Spokane Valley-Rathdrum Prairie Capture Spreadsheet

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The Spokane Valley-Rathdrum Prairie Capture Spreadsheet is a Microsoft Excel Spreadsheet utility that allows lay users to identify a location, magnitude, and timing for aquifer withdrawal or recharge (a stress or stresses) and determine the resulting location, magnitude, and timing of impacts on surface water bodies interconnected with the Spokane Valley-Rathdrum Prairie (SVRP) aquifer of Washington and Idaho. The spreadsheet is based on the SVRP aquifer model which represents our best understanding of surface and ground water interaction in the basin. The surface and ground water interaction forming the basis of the spreadsheet tool were developed from a double-precision version of the SVRP MODFLOW model consisting of 120 monthly timesteps (10 years) followed by a steady state condition. The simulation represented average hydrologic conditions for the October 1995 through September 2005 period.

The spreadsheet provides a more aggregated look at the surface and ground water interaction in the SVRP aquifer model. Aggregation occurs by the development of zones within the aquifer and reaches associated with surface water systems. Aquifer zones have been developed in which it is assumed that the interaction with surface water bodies are the same for a stress anywhere within a given zone, and can be represented by an average response for that area. This requires that aquifer zones be developed which have minimal differences in their response to different river/
lake reaches at all times.

Hydrologic effects from ground water pumping and recharge are represented in the changes (gains and losses) of the Spokane River, Little Spokane River, Long Lake, Lake Coeur d'Alene, and Lake Pend Oreille. Location of pumping and recharge are pre-defined by zones based on the response in steady state conditions and the time it takes the response to reach 50%. A total of 36 zones comprise the SVRP and each zone has a degree of variation based on responses to transient conditions (time to 50% response) and steady state conditions.

The spreadsheet utilized capture response functions which were determined from the SVRP aquifer model. The use of response functions requires that the governing equation are linear so that effects of multiple stresses are additive and the magnitude of the effect is proportional to the magnitude of the stress (recharge or discharge). Unconfined conditions and piecewise linear representations of streams and lakes creates the potential for some non-linearity in the SVRP aquifer model. Non-linearity errors are minimized when this spreadsheet is used to represent aquifer conditions (e.g., aquifer water levels) that are similar to those of the 1995 to 2005 period, and additional recharge and discharge stresses that do not represent major changes to the water budget of a region of the aquifer. Recharge and discharge stresses less than about 10 cfs should be acceptable in most areas; however, further testing is being performed to better identify thresholds of concern.

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Stacey Taylor received her M.S. in Hydrology and her B.S. in Geology from University of Idaho. After finishing her M.S. degree, she began working for the Idaho Water Resources Research Institute (IWRRI) in Idaho Falls as a Research Hydrologist. Currently with IWRRI, she continues to work on the water budget for the Eastern Snake River Plain and has completed response function work for the Spokane Valley-Rathdrum Prairie Aquifer.