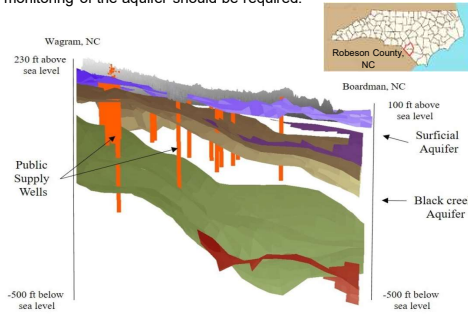


INTRODUCTION

The Department of Geology and Geography at the University of North Carolina at Pembroke (UNCP) is teaming up with industry leaders and county and state administrators to analyze our local water resources so that we can sustainably use this resource. The Black Creek Aquifer is a primary ground water resource for five different counties in Southeast North Carolina and is the focus of this study. Undergraduate interns worked with their faculty mentor, county officials, and a local well driller to site 13 monitoring wells and 1 pumping well across the region. Each of the 14 wells in the network are monitored using pressure transducers and the data is collected and downloaded each month to a publicly accessible database (database url: <https://arcgis/9qqjX>).

The Central Coastal Plain Capacity Use Plan put restrictions on other counties in the Coastal Plain Aquifers of North Carolina who pump from the Black Creek Aquifer, which requires the resource to be monitored so that the beneficial use rates do not exceed the recharge rates of the aquifers. In 2004, our region was investigated and deemed unnecessary to put under capacity use restrictions at that time. However, the investigation did suggest that further monitoring of the aquifer should be required.



Simplified 3D Model of the Aquifer System under a cross-section of Robeson County. Each of the layers are the tops of significant confining layers (clays) or aquifers (usually sands).

INSTALLATION AND MONITORING



Student interns aided in the site analysis of each of the wells and worked with county officials and local well drillers in the installation process.

Once a well had been drilled, UNCP installed down-hole data loggers to take water level measurements every 0.5 hour. This continuous monitoring will help to see how changes are occurring over time and will give us an understanding how water levels change due to seasonal fluctuations and regional use of the water within the aquifer.

Interns obtaining well data using e-tape and probe.

GROUNDWATER DATABASE

Southeastern North Carolina Groundwater Database

1 Well Records

This database is continuously updated.

This map shows the location of various water supply wells throughout Robeson and surrounding counties in North Carolina. However, not all water supply wells are present.

With this map, one is able to easily and quickly access documents related to a well, such as well construction logs, pump test results, geophysical logs, and construction permits.

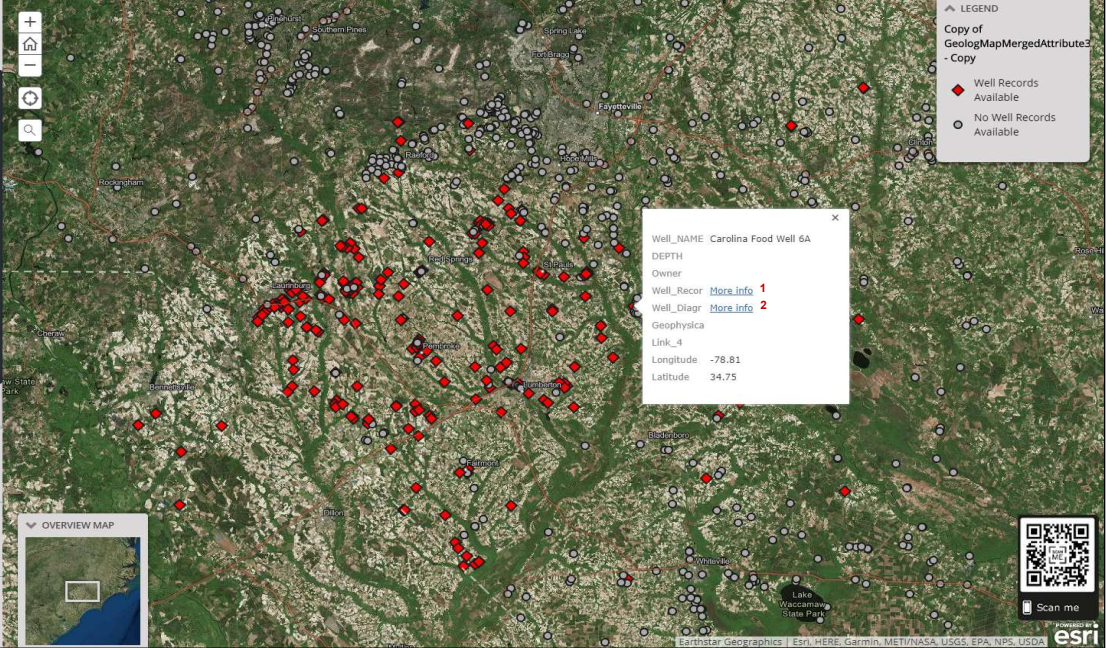
To access the documents

1. Click on any of the diamonds to bring up a pop-up.
2. Click on More info under the reports field click on it to bring up a new tab containing a pdf of the associated well log.

2 RCGW Wells

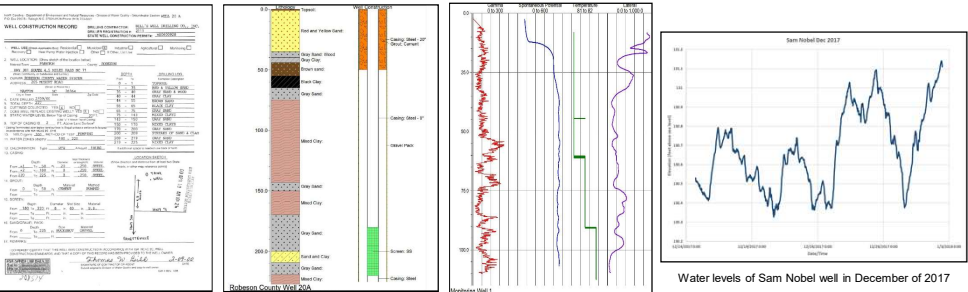
3 USGS Water Levels

4 State Wells



The interns collect well records from local drillers and the Water Resources Division of the North Carolina Department of Environmental Quality (DEQ) to be digitally linked to an online GIS database. All of the data obtained is synthesized in order to simplify the records for the public. The students create well construction and formation diagrams for each of the wells in the database. These new diagrams will help the research team and database users to better understand the aquifer system by determining the distribution of sediments in the subsurface.

The interns also create monthly potentiometric maps for the region based on the measurements from the wells and a report of these findings are reported to the county on a semi-annual basis. The potentiometric maps are based on the sparse data provided by state and the USGS and then the project fills in the gaps to calculate a more accurate potentiometric surface map. These maps will be important for analysis of how the region is using water over time so we can better manage the resource.



1 Well construction record

2 Lithology and construction diagrams

Geophysical data for UNCP campus monitoring well 1

Water levels of Sam Nobel well in December of 2017

The database includes well completion records, geophysical logs, formation records, pumping data, aquifer tests, well permits, photos of the location, water level measurements, hydrographs, and other information regarding the individual wells. The database also links individuals to a DEQ database for records in our region and a database that is managed by the United States Geological Survey.

PURPOSE & PLAN MOVING FORWARD

Industrial and agricultural uses of groundwater within the region have grown dramatically in the last 20 years. Companies such as Campbell Soup, Sanderson Farms, Prestage Foods - Farms, Smithfield Foods, and Mountaire Farms all have developed production plants in the region that require large withdrawals of groundwater during the processing of their products. In addition, farms that provide livestock and poultry to these processing plants need to provide water for their animals, and irrigators of local crops are increasingly utilizing local groundwater resources to provide water for their operations.

The goal is that we also want to sustainably use the resource so that capacity use restrictions are not implemented in the region but the resource can still aid with the regions economic growth. The monitoring of the groundwater and the database will hopefully act as a reference for water managers to determine how increased industrial and agricultural uses are impacting our local groundwater systems and to effectively manage the resource.

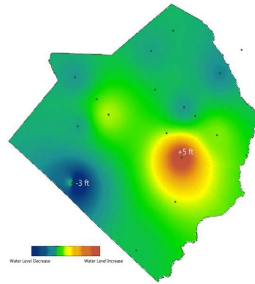


Diagram of water level changes between February and April, where red indicates an increase and blue indicates a decrease.

In order to gain an accurate assessment of how increased development is impacting the groundwater, analysis of the potentiometric surface over a longer period of time is required. However, funding from the initial pilot program is coming to an end, so we hope to acquire additional funds to continue and expand the project. The students would continue to collect archived groundwater data from surrounding counties in North and South Carolina that will be compiled and analyzed to produce stratigraphic columns, well diagrams, hydrographs, and maps of the region, as well as continue to collect water level information from local monitoring wells to provide potentiometric surface maps for the region.

ACKNOWLEDGEMENTS

We would like to thank **Charles R. Underwood INC.** for donating local wells (\$38,000) to UNCP as well as providing well log data for the online database.

We would like to thank the **Robeson County Water Department** for providing the funding (\$131,000) for the project.

We also want to thank all the interns who have worked on the groundwater project: Rebecca Hunter, Wren Varga, Joseph Leary, Jillian Robson, Edgar, Lopez, and Derek Gosciniak.

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