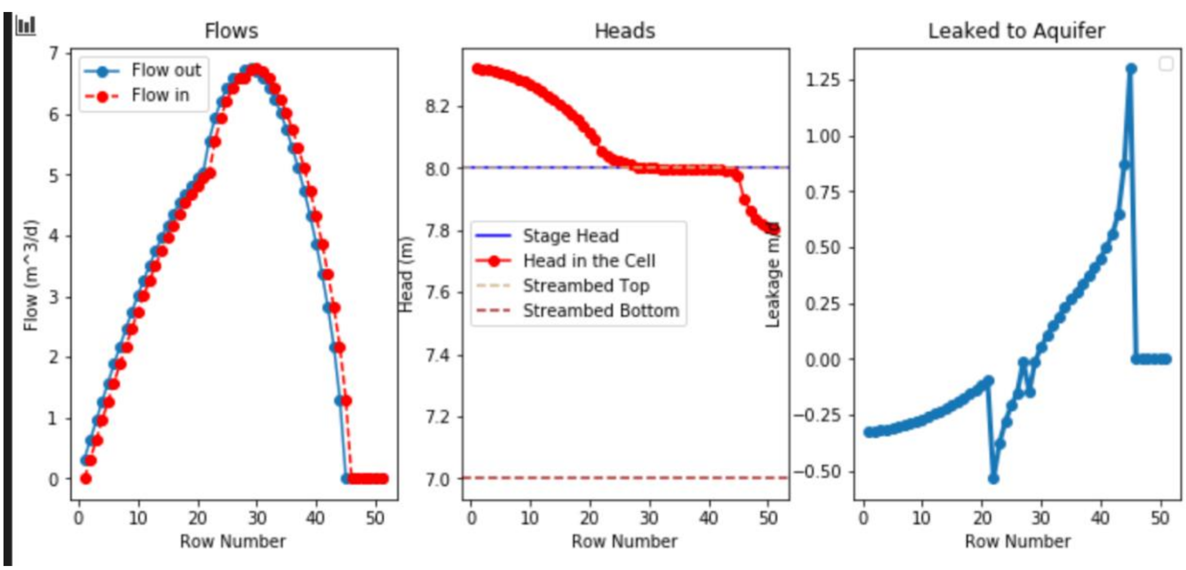
Challenge_Updated

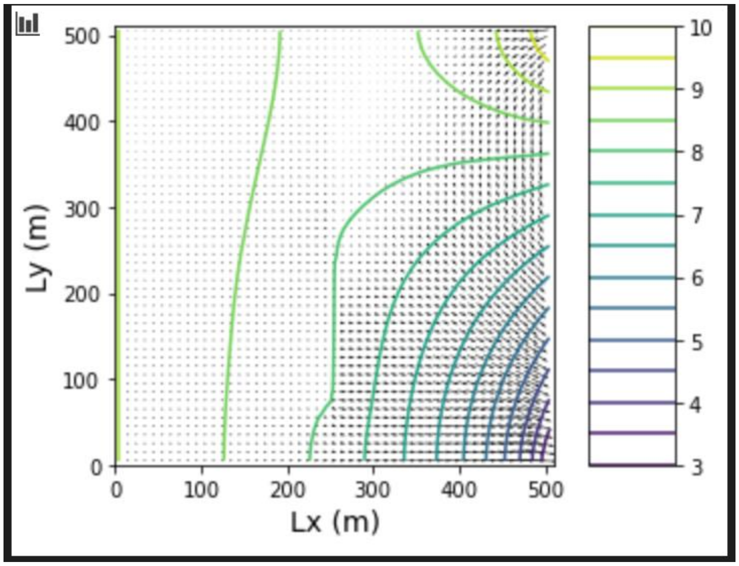
a) Use these figures to describe the nature (direction/magnitude) of stream/aquifer exchange along the stream. In particular, explain why the leakage changes magnitude or direction where these values change.

The 'flows' graph indicates gaining and declining of the river showing a zero or below zero flow at a row number around 45. From row numbers 10-30 there is a positive slope and then from 30-45 it is a negative slope and shows the flow of the river is declining but the head is still above the streambed. Using the 'heads' figure, when the head is above the streambed top, the river is gaining and when it goes below that line, the river is losing water. Using the 'leaked to aquifer' graph, it shows that from 0-20, the values are mostly negative so the river is gaining from the aquifer and then goes positive indicating that the flow and head decreases which is because the water from the river is leaking to the aquifer.



b) Use the head distribution to describe the movement of water across the boundaries and into/out of the stream.

Looking at the graph below, it shows that barely any water is coming from the left boundary and almost all of it is coming from the right boundary. The graph shows that lower right corner has less flow than the upper right corner. The left boundary is interesting because it seems that it is at a constant flow? (not quite sure what is happening on the left side)

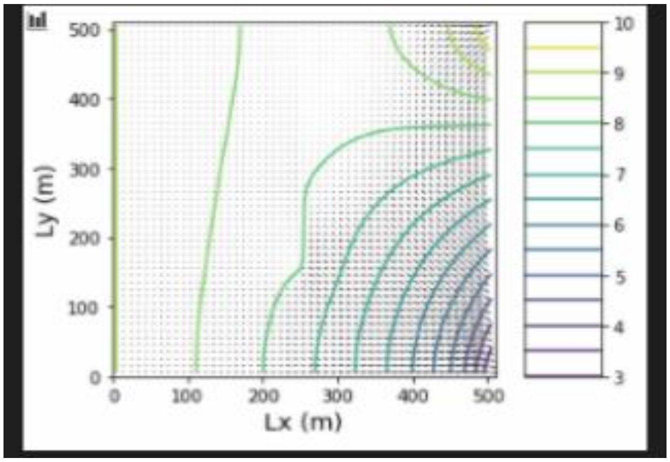


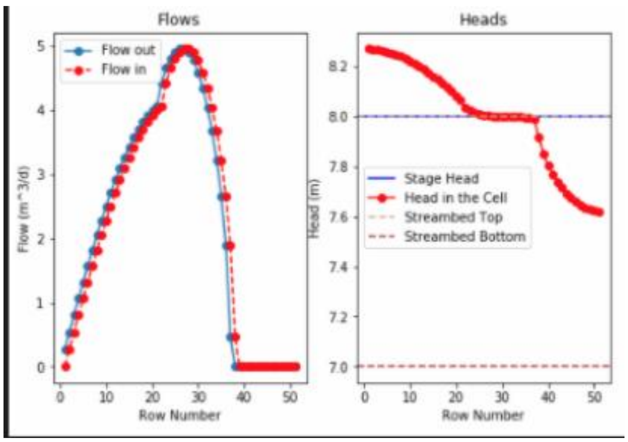
c) Choose two things to explore (e.g. impact of streambed K or inflow into the river or recharge rate). Produce a plot for each to compare to the base plots and use the plots to explain the impact of the hydrologic change.

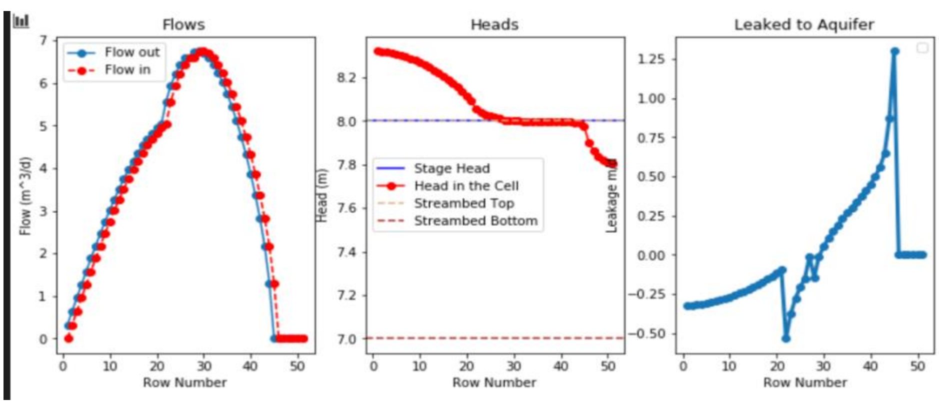
Change 1: decrease recharge rate (changed to 1e-5 m/day)

With this change, the flow becomes steeper in the negative direction and the head also drops lower than when the recharge is smaller.

Flow stays the same but since there is less recharge, the river loses more water faster and that's why the 'flows' graph reaches 0 flow by row 40 compared to 45 and then on the 'heads' graph, you can see that the stream loses way more water from how low the head values get after the head goes under the stage head.



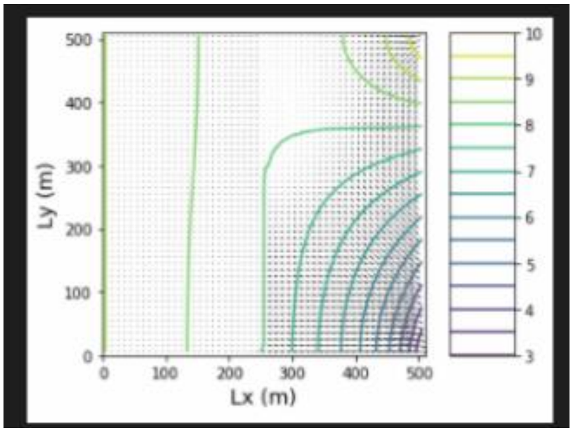


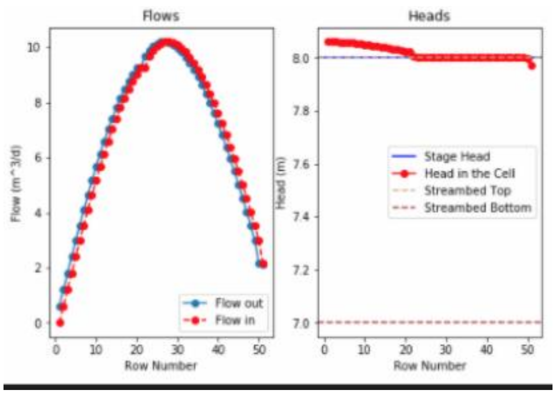


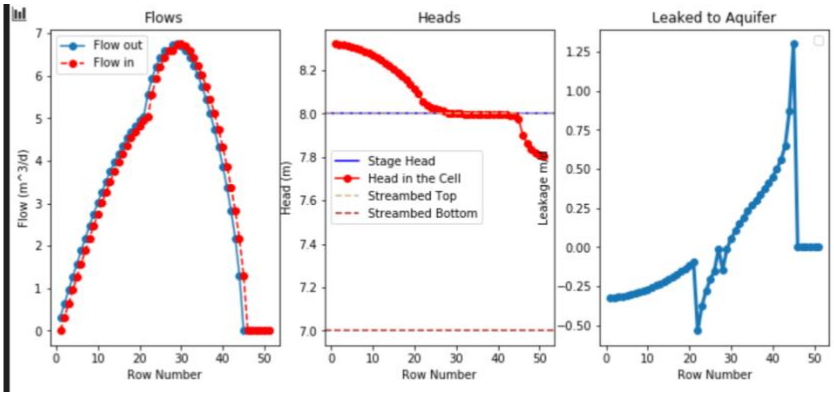
Change 2: K of stream bottom (changed to 10)

With a larger hydraulic conductivity value, the flow graph has a more even curve than when the K value was 1 and the head values fluctuate way less than the original graphs. Since the K value is greater, it is easier for water to flow so there is less effort for water to move through the streambed.

By changing the K of the streambed from 1 to 10, it allowed more water to come into the stream because the K is larger, and you can also see on the graph that the flow goes up to 10 m^3/day compared to 5 m^3/day in the original graph. We have flow all the way to the end of the domain because there is more water coming into the stream so there is enough water until the end of stream. The 'flows' graph also stops at 2 m^3/day whereas the original graph stalls at 0 m^3/day at the end of the rows. The 'heads' graph is flatter than the original because more water flows into the stream because of the higher K value, so the head value also stays at the same value at the stage head longer before it drains and goes below the stage head.







Original Figures: