Measuring change in well depth over time

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Measurements of water levels in state observation wells are subject to many fluctuations. Depths can be influenced by time of year and whether or not a pump was running. The Oregonian/OregonLive attempted to estimate long-term trends in water levels by isolating 185 observation wells for which the Oregon Water Resources Department has kept the most consistent data since 1970.

Step 1: Download data

We downloaded 246,514 observations (file = owrd_wls.txt) from 19,462 wells in the OWRD master list (file = owrd_master.txt). Both files are located at: https://www.oregon.gov/owrd/pages/gw/well_data.aspx

Step 2: Limit timeframe

We eliminated any observations before 1970 and after 2014. We kept only wells with SourceOrg listed as OWRD or USGS. This left 130,869 records.

Step: 3: Select wells for consistency

For every observation date, we listed a half decade (1970-74, 1975-79, etc.) and quarter of the year (1, 2, 3, 4).

We only kept wells at which at least one quarter of the year was tested in all nine half decades from 1970-2014.

If a well had more than one quarter of observations for nine half decades, then we chose the quarter with the largest total number of observations.

If two or more quarters were tied for the most observations, we chose the earlier quarter. For example, if Q2 and Q4 both had 100 observations from 1970-2014, we chose Q2.

(It would have been desirable to keep only observations made when the well was static and not pumping. However, the field indicating static or pumping too often was listed as “Unknown.” We therefore opted to keep all status codes.)

The final list contained 185 observation wells statewide, 130 east of the Cascades.

Step 4: Calculate typical depths over time

We calculated the median depth for all observations in the chosen quarter for each well and each half decade.

Step 5: Calculate change in depth over time

We treated the 1970-74 median depth of each well as the baseline. We then calculated changes in median every five years (the well “deltas”). The average of eight deltas indicates the trend over time.

For 96 of the 130 wells east of the Cascades (74 percent), the trend was toward falling water levels since 1970. “Increasing depth” shown as negative below.