Final Reports for Geography 595 (Summer 2021)

Felix Mitchell — Internship at the South Carolina Broadband Office

Mapping Broadband Access

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Felix Mitchell
GEOG 595 - Summer 2021

BACKGROUND & GOALS

The South Carolina Office of Regulatory Staff (ORS) is "responsible for many of the non-adjudicative functions associated with utility regulation".[1]
The current charge of the Broadband Office, a body within ORS, is creating maps illustrating access, or lack of access, to the internet.

WHO HAS ACCESS?

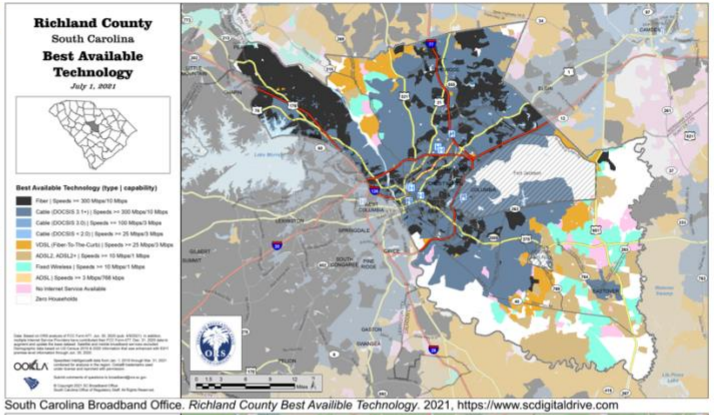
Communication over the internet fuels almost every aspect of life. However, many rural areas do not have access.[2] A sizable 33.7% of South Carolina's population lives in rural areas, so this issue is pressing.[3] Naturally, state and federal bodies have both prioritized rural locations. However, the question remains: where exactly should money be spent? That answer comes from a broadband-access map that illustrates a lack of access from a complex set of data.

EXPERIENCE GAINED

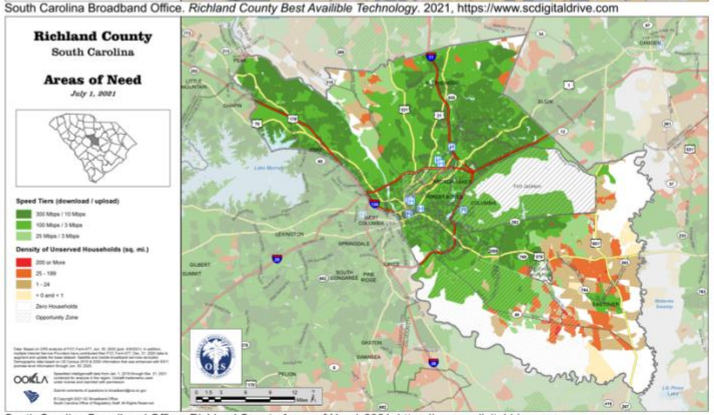
I worked with various GIS software packages, including QGIS, ArcGis Pro, and ArcMap, on this project. Our mapping methodology required that I learn SQL to wrangle and query our data, and that I sharpen my Python abilities to automate the parsing of filenames into to a new metadata format for our map store.
Our data is at census-block level, and querying this information can be time consuming, so it is critical to write precise queries that effectively retrieved relevant information.
This collaborative effort between ORS interns was made easy by our close proximity to each other in the office. Many things we do are handled in the problem-solving stage, long before we begin to put together an actual map. Part of our problem-solving handled the interplay of our less-than-state-of-the-art computers and having to process lots of data.

CHALLENGES IN MAPPING

In public Federal Communications Commission (FCC) datasets, there have been multiple changes to what defines high connection speed, the scale at which data was reported, and the size of provider that has to report.[4] Other issues exist in the FCC standard of "complete and accurate data".[5] They require filers "to submit broadband coverage [...] where they actually have broadband-capable networks" and that "the filings must reflect the maximum download and upload speeds actually made available in each area".[6] Coverage exists if an ISP "has a current broadband connection or it could provide such a connection within ten business days".[6] However, simply because they *can* does not mean they *will*. This means access cannot be determined with FCC data alone. To counteract these issues, the Broadband Office partnered with a company called Ookla.[7] They provide data from their Speedtest platform, an application that tests download speed, upload speed, and other network statistics. Most importantly, GPS coordinates are attached to tests coming from GPS enabled devices. Those tests with location data allow a check against the reported speeds, that is the level of access, as shown in the FCC data.



South Carolina Broadband Office. *Richland County Best Availible Technology*. 2021, https://www.scdigitaldrive.com



South Carolina Broadband Office. *Richland County Areas of Need*. 2021, https://www.scdigitaldrive.com

NOTES ON THE MAPS

Both maps show Richland County at a census block level.
The first map shows the best availible technology as reported by ISPs on FCC form 477. These are ordered by speeds possible on the technology and then grouped if there are multiple types of one technology. Importantly, this is the best *available*, it does not indicate whether or not residents have access, economically or otherwise. The second map shows areas of need; census blocks that do not have access to internet at or above 25 Mbps download and 3 Mbps upload (25/3). On census blocks that have access, they are colored by the "speed tiers" key, showing what level of access they have. If a block has access below 25/3, the density of housing is shown instead, following the second key.

References
1. "About ORS." About ORS | Office of Regulatory Staff, ors.sc.gov/about-ors
2. "2018 Broadband Deployment Report." Federal Communications Commission, 2 Feb. 2018, www.fcc.gov/reports-research/reports/broadband-progress-reports/2018-broadband-deployment-report.
3. "Urban & Rural Population 2010." South Carolina Revenue and Fiscal Affairs Office, rfa.sc.gov/data-research/population-demographics/census-state-data-center/urban-and-rural-population-2010.
4. FLAMM, KENNETH. "The Determinants of Disconnectedness: Understanding US Broadband Unavailability." Beyond Broadband Access: Developing Data-Based Information Policy Strategies, edited by Richard D. Taylor and Amit M. Schejter, Fordham University Press, NEW YORK, 2013, pp. 158–188.
5. Modernizing the FCC Form 477 Data Program. Federal Communications Commission, 27 June 2013, https://docs.fcc.gov/public/attachments/FCC-13-87A1.pdf. FCC 13-87. Accessed 1 July 2021.
6. Establishing the Digital Opportunity Data Collection. Federal Communications Commission, August 6 2019, https://docs.fcc.gov/public/attachments/FCC-19-79A1.pdf. FCC 19-79. Accessed 1 July 2021.
7. Macdonald, Kathy. "Ookla Partners with House Majority Whip Clyburn on Broadband Maps forSouth Carolina." Speedtest Stories & Analysis: Data-Driven Articles on Internet Speeds, 24 June 2020, https://www.speedtest.net/insights/blog/ookla-partners-clyburn-south-carolina-broadband-maps/.

Garrett N. DeSantis — Internship at the SC Department of Natural Resources

Geographic Information Systems Internship: South Carolina Department of Natural Resources (SCDNR) Spring/Summer 2021 – Garrett N. DeSantis

About SCDNR

SCDNR's mission is to serve as the principal advocate for, and steward of, South Carolina's natural resources. Its core vision for South Carolina is to enhance the quality of life for present and future generations through improved understanding, wise use, and safe enjoyment of healthy, diverse, sustainable, and accessible natural resources. SCDNR aims to be a trusted and respected leader in natural resource protection and management by basing its decisions and actions on scientific knowledge, strong conservation ethics, and the needs and interests of the public.

Changes at SCDNR

The agency is migrating to a new integrated cloud system provider to internal operations and engagement with the public. Internally, SCDNR is centralizing and consolidating spatial information into a single database to streamline management and upkeep. This includes how SCDNR holds and offers publicly available data. This consolidation of databases and records has been undertaken in cooperation with private contractors such as ESRI. The spatial component has been the purview of the Central GIS Team within SCDNR.

SCDNR is developing an app that makes public lands and common activities searchable and that presents pertinent information to the people of South Carolina. This has been the core of my work with SCDNR's Central GIS Team. More specifically, this web-based service aims to provide searchable geolocated information of SC's natural resources. These natural resources include public boat ramps, banks, piers, tackle loaner sites, and other features. This information can be updated regularly.

The easiest way to illustrate how this will be achieved would be to compare how information is served to the public now to how the WebGIS application will improve data access. Currently, publicly accessible feature (boat ramps, pier, banks, etc.) are searchable and can be browsed by category via different web pages. In its current state, the web service serves a functional amount of information to the public. However, it is outdated when compared to similar services such as Google Maps or other comparable WebGIS services.

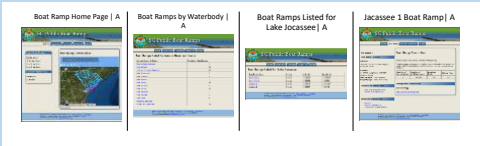


Figure 1: Diagram of the home page for the SCDNR Public Boat Ramps and the linked web pages for the Jocassee 1 boat ramp. The linked web pages are navigated from left to right from the home page using embed we link to the next web page.

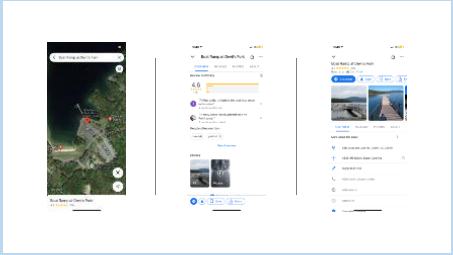


Figure 2: Diagram of the mobile user interface of Google Maps looking at the Lake Jocassee Devil's Fork boat ramp. This boat ramp is referred to as Jocassee 1 boat ramp SCDNR's Public Boat Ramp information website.

Figure 3: Image of the desktop user interface of Google Maps looking at the Lake Jocassee Devil's Fork boat ramp. This boat ramp is referred to as Jocassee 1 boat ramp SCDNR's Public Boat Ramp information website.

The Google maps interface shown in Figures 2 and 3 displays far more information than the current SCDNR web interface. The most significant changes have to do with the degree of integration into the digital map and the way the information has been organized. The searchable information is embedded and organized via its location on the digital map. SCDNR aims to provide a comparable service and end-user experience to the people of South Carolina and those who visit the state.

It is the hope behind the efforts at SCDNR that the people of South Carolina will come to care more deeply about their natural environment and that they will fully enjoy the state's natural resources. To fulfill this aim, it is important to increase public access to information, and to increase public investment in the natural environment. People intrinsically care about what they use and enjoy, so more usage ideally will mean more public commitment to stewardship of the state's resources.

My Tasks

I have assisted the SCDNR's GIS Team with building a preliminary database with geospatial layers in preparation for the development of a public web application. This WebGIS application will display geospatial data to the user over a base map along with the attribute information for selected or searched features. I compiled data and migrated data into a common data structure from multiple management and administrative databases and other digitized records. Most of this data was in CSV format. It was my job to convert or amend this data into geographic layers. These layers are files with spatially referenced features and corresponding attributed data. Each layer includes a set of geolocated features with attached or attributed information. In the case of a boat ramp, attached to the geolocated feature is a set of pertinent information about the boat ramp in question; called attributes. Some examples of the layers included in the app are publicly accessible boat ramps, banks, piers, and tackle loaner sites.

This process of compiling records revealed quite a few holes in data because not all the records used the same schemas or recorded all the same information about a particular entry or feature. Data could either be deterministic, numeric, or multi-variable. An example of a hole in a deterministic attribute would be whether a public boat ramp has bathroom facilities. An example of a multi-variable attribute would the kind of material used to construct a pier. It could be wood, concrete, metal. Information like this is important for understanding maintenance intervals, service life, and risk assessments to natural disasters. After identifying holes, I reconciled the spatial or attribution data from satellite imagery, other sources within SCDNR, and/or other publicly accessible, credible data on the web. The layers I developed will be used as a baseline for the web application; and are very much a preliminary measure before creating the final product.

Images of My Work and Workspace

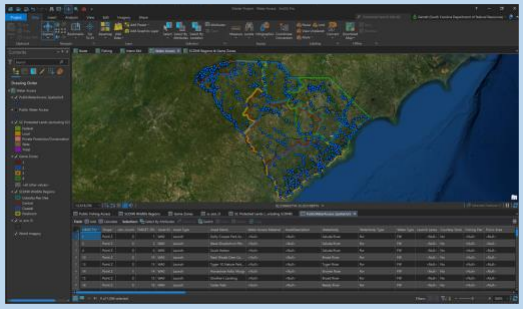


Image 1: ArcGIS pro workspace The Map displayed includes layers with the location of public water access cites(represented by blue points) against satellite imagery. The colored polygons are state designated game zones each is managed individually. SC Protected Lands is included in this map but is not visible at this scope. The Public Water Access layer attribute table is visible below the map display element.

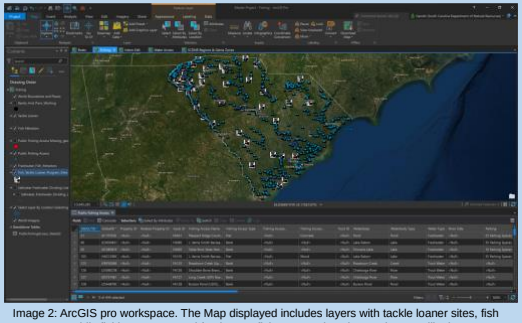


Image 2: ArcGIS pro workspace. The Map displayed includes layers with tackle loaner sites, fish attractors, public fishing access, and freshwater fish attractor location against satellite imagery. Other included features that are not visible are the Saltwater – Freshwater dividing line and non-finalized Banks and Piers layer.

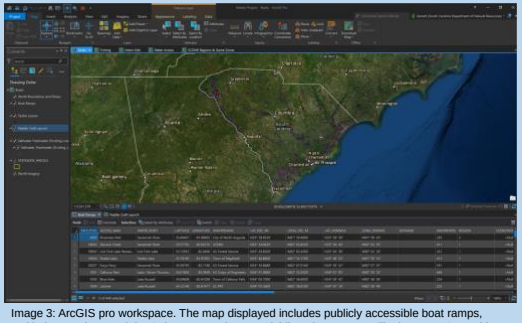


Image 3: ArcGIS pro workspace. The map displayed includes publicly accessible boat ramps, tackle loaner sites, and the Saltwater-Freshwater Dividing Line over satellite imagery. Statewide parcel information is also displayed on the map but are not visible at this scope.