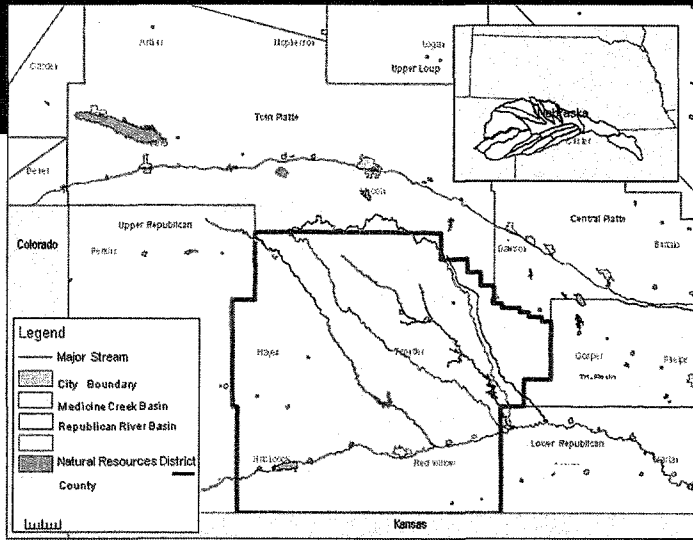# Medicine Creek Basin Model Summary

The Medicine Creek groundwater model is a transient groundwater model of the High Plains Aquifer in the Medicine Creek Basin developed by Brown and Caldwell. It consists of 77,512 active 40 acre cells in two layers. The model domain covers an approximate area of 1,550,246 acres between the Platte River and Republican river north to south, and between the Redwillow creek and Deer Creek east to west. These natural boundaries extend beyond the area of focus of the Medicine Creek Basin to aid in understanding groundwater/surface water interactions between the area of focus and the surround area. Stress periods start during predevelopment in 1950 and extends to 2013, simulating in monthly hydraulic stresses. The model was calibrated using 52 monitoring well locations using 1,753 water level measurements.

Hydraulic zones and other hydraulic properties used in the model were based off of well drillers logs, the COHYST ground water model, and the Republican River compact model. The model was then calibrated, using monitoring well data, to find how fast or slow water flows between cells; known as hydraulic conductivity. Stresses on the aquifer such as pumping, ET, and recharge were include by taking metered pumping, land use, and climate data and running those variables through a cropsim model. This differs from many models in that pumping and crop type were a known variable; where other models use a net irrigation requirement to determine the volume of irrigation.

The Medicine Creek Basin model was developed to determine an irrigation allocation on the medicine creek watershed to minimize the negative impacts on the aquifer. Streamflow was included this model, however, it was not the primary intent of this model. Using the highest resolution model and data available allows for a more comprehensive understanding of how the aquifer reacts to hydraulic stresses. It can also serve the purpose of understanding how irrigation density and intensity can affect a localized area. The long term goal for the MRNRD is to have a watershed model on every watershed within the MRNRD to determine a sustainable allocation in each one.

Middle Republican NRD
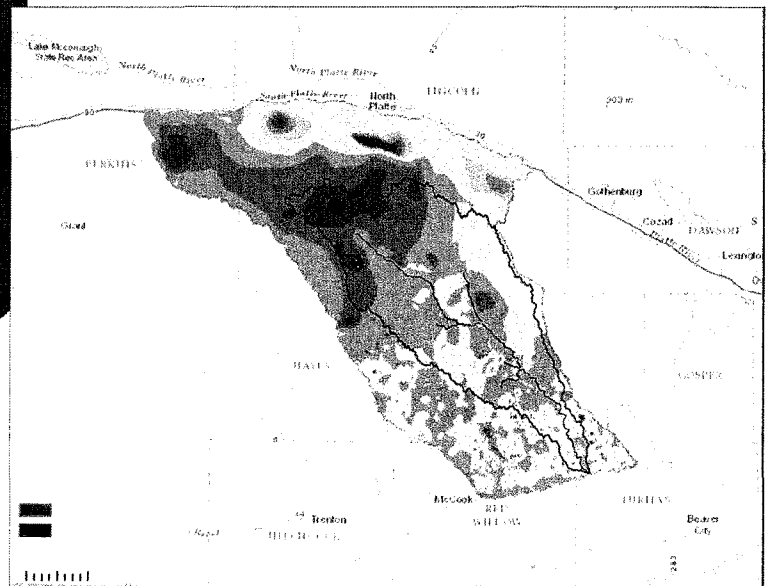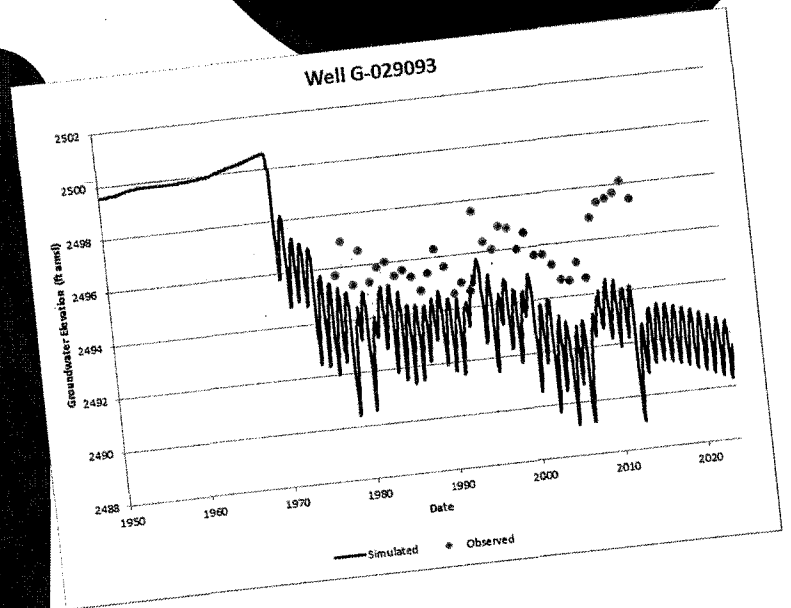## *Medicine Creek Basin Model*

Medicine Creek Basin Model

Developing a calibrated transient groundwater flow model of the Medicine Creek Basin. This will develop a robust tool for the Board of Directors to be able to use for decision making with a more science based answer.

Well G-029093

MRNRD will use the Basin Model to evaluate future water management scenarios that optimize the use of surface water and groundwater resources, while minimizing or avoiding long-term declines in aquifer water levels.

The Basin Model was built with 77,512 active 40-acre cells

Developing a robust modeling framework with the flexibility to analyze and evaluate groundwater wells/pumping, aquifer-stream interactions, aquifer-reservoir interactions, surface water/groundwater augmentation, and water consumption/irrigation for various crops and native landscapes

Middle Republican Natural Resources District