
Idaho Department of Water Resources
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Overview

1. The Stateline Subarea is one of five subareas for the Rathdrum Prairie aquifer. This subarea is located in the southwestern portion of the aquifer.
2. There are six monitoring wells in the Stateline Subarea.
3. Ground water level and water temperature data are collected at the wells by manual electric tape measurements and by electronic transducers that have been deployed in the wells. However, transducers were deployed relatively recently (November, 2014) in two of the wells, and thus transducer data for those two wells were limited for this analysis.
4. Ground water levels in this subarea, and for most of the aquifer, occur in an annual cycle with maximum water levels in the April-July time period, and minimum levels in the August-March time period.
5. The ground water level trend from 2006 to 2011 was flat to moderately declining.
6. Ground water levels rose about 5 to 10 feet above normal in 2011 due to higher-than-average snowpack. The levels declined slightly in 2012. The levels continued to be slightly above normal in 2013 through 2015.
7. The ground water gradient is to the north from the Spokane River, to the west toward the state line, and probably to the southwest along the base of the western mountains. The gradient varies from 3 to 12 feet per mile.
8. Ground water temperatures are highly variable. Three wells have annual temperature cycles with ranges of 3 to 40 degrees Fahrenheit. One well has a flat temperature profile.
9. The two wells that are within a couple hundred feet of the Spokane River show strong hydraulic connection to the river. Two wells that are one mile and 1.5 miles from the river show some hydraulic connection with the river, but are probably more strongly influenced by ground water flow from the north and east.
10. Two wells located are to be added to the monitoring network in this subarea in 2016. A well between Post Falls and Coeur d’Alene, located along the eastern edge of the subarea, is to be drilled by Kootenai County Fire and Rescue on their property, with financial assistance from the Idaho Department of Water Resources (IDWR). An exploration well being drilled by the City of Rathdrum at a location about two miles south of the city, and near the northern edge of the subarea, is going to be available to IDWR for monitoring.
11. IDWR will continue to try to determine the flux from the Spokane River into the aquifer during different times of the year, and to determine the underflow from lakes and the mountain slopes to the north.
Detailed Analyses

The Idaho Department of Water Resources (IDWR) has a ground water level and temperature monitoring program for the Rathdrum Prairie aquifer. The network currently contains 30 wells. The Stateline Subarea, which is one of five subareas for the aquifer, is located in the southwestern part of the Rathdrum Prairie aquifer. There are six monitoring wells in the Stateline Subarea. Two wells are located along the north bank of the Spokane River. The other four wells are located one to two miles north of the river. Figure 1 shows the location of the six wells and Table 1 provides the attributes of each well. In Situ© transducers are deployed in all six wells. However, transducers were only first deployed in Wells #19 and #20 in November, 2014.

The Spokane River is a losing reach in this subarea. The aquifer is in good hydraulic communication with the river based on the similarities in water level trends; ie, the maximum water level in the aquifer occurs when the river is at its highest discharge, or shortly after its highest discharge, and vice versa. The ground water gradient is to the north from the river, to the west toward the state line in the main channel, and to the southwest along the slopes of the mountains to the north.

Wells #16 and #17 are very close to the Spokane River (Figure 1). Well #16 is 79 feet deep and Well #17 is 46 feet deep. Ground water levels in Well #16 are generally about 15 to 30 feet lower than the levels in Well #17 for the maximum and minimum values, respectively (Figure 2). The range in the water levels is greater in Well #16 than in Well #17, and the hydrograph for Well #16 more closely mirrors the discharge profile for the Spokane River. This indicates that the deep well is in closer hydraulic connection to the river than the shallow well. The water temperature profiles for Wells #16 and #17 show that Well #17 has a much wider range in values, and that the maximum and minimum values generally occur in this well one to three months before they occur in Well #16 (Figure 3). This would suggest that Well #17 has closer hydraulic connection to the river than Well #16. The reason for the discrepancy between the water level and water temperature data, relative to hydraulic connection to the river, is unknown.

Well #18 is about two miles north of Well #16 (and the Spokane River), and about 3.8 miles west of Well #21. Well #18 has a water level profile that is very similar to Well #21, and has some general similarities with Well #16 (Figure 4). Since Well #16 is hydraulic connected to the Spokane River, it is reasonable to assume that Well #18 is also in hydraulic communication with the river based on the similarities in the hydrographs. Well #18 is also influenced by runoff from the mountain slopes and leakage from Hauser Lake to the north, based on the study by Stephens, 2013 (Figure 5). The gradient between well #16 and Well #18 is about 12 feet per mile (ft/mi). The gradient from Well #21 to Well #20 is about 3 ft/mi, and the gradient from Well #20 to Well #18 is 8 ft/mi. Well #21 has a ground water level profile that is remarkably similar to Well #22, which is located almost 6 miles to the northeast in the Coeur d’Alene Subarea. The gradient between these two wells is only 1.2 ft/mi.

Ground water temperatures for Wells #16, #18, #21, and #22 are shown in Figure 6. Wells #16 and #18 have similarities in the timings of their maximum and minimum values which further supports the hypothesis that both wells are in hydraulic communication with the river. The flat temperature profile in Well #21 indicates that this well is probably not hydraulically connected to the river. Wells #21 and #22 have similar temperature profiles, but Well #21 has water temperatures that are 12 degrees Fahrenheit (°F) warmer than the temperatures in Well #22. Overall, ground water temperatures
increase about 18 °F over a distance of 12 miles from Well #23 near Hayden Lake to Well #18 near the state line.

Figure 1. Location of IDWR’s six monitoring wells in the Stateline Subarea.
Table 1. List of the Stateline Subarea monitoring wells.

<table>
<thead>
<tr>
<th>Well Number</th>
<th>Station Name Common Name</th>
<th>Year Drilled</th>
<th>Well Depth (feet)</th>
<th>Open Interval(^1) (feet from top of casing)</th>
<th>Open Interval (feet above Sea Level)</th>
<th>Water Level Elevation(^2)</th>
<th>Height of water column (ft)(^3)</th>
<th>Period of Monitoring Data</th>
</tr>
</thead>
</table>

\(^1\)P = Perforations; O = Open Hole; S = Screen  
\(^2\)Based on maximum water levels.  
\(^3\)Based on maximum water levels.  
\(^4\)USGS manual measurements.  
\(^5\)IDWR manual and transducer measurements.  
\(^6\)USGS and IDWR manual measurements

Figure 2. Lake Pend Oreille lake levels and ground water levels for IDWR Monitoring Well #16 and #17.
Figure 3. Ground water temperatures for Monitoring Wells #16 and #17.

Figure 4. Ground water levels for IDWR Monitoring Wells #16, #18 and #21, and Spokane River discharges.
Figure 5. Recharge areas as determined by deuterium (2H) and oxygen (18O) isotope data (from Stephens (2013)).
Figure 6. Ground water temperatures for Monitoring Wells #16, #18, #21, and #22.

Conclusions

The Stateline Subarea is a part of the Rathdrum Prairie aquifer where four different pathways of ground water underflow converge. Ground water comes from the Spokane River and flows north in the area about two miles west of Post Falls. Ground water comes from the mountains and lakes to the north and flows south into the aquifer. Ground water comes from the east where its sources are Hayden Lake, Coeur d’Alene Lake, and the Spokane River. Ground water flows from the northeast where its sources are the western mountain slopes and Lake Pend Oreille. One well in the Stateline Subarea has a water level profile that is distinctly similar to the discharge hydrograph for the Spokane River. Two other wells show some similarities to the river discharge, and one well does not appear to have any hydraulic connection to the river. Water temperature data from the wells is also useful for analyzing the degree of hydraulic connection between the river and the wells.

Future Plans

1. Continue to monitor all six wells.
2. Add two wells to the monitoring network in the Stateline Subarea in 2016. These wells are located on the eastern and northern edges of the subarea.
3. Investigate the possibility of adding a well to the monitoring network at a location about 1.5 miles south of Hauser Lake
References


