WHERE THERE IS A "WELL" THERE IS A WAY: CONNECTING UNDERGRADUATES TO THE WATER RESOURCE COMMUNITY VIA THE SOUTHEASTERN NORTH CAROLINA MONITORING PROJECT

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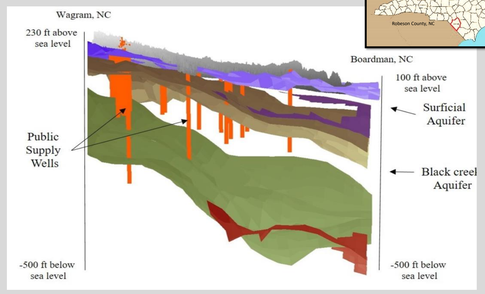
INTRODUCTION

The Department of Geology and Geography at the University of North Carolina at Pembroke (UNCP) was given the opportunity by Robeson County administrators to monitor and analyze the local water resources in the area. Given this position, the Department of Geology and Geography has allowed undergraduate students at UNCP to become interns for the project by taking on demanding responsibilities.

Undergraduate interns worked with their faculty mentor to obtain and analyze data to determine the sustainability of the water resources. The interns are tasked with individual responsibilities which will strengthen their knowledge and experience working on tasks related to their field.

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.



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).

MONITORING WELLS

The interns are responsible for extracting data from the monitoring wells in the counties. With the data extracted, the interns then use different software and techniques to monitor and visualize the groundwater levels by recording the levels in tables and graphs.

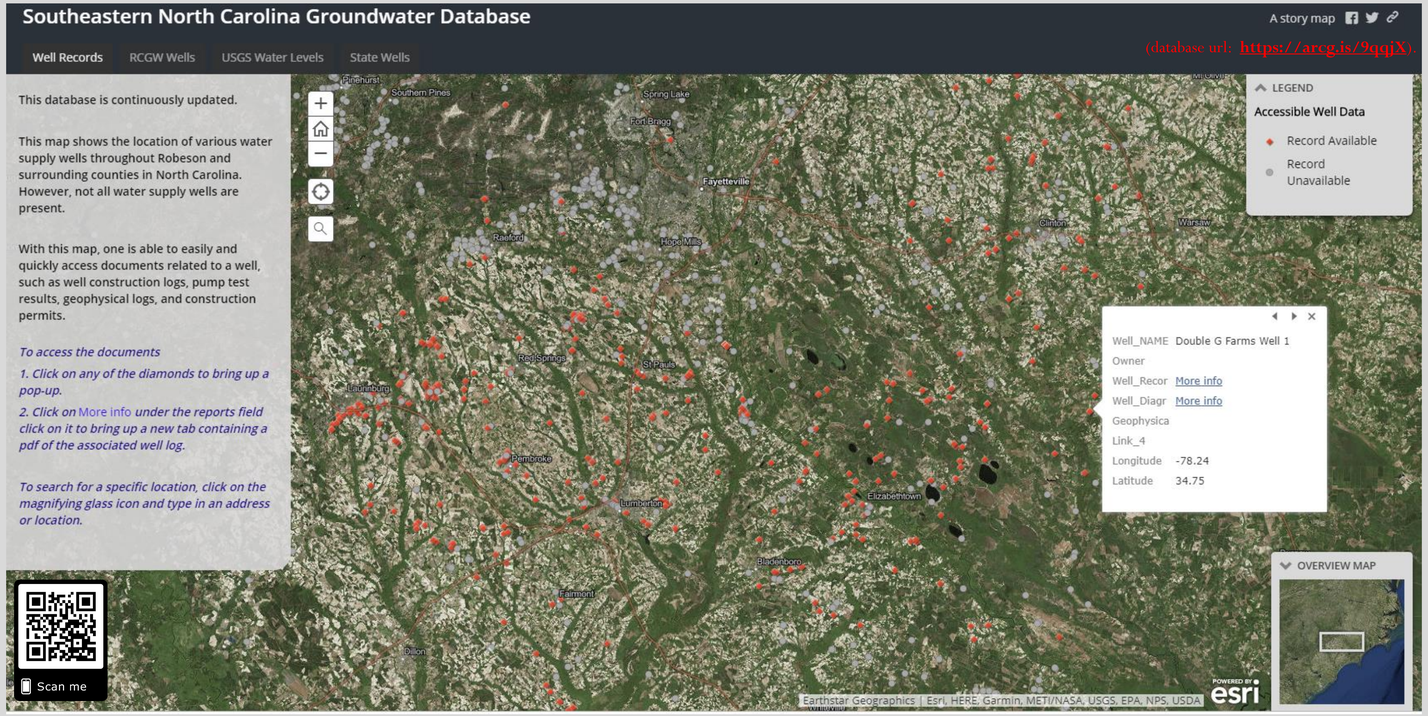
By partaking in these tasks, the undergraduate interns have become knowledge on how monitoring wells are used to keep track of how groundwater changes through precipitation and through extraction, as well as learn how to record and analyze groundwater level changes over time.

Interns working with faculty to collect data from campus well.

Manual collection of water levels at pumping wells

UNCP campus monitoring well.

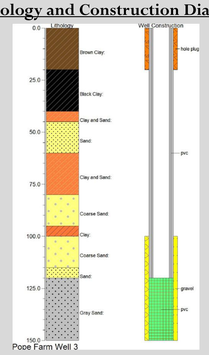
SOUTHEASTERN NORTH CAROLINA GROUNDWATER DATABASE



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.

Well Construction Record

Lithology and Construction Diagrams

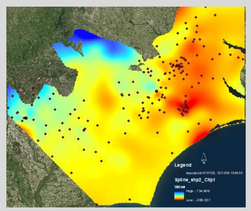


Poee Farm Well 3

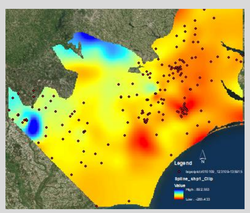
The groundwater database is comprised of data records which include information on individual wells. Such records consist of well completion records, formation records, geophysical logs, pumping data, well permits, aquifer tests, water level measurements, hydrographs, and photographs of the well's location. This database also provides a quick access to a NCDEQ database for their state monitoring system and a link to the federal monitoring data managed by the United States Geological Survey.

Some of the main duties for the interns are to complete the records and maps shown above. These all go into the database and each is used to analyze how the region is extracting water over time which will allow us to better understand how to better manage the resource.

2008 Potentiometric Black Creek Aquifer Map



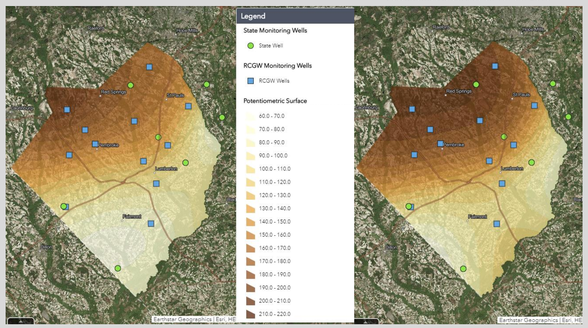
2009 Potentiometric Black Creek Aquifer Map



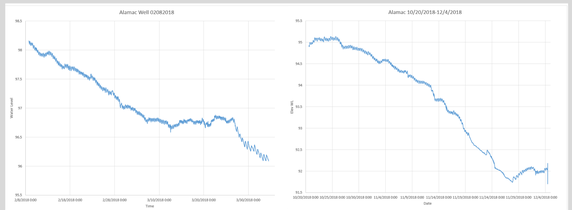
Potentiometric Maps of Robeson County

Potentiometric Surface on 02/08/2018

Potentiometric Surface on 10/30/2018



Water levels of UNCP Monitoring Well 01



UNDERGRADUATE INVOLVEMENT

Success:

As part of our Geo-Environmental Studies Major students are required to either complete a field camp experience, internship, or senior thesis research project. The project has been able to provide 12 students in our program with a paid internship that can be used toward their current degrees.

Thanks to the internship, students that have applied to graduate programs have been accepted in places such as the Eastern Carolina University, the University of North Carolina at Charlotte and the North Carolina State University. The graduate students have also found success in applying for employment and getting jobs, thanks to the experience and knowledge the Ground Water Project has provided them.

Moving Forward:

Moving Forward students will continue on with the gathering of data from two main sources: the Department of Environmental Quality, where well logs are kept and stored, as well as in-field data collection from the well sites. The project will eventually decrease the number of interns needed, and will begin a maintenance stage where minimum work will be required, all this thanks to the hard work and dedication of every past intern and faculty member who worked and continue to work on the project.

FUTURE WORK

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 but will be extended for 2 more years. The students will continue to collect archived groundwater data from surrounding counties in North and South Carolina that will be complied 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.

Further analysis will also be required to see how the potentiometric surfaces change over time and to help the county ensure that capacity limit restrictions are not applied to the region.

ACKNOWLEDGEMENTS

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

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