ted from the map because this well represents a localized recovery. If this point were to be used, the interpolation process would spread this local phenomenon across much of the aquifer and not limit it to near the well. The Dakota aquifer (Figure 2) shows decreasing water levels over much of the aquifer extent. The Silurian-Devonian aquifer (Figure 3) shows stable water levels in some areas of the state and decreases in other areas. The largest decreases in water levels in the Silurian-Devonian aquifer are in Johnson County, where three wells had decreases of more than 10 feet. The Mississippian aquifer (Figure 4) shows a decrease in water levels in central Iowa, but that trend is documented by only two wells.

ArcGIS™ was unable to interpolate water level changes in the Dresbach aquifer or the local aquifer systems listed in Table 1 for various reasons. Though the aquifer exists under most of the state, the Dresbach aquifer had too few wells (3) to adequately cover its full extent. The Ordovician-Galena, Pennsylvanian, and alluvial aquifers also had too few wells to adequately cover the extent of the aquifer, despite the fact that these are localized aquifers. The Pleistocene drift aquifer and the Pleistocene buried channel aquifer are localized and discontinuous, which hinders interpolating that data across the state.

Investigation into the causes of these water level trends is ongoing. The influence of climatic conditions on the water level trends needs be examined. Some wells in the network are associated with or located near municipal or public water supplies. These wells need to be evaluated to determine if the municipal or public water supply wells were actively pumping during this time frame, and if so, how that pumping may be impacting local water level trends. Finally, many wells have data available prior to 1995, which will be included in future analysis of water level changes.

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Iowa Watershed Monitoring and Assessment Program Web Site – wqm.igsb.uiowa.edu

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IOWA'S WATER
Ambient Monitoring Program

Water Level Changes in Iowa's Aquifers

Preliminary Investigation for 1995-2004

Since 1982, the Iowa Department of Natural Resources (IDNR) and the United States Geological Survey (USGS) have maintained a network of groundwater wells to monitor water level changes in aquifers across the state. In 2004, monitoring of this network was suspended because of budget cuts, but was reactivated in late 2007 in response to renewed interest in water quantity issues. The wells in this network are located in the principal bedrock and surficial aquifers in the state, and water levels are measured quarterly.

Water level data from 1995 to 2004 from wells in this network were examined to document any long-term changes in water levels. A search of the USGS's National Water Information System (http://water-data.usgs.gov/ia/nwis/nwis) found 157 wells with data from this time frame. Regression lines were plotted through these data to evaluate temporal water level changes, and these results were then tested for statistical significance.

Table 1. *Summary of the number of wells in each aquifer that showed increases, decreases, or no change to water levels, 1995-2004. See* Iowa's Groundwater Basics *for more information about these aquifers.*

Aquifer	Total wells	Wells with no change	Wells with increasing water levels	Wells with decreasing water levels
Regional Bedrock Systems				
Dakota	39	10	2	27
Mississippian	11	8	1	2
Silurian-Devonian	36	21	2	13
Cambrian-Ordovician	19	7	5	7
Dresbach	3	0	1	2
Local Systems				
Alluvium	4	3	0	1
Pleistocene drift	20	16	0	4
Pleistocene buried channels	19	5	1	13
Pennsylvanian	4	3	0	1
Ordovician-Galena	2	2	0	0

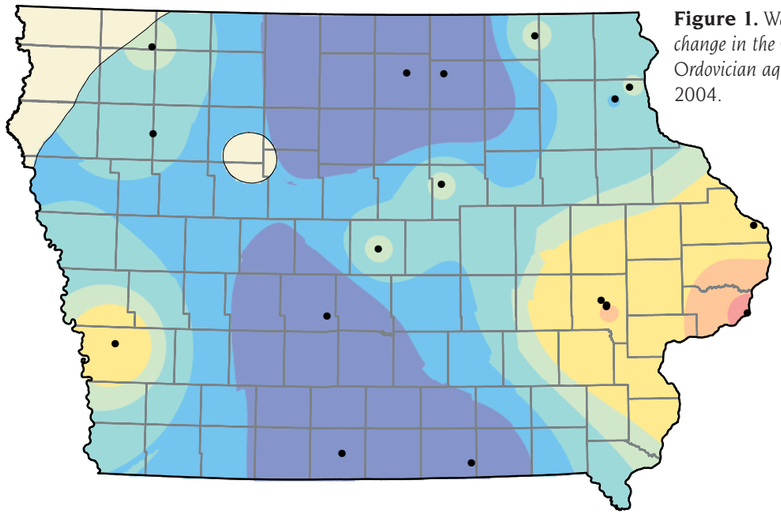


Figure 1. *Water level change in the Cambrian-Ordovician aquifer,* 1995-2004.

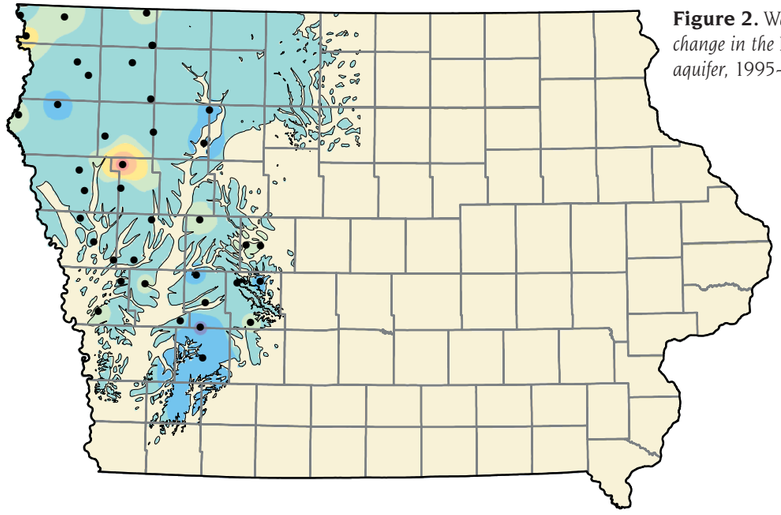


Figure 2. *Water level change in the Dakota aquifer,* 1995-2004.

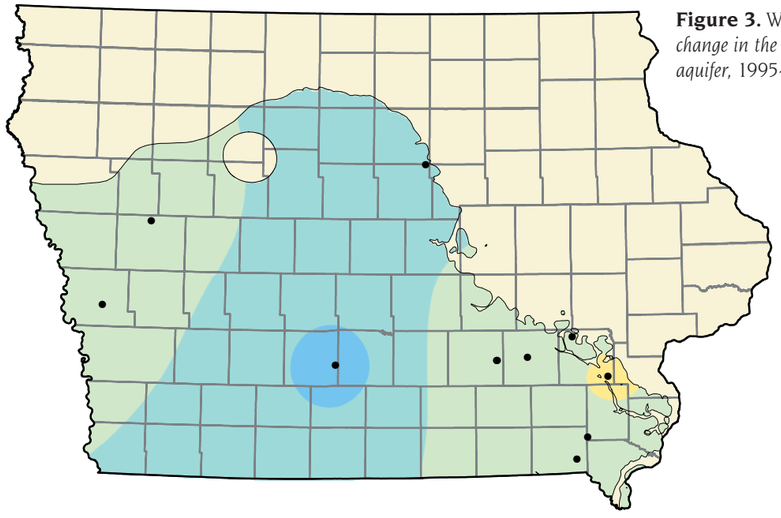


Figure 3. *Water level change in the Mississippian aquifer,* 1995-2004.

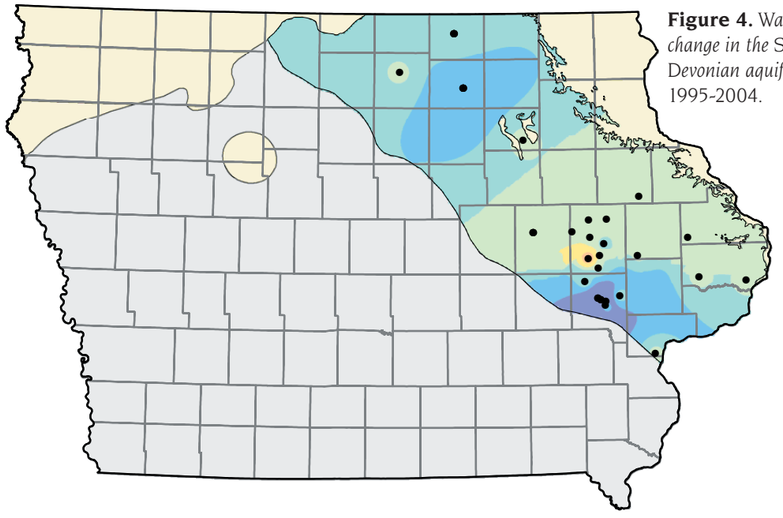
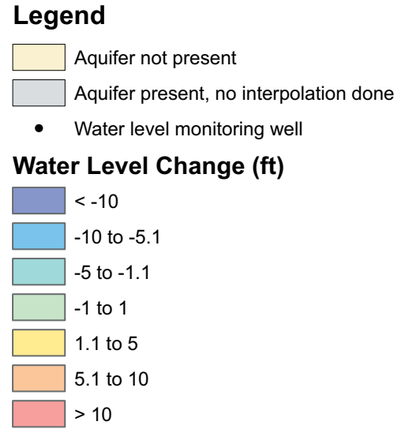


Figure 4. *Water level change in the Silurian-Devonian aquifer,* 1995-2004.



NOTE: A single well may have a dramatic impact on the interpolation process and significantly alter the results. One well in the Cambrian-Ordovician aquifer and one well in the Silurian-Devonian aquifer were omitted during the interpolation process. Both wells experienced extremely large increases in water levels, which are not believed to represent overall trends in the regional aquifer. These increases are likely the result of localized well issues. If data from these wells were used, this local phenomenon would be spread across much of the aquifer.

Statistically significant changes in water levels were identified in 52% of the wells ($p<0.05$). Table 1 summarizes the number of wells in each aquifer that showed increases, decreases, or no change to water levels. *Iowa's Groundwater Basics*, which is available from the IDNR or online at www.igsb.uiowa.edu/gwbasics/, presents basic information about the aquifers listed in Table 1. The Dakota aquifer had the most wells with decreases in water levels (27). A well in the Silurian-Devonian had the largest decrease in water level (-47.5 ft). The Cambrian-Ordovician aquifer had the most wells with increasing water levels (5) and had the well with the largest increase (174.2 ft). The increase in this particular well is believed to represents a return to static (non-pumping) water levels after the town (Leighton, Mahaska County) stopped pumping groundwater from this well and switched to a rural water system. The Silurian-Devonian aquifer had the most wells with no water level changes (21).

ArcGIS™ was used to interpolate the water level changes at individual wells across the entire extent of several regional bedrock aquifers. The Cambrian-Ordovician aquifer (Figure 1) shows large areas with decreases in water level, with five wells having decreases of more than 10 feet. One well was omit-