Rio Grande Basin Model
Stream aquifer Darcy flow equation:

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Darcy Equation:

$$V / t = -KA \frac{dH}{dL}$$

where V = volume of flow

K = hydraulic conductivity - speed water moves through a porous medium

A = Area of contact between aquifer-stream (height of contact times river reach length).

dH/dL = simple slope gradient: height differential between aquifer water table and stream water level divided by distance between two.

Related Concepts Resulting from Darcy Flow

Water flow from aquifer to river is proportional to aquifer stream area (height times river reach length) times hydraulic gradient (difference in water table height from pumping area to river surface height).

After X flow goes from aquifer to river, then the hydraulic height falls in proportion to the aquifer's loss in volume.

Aquifer's loss in hydraulic height is proportional to the volume passing from the aquifer to the river compared to its base volume.

For a known volume per unit time added to the river, the change in depth is proportional to the width times length.

River's volume gain is proportional to the segment length.

Surface river flow per unit time increases by the aquifer volume per unit time discharged to the river.

Volume per unit time from aquifer to river reduces river flow and increases aquifer stock and water table in proportion to the time flow rate occurs.

1000 acre feet per year from river to aquifer: reduces river flow by 1000 acre feet per year (reducing its depth) and increases aquifer storage volume by 1000 acre feet per year.

Existing NMSU Rio Grand Basin Policy Model

Our Rio Grande Model assumes continued and sustained stream-aquifer equilibrium. This means it has no Darcy Flow. Zero Darcy flow assumes no differential in water table height from the aquifer to the stream. The aquifer water table and stream height move together. (It's based on the equilibrium condition described by Theis equation, 1944) So net seepage into the aquifer (positive or negative) takes (or gives) a constant proportion of volume from both stream and aquifer. The stream has no gaining and no losing reaches from the headwaters to the bottom.