Loudoun Groundwater Study Raises Concerns About Long-term Sustainability

Norman K. Styer Oct 7, 2025

A study group assembled by the Loudoun County Preservation and Conservation Coalition has published a 57-page assessment of groundwater data that is expected to generate new discussions about rural resource protections—if not alarm over declining water levels.

For nearly four decades, developers of rural subdivisions have been required to conduct groundwater studies and submit the data to county planners.

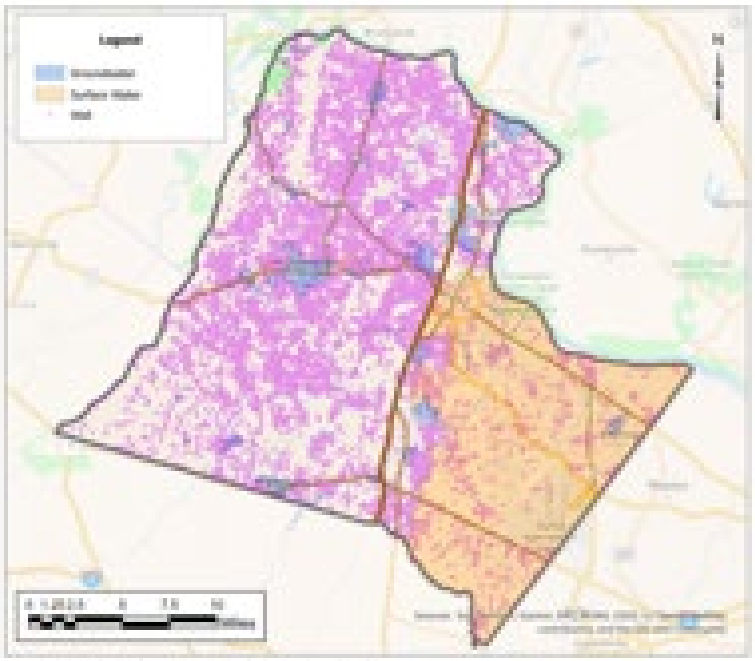
More than 200 reports on file. However, little has been done to evaluate the troves of data included in those reports, especially in a comprehensive way.

Until now.

The assessment began with a focus on developing a plan to ensure water would be available to support farmers and rural businesses over the long term.

But the report's conclusions raise questions about whether that is possible.

"Groundwater conditions in Loudoun County have significantly worsened over the past several decades. Groundwater as a water supply is no longer sustainable as the water table has slowly declined and several droughts have caused some wells, springs, and ponds to dry up," according to the report summary.



A map depicting the areas where wells (purple) serve as the source of drinking water.

Loudoun County Preservation and Conservation Coalition

In addition to droughts, the study points to a “silent shift,” whereby changes in land use and residential development have reduced the amount of precipitation recharging the groundwater supply by 5% to 10%.

The report’s authors are three longtime county residents: David S. Ward, a hydrologist who worked as a water resource engineer for the county government from more than two decades; Andrew Stoddard, a nationally recognized water quality monitoring expert from Hamilton; and John Adams, who has operated his farm near Lucketts for 50 years.

While rolling out the study, coalition members are being careful not to attribute blame to controversial factors like climate change or overdevelopment. Rather, they are calling for a more comprehensive effort to evaluate, understand, and regulate groundwater.

Coalition member John Lovegrove, of Save Rural Loudoun, sees concerns in the increasing number of “dry holes” drilled by well companies and in evidence that the water table is falling below soils and into lower areas of bedrock.

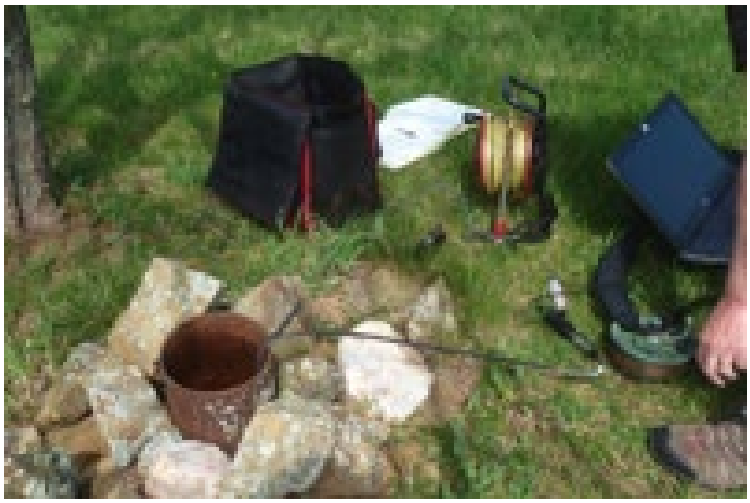
“Let's assume it shows us we've got a decreasing water supply. Now we have to get together and do something about it,” he said. “I think that's something that we want. We are advocating for the county to take on that this is a real problem. It's not going away. If we continue to ignore it, it's going to get worse. The consequences are tremendous,” he said.

The study includes an examination of 50 years of groundwater recharge data and long-term records of stream flows. While the study’s architects say there is not enough data to reach definitive conclusions, it is clear that conditions since the year 2000 are different from the years before.

One suggestion is to develop more monitoring wells.

At one time, the county government had plans to operate 35 to 40 of them, but there are only 14 active monitoring wells today. The U.S. Geological Survey operates three wells and 10 streamflow gauges that provide real-time measurements. Until 2023, data from the county's monitoring wells was published in annual reports—providing data that was nearly a year old.

"Our neighboring counties are ahead of us in understanding their problems, engaging the U.S. Geological Survey for better, newer information. We're collecting data and putting it on the shelf," Ward said.



A groundwater monitoring well.

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The long-term data on groundwater recharge shows a 5% to 10% drop in replenishment over the past 50 years. More recently, the impacts of reduced recharge have been exacerbated by significant, prolonged droughts.

During the same 50-year period, the number of wells increased from less than 5,000 to more than 17,000. According to the report, the pace of drilling increased from 300 wells per year between 1977 and 1999 to approximately 800 wells per year between 1999 and 2007. After 2007, the number of wells drilled each year declined to about 200 wells per year. Since 2001, there has been a rise in the number of replacement wells, attributable at least in part to the decline of the water table in locations were new subdivisions have caused more shallow wells in older homes to go dry.

"Half the wells are within 200 feet from one another. Ninety percent of the wells are within 500 feet of one another. There's a technical graph in the report that shows this," Ward said. "I think it's common sense. If your neighbor's well is only 200 feet away, you and they are competing for that same water source. There are simply too many straws pulling from the same bucket. When you draw the water down, he's got to draw the water down even further."

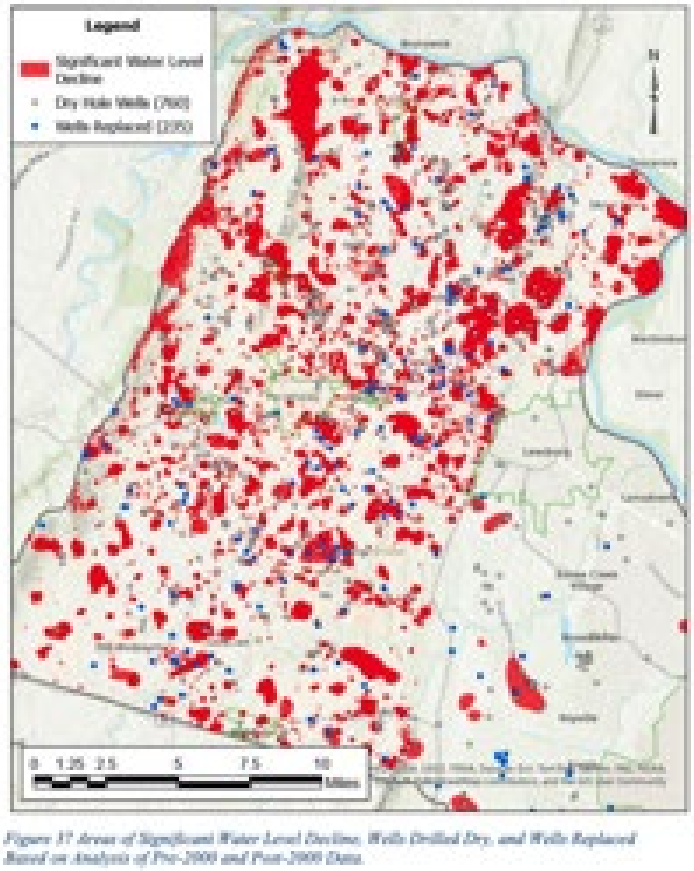

Figure 17 Areas of Significant Water Level Decline, Wells Drilled Dry, and Wells Replaced Based on Analysis of Pre-2000 and Post-2000 Data.

A graphic showing areas of significant water level decline, wells drilled dry, and wells replaced based on analysis of pre-2000 and post-2000 Data.

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Perhaps the most startling of the report's numerous graphs and charts is a map of rural Loudoun showing "red zones" where data indicate the water table has declined by 10 to 40 feet during the past 25 years.

"This report describes and provides scientifically defensible evidence that groundwater resources in Loudoun County are being significantly depleted by continued growth, that there have been periods of significant drought which are anticipated to worsen in magnitude and frequency, and that groundwater as a water supply is no longer sustainable," the report's authors conclude. "The supporting data and information presented in this report includes well construction, declining water levels, changes in groundwater recharge, well interference, and dry holes. Groundwater resources in Loudoun County cannot be sustained under existing practices, monitoring, management, and planning. Adverse conditions for water resources will only worsen with climate change."

For Ward, the report should be viewed as a call to action.

"The sky is not falling. We're not going to fall off the edge of the groundwater cliff tomorrow," he said. "But it's been dismissed and ignored, if you will, for quite a few decades, and that's the reason for putting this out—to say, hey, let's take a look at this. There's just too much at stake."

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