**Using Thermal Modeling to Ascertain Flux from Lake Pend Oreille into the Rathdrum Prairie Aquifer**

Ken Neely[1] and Allan Wylie
[1]Idaho Department of Water Resources
332 E. Front St
Boise, ID 83720
(208) 287-4852
ken.neely@idwr.idaho.gov

A ground-water flow model was completed for the Spokane Valley Rathdrum Prairie Aquifer in 2007. One of the model's limitations was identified to be the uncertainty in the seepages from Lake Pend Oreille and Coeur d'Alene Lake. In 2008, Nimmer and Ralston used water elevation and temperature data to determine that wells near the Lake Coeur d'Alene outlet were hydraulically connected to the lake, that more leakage occurs along the shoreline than at greater depths, and that more leakage from the lake occurs at high lake levels. The Idaho Department of Water Resources (IDWR) decided to apply the technique used by Nimmer and Ralston in an attempt to understand the flux from Lake Pend Oreille into the Rathdrum Prairie aquifer in the Farragut State Park area. IDWR chose this area to study first because the hydrogeology is less complex than it is in the Coeur d'Alene Lake area, there is less anthropogenic impact than in Coeur d'Alene, and there are a number of unused production wells in Farragut State Park that could be easily adapted for monitoring. The water level/temperature cycles in Lake Pend Oreille are higher/warmer in the summer and lower/cooler in the winter. Ground water flows from the lake to the west into the aquifer. IDWR's monitoring plan is to attempt to determine if the water level/temperature signals in the lake are transmitted into the aquifer, and if so, what is the rate of transmission. In a portion of the aquifer from Farragut State Park west to Athol, IDWR monitors seven wells (five in the Park and two west of the Park). The wells are instrumented with Insitu transducers and Hobo temperature loggers. Most wells have two or more transducers, deployed at different elevations in the water column. The initial results indicate that the water levels in all seven wells respond very quickly to the changes in lake levels. Temperature responses are variable and more complex. In three of the Park wells, the temperature cycles correlate directly with the water level changes. In two of the Park wells, the temperature cycles are out of phase (i.e., delayed arrival) with respect to the water level cycles. Furthermore, one Park well shows different temperature responses in two transducers that are deployed 40 feet apart in elevation. The Highway 54 well, which is about two miles west of the Park, has a much subdued temperature response and a temperature cycle that is out of phase with the water level cycle. In addition to the phase shifts, the temperature patterns in the water columns of the wells may be further impacted in the area west of the park by the downward movement of cooler temperatures from the vadose zone and the upward movement of warmer temperatures from deeper in the earth. A new monitoring well proposed to be drilled in 2011 may help answer some of the water temperature questions. Also, enhanced monitoring, such as deploying additional transducers at various elevations in some of the existing wells, may also be beneficial for thermal modeling.