Mapping Rural Transformations:

Shenandoah County's Departure From The Countryside

Background

This research is seeking to digitize, georeference, and publicly publish various maps using ESRI's Web-App-Builder so that the Shenandoah County Office Of Community Development can utilize the tool in its community meetings. This involved both georeferencing raster maps as well as developing vector datasets based on various topics from raster maps such as the locations of former school houses. In addition this research is seeking to address the common conceptions that the rural areas of Shenandoah County have always been vacant of community resources and that the process of shifting development towards the six Towns has been a natural process. In order to address these topics, a review of the relationship of the maps and the data they present is performed as well as an analysis to determine trends in the spatial distribution of resources in Shenandoah County. The study area is Shenandoah County and the analysis has utilized various maps and materials from privately owned to publicly accessible documents in order to develop a comprehensive view of the shifts in land use in the County.

Shenandoah County's Office of Community Development states that there are over 200 villages, hamlets, hollows, and other small settlements in the County which have been historically overlooked in the planning process and were identified in a 1885 Hammond Atlas Map Book. On August 28th, 2019 the Citizens Advisory Committee (CAC) of Shenandoah County started work on the fourth Comprehensive Plan for the community. In order to christen the proposed new plan, the CAC agreed on the title, "Shenandoah 2045: A Future Together."

The committee laid out a broad scope for community outreach, with the first six months of their work composing of developing a community survey to better inform the next 20 years. In addition to the community survey that was launched, the CAC plans to host meetings where people live by traveling around the County in order to hear the visions of the future from individuals in the communities where they live. The CAC is looking for ways to easily share information on changes in land use and settlement patterns in Shenandoah County in order to aid in the proposed community meetings and design charrettes to start in the summer of 2020.

Purpose

The purpose of this research holds the main intent of digitizing, georeferencing, and publishing historic maps and diagrams online for the CAC to use in the community meetings that it has proposed to host across Shenandoah County. This purpose falls into the exploratory category of research through developing new datasets in order to better understand an aspect of mapping, history, and place that has not been addressed in the past. In addition, the research seeks to perform methods of analysis in a descriptive manner as well as explanatory. An outline of the three methods of research herein are explained below:

Exploratory: This research will digitize numerous maps, georeference them, and publish them online in order to share the maps publically so that the people of Shenandoah County can better understand the place that they live and inhabit. While historians of Shenandoah County have used many of the maps that are georeferenced in this analysis in order to perform their own research, no historian or past researcher have attempted to georeference any of the maps in order

to connect all of the locations on the maps to their current place and condition. This research will create more new questions than the number of old questions that needed answers.

Descriptive: The research will also seek to answer some of the new questions that arise from the exploratory research through developing vector datasets to outline where all of the settlements, churches, schools, mines, businesses, and other places of significance were throughout time. This aspect of the research is seeking to answer two main questions which are: how many communities have there been in Shenandoah County over time and is the 200 number provided by Shenandoah County accurate, and where has there been a shift in the identity of places and where people reside over time.

Explanatory: The third and final aspect of the research examines the proposition that there has been a departure from the countryside and that the departure was due to chance and life conditions rather than top down decisions. This research will use various methods of analysis to test the common conception that if there has been a shift in where people live and a sense of place in Shenandoah County, it has been part of a natural process.

Expected Findings

It is expected that from the analysis and research that it will become clear that there has been a shift from a sense of community in the communities that dotted the countryside to a sense of community in the six towns and the County overall. It is also expected that overlaying the current road lines over the historic maps will reveal that roads have shifted and been abandoned over time. In addition it is expected that the number 200 will be too high in terms of the data on the maps, but that the purpose of demonstrating that there has been a decline in the number of

communities recognized will be apparent and valid. The research is also expected to demonstrate that plans made by Shenandoah County in the past have played an important role in shifting development and a sense of community away from the original communities and towards the six towns. Finally it is expected that the research will open the door to numerous new questions and lines of research, with avenues for the citizens of Shenandoah County and anyone interested to be able to contribute to and perform such research.

Outputs

The deliverables and products of this research include two tiers with the first set being promised and the second being potential deliverables. The first tier includes:

- Georeferenced historic maps and various materials.
- Constructing vector map layers from raster historic maps and materials.
- Constructing a publicly accessible web app mapping service.

The second tier includes:

- Running various arc tool box analyses on vectorized data .
- Developing marketing materials for the public web application.

Data Sources And Methods

There are five sets of data sources that were used in this analysis through georeferencing and existing georeferenced data sources, and they are outlined below:

- Existing shapefile layers from the Shenandoah County GIS Office.
- Existing georeferenced maps from the United States Geological Survey agency.
- Existing digitized maps provided by the Library of Congress that are not georeferenced.

- The Shenandoah County Hammond's Historical Atlas, which draws from the 1885 D. J. Lake and Co. Atlas and the 1878 Gray's Atlas. This was digitized through scanning a personal copy that was purchased from the Shenandoah County Historical Society.
- Various reports held by the Shenandoah County Office of Community Development including a groundwater study from 1977 and the first comprehensive plan from 1978. These maps were digitized through scanning the files held in the Department.

The method of analysis involved first gathering various maps and either digitizing them or downloading and storing them all in one location. Once all of the maps were gathered in one location then they were georeferenced using ArcGIS and shapefile layers provided by Shenandoah County's GIS Office. Following the georeferencing of the clear historic maps then the hand drawn and less clear maps were georeferenced based on the locations identified by the historic maps. Once all of the maps were georeferenced then a set of vector data sets were generated through point-and-click manual methods to ensure that the notes on the maps were captured in the new vector data sets.

The explanatory section of the research used an Average Nearest Neighbor analysis to determine if there was correlation in where resources were once located , and a Kernel Density map helped demonstrate where hot spots of community resources were in 1885 and then the process was repeated with data from the current day drawn from the GIS Department and Google Map data gathered from a scrubbing tool. Community resources was defined by churches, schools, government buildings and service locations, businesses, industries, and stores but no data on residential development was used and neither was data on landmarks such as springs. Finally the information gathered on past densities of development and current densities of

development were examined in relation to the first future land use map of Shenandoah County from 1978 in order to determine if the plan had any relationships to the spatial distribution that was discovered.

Results

The results of each of the three forms of research and analysis performed will be presented separately in order to ensure proper detail is paid to each. Following the discussion on the results from the study, there will be discussion on the implications they pose.

Exploratory

The exploratory research and analysis of georeferencing various historic maps and diagrams of Shenandoah County all in one interactive public atlas has revealed changing conceptions of space, changing inhabitations of the land, capabilities of public input and formulation of knowledge, and numerous future research possibilities. Due to the maps that were accessible and scanned, the public atlas is capable of mapping transformations of space in Shenandoah County with snapshots of time with 1860, 1863, 1864, 1875, 1878, 1885, 1886, 1892, 1905, 1926, 1947, 1949, 1950, 1951, 1956, 1966, 1967, 1978, 1986, 1994, and the current day with the highest of detail for historic maps being 1885 due to the extensive Lake's Atlas. There are two major issues with the collections of maps that have been gathered to map the history of Shenandoah County: many lack fine detail and do not cover the whole County, and there are no maps between 1926 and 1947 which is believed to be a period of great transformation in the County due to the Great Depression.The benefit from this collection of maps is that they provide a baseline to draw preliminary vector datasets in order to pull out a

narrative of the changes over time. In addition, placing all of the maps in one primary location allows for the public to be able to add to the maps and send in locations and additional graphics that can be added to further flesh out the history of the County.

There are locations which change names over time, some which gain names after time passes, and many which stop appearing on maps. Examples of name changes are seen with Edenburg transitioning into Edinburg, Slate Hill into Dilbeck, and Cabin Hill into Conicville. A few examples of locations that appeared over time were Williamsville, Jerome, and Coffmantown. Finally, examples of locations that have disappeared with time are Valley Views outside of New Market, Walnut Grove outside of Forestville, and Mount Hope near Lebanon Church. In addition to these locations changing names and disappearing over time there is a clear appearance of the communities being identified having urban form in that they are centered around typically at least two transportation and communication routes which merge in order to form a public space where some semi-public buildings exist in order to allow locals and travelers to meet. The communities are typically centered around a school house, mill, or furnace with many having shoe stores and all of the locations existing alongside a stream or body of running water. Many of these communities are places of change as many over time either grow, or degrade to the point of being unrecognizable.

The shift in labeling landmarks and communities throughout Shenandoah County is partnered with being able to clearly see that there are vast tracts of untouched land, and the houses that are in the countryside are either clustered to form communities, or dispersed enough to have a rural quality of aiding the working landscapes. Along with untouched landscapes, it is clear that the communities which have lost the most over time are the former mining and iron

smelting communities that were built around an industry which collapsed in the early 20th century. While not pictured on any maps that were uncovered, there was once a second railroad line which ran from Edinburg to Liberty Furnace and the line of communities settled along Stoney Creek were able to use it as passenger rail in addition to cargo transportation.[1] As stated earlier it is clear that through making all of these maps available in one publically accessible location and being able to turn on and off various layers that this opens the door to numerous potential forms of citizen research, including but not limited to citizens being able to submit and add their own maps in order to allow for a generative and collaborative process.

On the topic of future research, there are numerous aspects and trends that have become clear after handling these maps and reviewing them with a fine grain over three months that could lead to future research efforts. An example of a potential future research project would be to examine all of the forgotten bridges and mills along the North Fork, as well as the smaller streams, and determine their current condition and if any remnants of past bridges and mills can be found. Another potential research project from this is to create a vector dataset of all of the roads and research deed records to see if there are any public rights of way that are left so that trails and other uses of the public land can be implemented. While there are numerous other research potentials from this project, another that stands out is creating a vector dataset of all of the structures and the family names associated with them to aid in genealogical research as well as demonstrating the change in figure ground and development in spaces over time.

[1] Cooper, Mason; Zimmerman, Bob. 1987. "Shenandoah Iron and Coal Company." Mountain Laurel. www.mtnlaurel.com/history/1208-shenandoah-iron-and-coal-company.html

Descriptive

According to the data compiled from all of the maps from 1860 to the present day the statement that there have been 200 or more communities in Shenandoah County is false as the number is too high.[2] The point data pulled from the maps reveals that there have been at least 122 communities in Shenandoah County, not including the six towns that are incorporated and widely recognized. This number reveals that Shenandoah County is failing to recognize at least 77 communities in relation to their E911 data that is held by the Shenandoah County GIS Department. While Shenandoah County does recognize 45 communities outside of the six Towns, the places that are recognized have faded into having hardly any resemblance to the communities that are depicted on the various historical maps. In the end, this revelation makes clear that when marketing discussions on the past communities of Shenandoah County the CAC should be more conservative and state that there have been over 100 communities in Shenandoah County other than the six Towns, rather than stating over 200 as the number appears to be inflated to a large degree.

It was found that there are at least 621 places of local historical and cultural importance in Shenandoah County ranging from mills, stores, schools, race tracks, and saloons to mines and landmark mountains. The highest number of such significant locations was the number of mills in the County as the maps reveal that there were once at least 84 different mills that dotted the landscape. Further, it is revealed that 28 of the mills were grist mills which are used for the production of grain, and 38 were sawmills which were a driving force in changing the landscape of Shenandoah County in order to gather fuel for the iron and ore industries.[3] Following mills is

[2] Shenandoah County. 2020. "Shenandoah 2045: A Future Together." Shenandoah County Office Of Community Development. Shenandoah County, Virginia. www.ShenandoahCountyva.us/future.
[3] Lake, D.J. (1885). *An atlas of Shenandoah and Page counties, Virginia*. Philadelphia, Pa, D.J. Lake & Co.

the number of schools across Shenandoah County as the maps reveal that there have been at least 82 schools in Shenandoah County, not including those currently in operation. Following schools is the number of churches with a recorded 76 historic churches in Shenandoah County over the last two centuries, which is less than the 115 churches that are still in operation and recorded by the Shenandoah County GIS Department. In addition to the information uncovered on mills, schools, and churches it was found that there were once at least three major tourism and health or wellness centers in the County as there were 22 hotels in 1885 with 12 in Orkney Springs which still serves as a major tourism and health or wellness retreat in the area. Orkney Springs also reveals another trend in the County which is that there are at least 51 springs throughout the County with eight in Orkney Springs. The other two major destinations were Alum Springs with 11 springs and Seven Fountains with seven springs and all three locations had ten pin alleys, or bowling alleys. The vector analysis also revealed 11 toll houses which were used to fund the three major turnpikes in the County: Valley Pike or US Route 11, Orkney Grade or Route 242, and Lee Highway or 211. Three toll houses were located on 242 with one in Rinkerton, one in Mount Clifton, and one in Mount Hermon and one was located on 211 outside of New Market. The remaining seven toll houses were along US Route 11 or Old Valley Pike with one in New Market, one south of Mount Jackson, one in Hawkinstown, one in Coleytown, one in Woodstock, and one south of Toms Brook. This means that at nearly every Town on Route 11 there was a toll house and so those who planned the County may have been the reason why there are no secondary roads running alongside Route 11 as it is possible the turnpike corporation did not want such roads to draw away from the funds earned at the toll houses.

In examining the historic hydrogeological study maps from 1977 it is revealed that the central area of Shenandoah County, meaning those areas without mountains, are low in the amount of iron concentration in the water. On the reverse, those areas which are mountainous and were the locations of the majority of the mines and forging operations have relatively high levels of iron in the groundwater.[4] While there are higher levels of iron in the mountainous regions of the County, these regions are also the location of the lowest hardness levels. The majority of the central region of Shenandoah County has relatively high levels of hardness in the groundwater, yet there are three sections with very high levels of groundwater hardness. There is a section in the shape of an oval running from Strasburg southwest to Maurertown, a section that runs from Conicville to Columbia Furnace, and a section between Valley View and Boren and crosses New Market.[5] Finally a map that depicts the groundwater potential for Shenandoah County reveals that the entire central region of Shenandoah County has a fair to good rating, while the mountainous regions except the area around Stoney Creek up to Liberty Furnace has a poor to fair rating. The areas with the highest ratings are near Buck Hill, Strasburg to Fishers Hill, the area west of Woodstock, a section between Mount Vernon and Narrow Passage, and a large swath that runs along Stoney Creek from Liberty Furnace and out towards Kern Springs and down to Edinburg and along the North Fork to New Market.[6] In addition to identifying the relationship of groundwater conditions and the communities in Shenandoah County there is a map depicting caves in the County which reveals a set of 51 caves with all private but two. The

[4] HINKLE, K. R., & STERRETT, R. M. (1977). *Groundwater of Shenandoah County, Virginia*. Richmond, Virginia State Water Control Board, Bureau of Water Control Management. Page 57.
[5] HINKLE, K. R., & STERRETT, R. M. (1977). *Groundwater of Shenandoah County, Virginia*. Richmond, Virginia State Water Control Board, Bureau of Water Control Management. Page 55.
[6] HINKLE, K. R., & STERRETT, R. M. (1977). *Groundwater of Shenandoah County, Virginia*. Richmond, Virginia State Water Control Board, Bureau of Water Control Management. Page 37.

layout of the caves reads as if they follow an ancient riverbed which ran northwest of the North Fork and had three large bends from Woodstock to New Market.[7] While this will require more ground truthing and analysis to test this theory, it still reveals that more research can be completed to help tell the rest of the story of land changes in Shenandoah County.

Explanatory

According to the average nearest neighbor analysis that was run on all of the places of local historical significance there is, "a less than 1% likelihood that this clustered pattern could be the result of random chance." In order to run a similar analysis for current data, the building footprints data set was run through an average nearest neighbor analysis and it determined that there was also a less than 1% likelihood the clustering was by chance. This preliminary analysis reveals that there may be a relatively substantial number of the former buildings which made up the more urban areas of the County still standing. In order to test for assets a scrub of all of the community resources on Google Maps in Shenandoah County was performed by BotSol and combined with the GIS Department's data, then an average nearest neighbor analysis was run on the data. This analysis also revealed that there was a less than 1% likelihood that the clustering was by chance, which means that the development and places that people travel to in Shenandoah County is still in urban settings. When the kernel density analysis was run on the historic data it revealed that there are pockets of resources across the County with major hot spots in each of the six Towns, Kings Crossing, Seven Fountains, Dilbeck, Lebanon Church, Alonzaville, Columbia and Liberty Furnaces, Quicksburg, Forestville, and Orkney Springs. When the same analysis was run with public data from Google Maps and the GIS Department, in

[7] HINKLE, K. R., & STERRETT, R. M. (1977). *Groundwater of Shenandoah County, Virginia*. Richmond, Virginia State Water Control Board, Bureau of Water Control Management. Page 11.

the present day there were five hot spots with small areas in Orkney Springs, Mount Jackson, and Toms Brook, and three large hot spots in and around New Market, Woodstock, and Strasburg. This analysis not only reveals the spatial distribution of community resources in 1885 and the current day, but when compared it reveals locations of disinvestment across the countryside. In addition, when the data is compared to the 1978 future land use map, it becomes clear that areas that were slated for development have retained the highest numbers of community resources and investment while everything else in the County was hung out to dry.

Conclusions and implications for policy, planning practice, or general knowledge

A major narrative in Shenandoah County is that Sheridan's Burning of the Shenandoah Valley is the driving cause for the lack of communities in the countryside. This is proven to be false by this report and analysis through demonstrating that in 1885 the countryside was vibrant in Shenandoah County and that Shenandoah County had seen growth in its villages, hamlets, and other settlement communities at least up until 1926. At that point it becomes unclear what influenced land use changes with the Great Depression, World War II, and the Cold War. While maps were found between 1926 and 1978, due to their patchwork of covering some areas but none covering all of Shenandoah County it cannot be stated that the future land use map created with the 1978 Comprehensive Plan was the leading cause in the decline of countryside communities. It can be stated that if the countryside communities were in decline, as they appear to have been, that the plans developed by Shenandoah County officials only aided in the process that was already underway by forcing all development into the six Towns. The zoning that

followed the future land use map from 1978 laid blanket regulations across the County which took the settlement communities as being the same as the rural areas of the County rather than addressing them as urban areas as can be noted in the historical maps in this report. In order to determine if the cause of this abandonment of the countryside was by government decree or by economic shifts following a tumultuous period further research will need to be performed on the period between 1926 and 1978. If there is no recorded or written history or information on this time period then the web application and the meetings that the CAC is planning to host across the County will help to draw the reasons for this shift through oral histories. The results from the explanatory analysis reveals that a major point of discussion for the CAC should be why disinvestment in the countryside has occurred, whether it should return, and if so in what manner and how the citizens can play a role in shaping that investment.

Limitations and caveats

As COVID-19 hit in the midst of performing research and developing this report, there were issues in terms of adjusting to new ways to use technology and personal time changes that affected the ability to perform more of the work that was first proposed on the schedule that was proposed. In addition, the original plan had every map being uploaded to a public map, yet after understanding that in order to host a raster layer online one has to convert it to KMZ format which can only go up to 10 MB, which can cause maps that had a high degree of detail to lose the detail, words, and ability for users to zoom in and examine all of the specifics presented by the maps. Due to this issue, additional time was taken to develop a set of vector datasets as well

as reclassify some raster datasets so that the number of bands decreased in order to allow for the details rather than the colors to be pulled out.

A few important suggestions were drawn from the process in order to ensure that a georeferencing mapping project can be done in an efficient manner. The first suggestion is to perform a mass sweep of loc.gov and online search engines such as WorldCat.org in order to locate everything that is already digitized and all of the data should be in TIFF format, if that is not possible then attempt to acquire the data in PDF format so it can be converted to TIFF. If possible and available, there will be a set of maps and files labeled geo.tiff, which are the most ideal data sources and many can be found of the USGS historical topographic map database and are already georeferenced to the research site. Then once everything that is already digitized is found a sweep of local libraries, government offices, historic societies, and other physical locations should be performed in order to pull as many physical maps as possible. When scanning such maps they should also be scanned in TIFF format, with PDF being a fallback if TIFF is not possible. Once all of the maps needed or possible to be gathered are found and stored in one location, then the map with the most locations that are easily recognizable should be chosen first. Depending on the location being georeferenced there may be a few locations that have not changed in over 200 years as for Shenandoah County the control points which were key to every map were the bend of Route 11 in Strasburg, Court Street intersection in Woodstock, Mount Jackson Union Church, New Market's crossroads of Routes 211 and 11, Forestville's intersection, the bend in Orkney Springs, and also various alleys and roads as well as the railroad. Rivers and streams cannot be relied upon for georeferencing maps over 100 years ago as they shift and typically buildings cannot be relied upon as they are typically not to scale in

historic maps. Once the familiar map is georeferenced then it can be used as reference for other maps in that time period which are not clear for various reasons such as being hand drawn. Once all of the historical maps are georeferenced then vector datasets can be pulled by creating them manually.

This process that was discovered through many trials and errors can certainly be used in different research projects which require georeferencing as any such project requires the user to have a keen eye and understanding of the space to make the decision on where similarities in the space are found. The findings from this report and the analysis performed are certainly applicable to other contexts as individuals who are building houses can now know the history of the land and the groundwater capabilities, historians are able to draw connections at a faster pace than looking back and forth between a paper atlas and online maps, and archaeologists are able to determine locations of military action or former historic structure for excavation purposes. Anyone can become researchers from their cellphones now as they will have the power to be able to start conversations on how land use has changed over hundreds of years in Shenandoah County all while also discussing the next 20 years and what they want the County will to like and retain as we look to 2045.

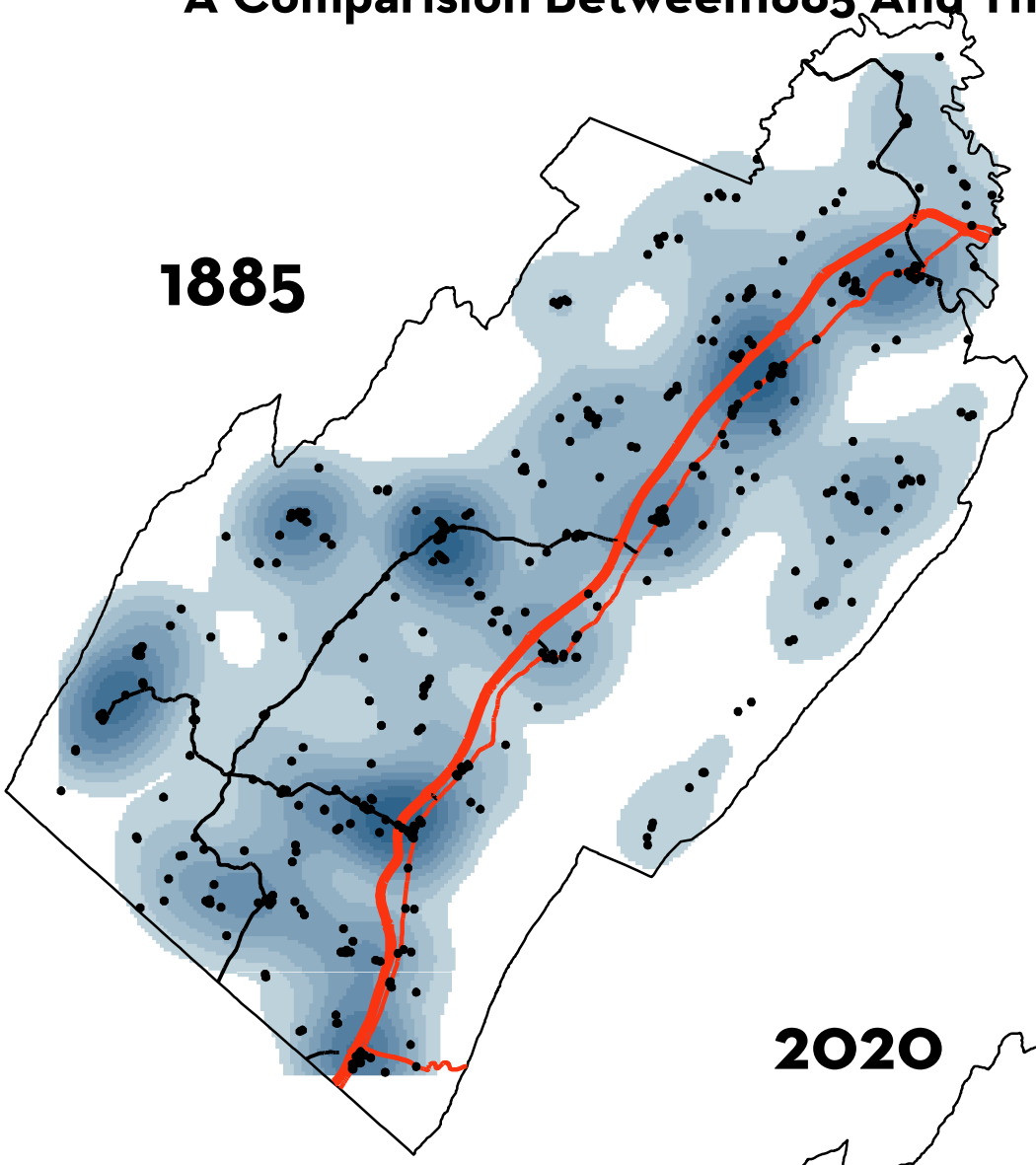
The online mapping tool can be accessed with the link below and will remain up to date until it is transitioned into the ownership of Shenandoah County.

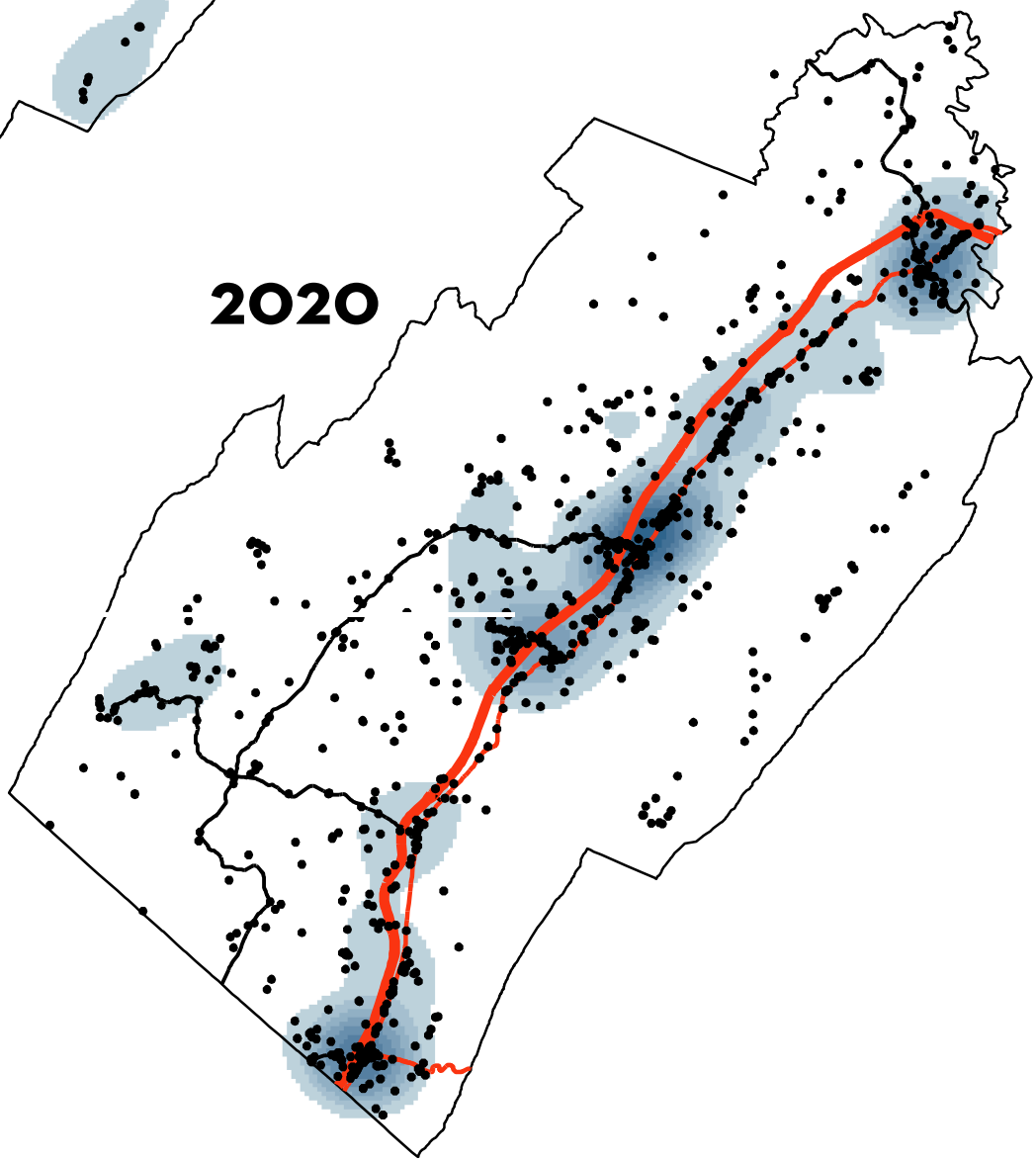
Link:

https://uvalibrary.maps.arcgis.com/apps/MapSeries/index.html?appid=17a4e659baa34559ab0c99ca12b17a27

Density Of Community Resources Of Shenandoah County A Comparision Between1885 And The Present Day

Date: May 5, 2020
Sources: Lake's Atlas 1885, Google Maps, Shenandoah County GIS Department
Author: Tyler Hinkle





Legend

- Community Resources

Roads

ROAD_TYPE

- Interstate
- Primary
- US Route

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- 0.379966736 - 0.759933472
- 0.759933472 - 1.139900208
- 1.139900209 - 1.519866943
- 1.519866944 - 1.899833679
- 1.89983368 - 2.279800415
- 2.279800416 - 2.659767151
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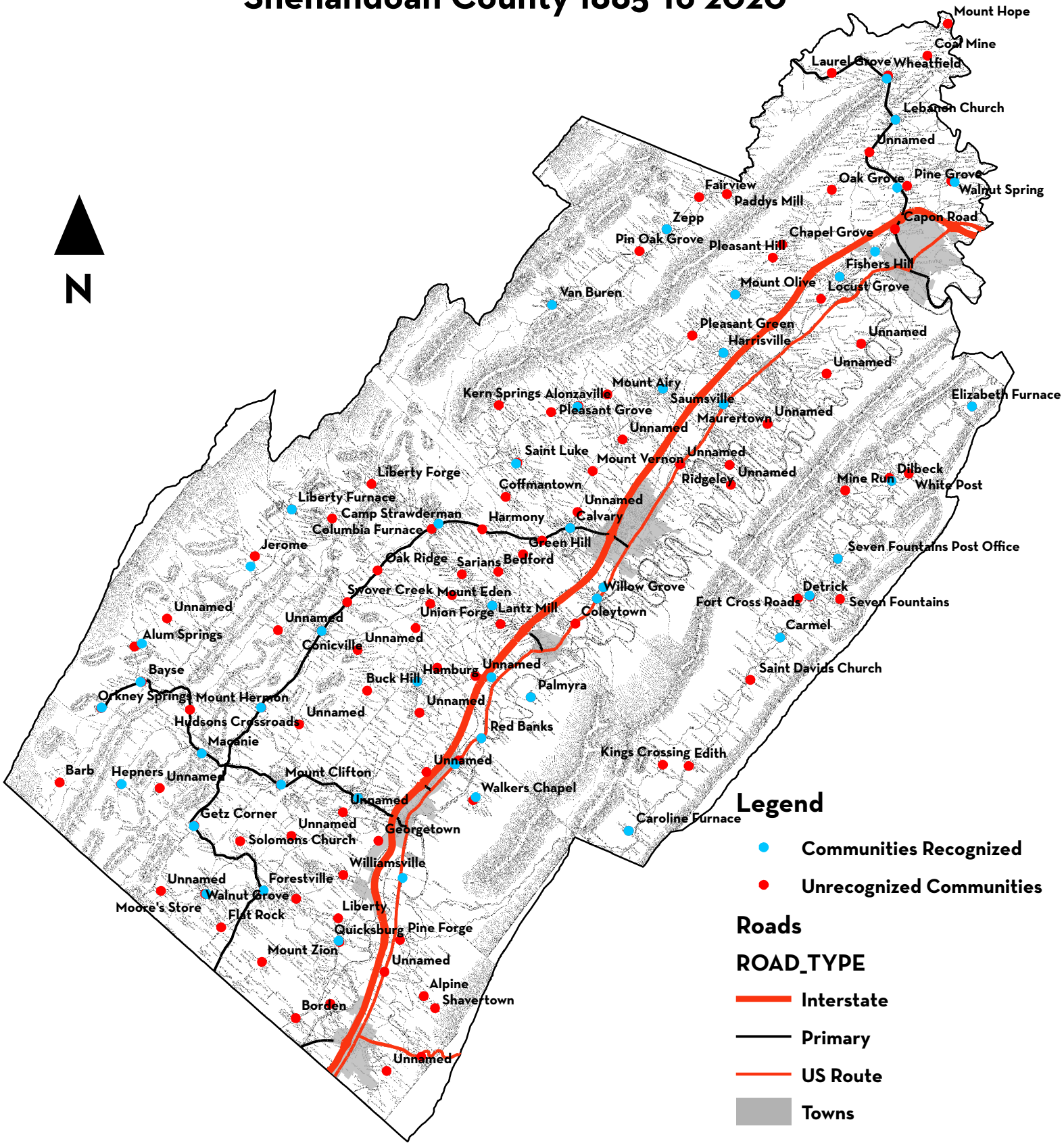
Changing Rural Landscapes
Shenandoah County 1885 To 2020



Date: May 5, 2020
Sources: Lake's Atlas, Shenandoah County GIS Department
Author: Tyler Hinkle

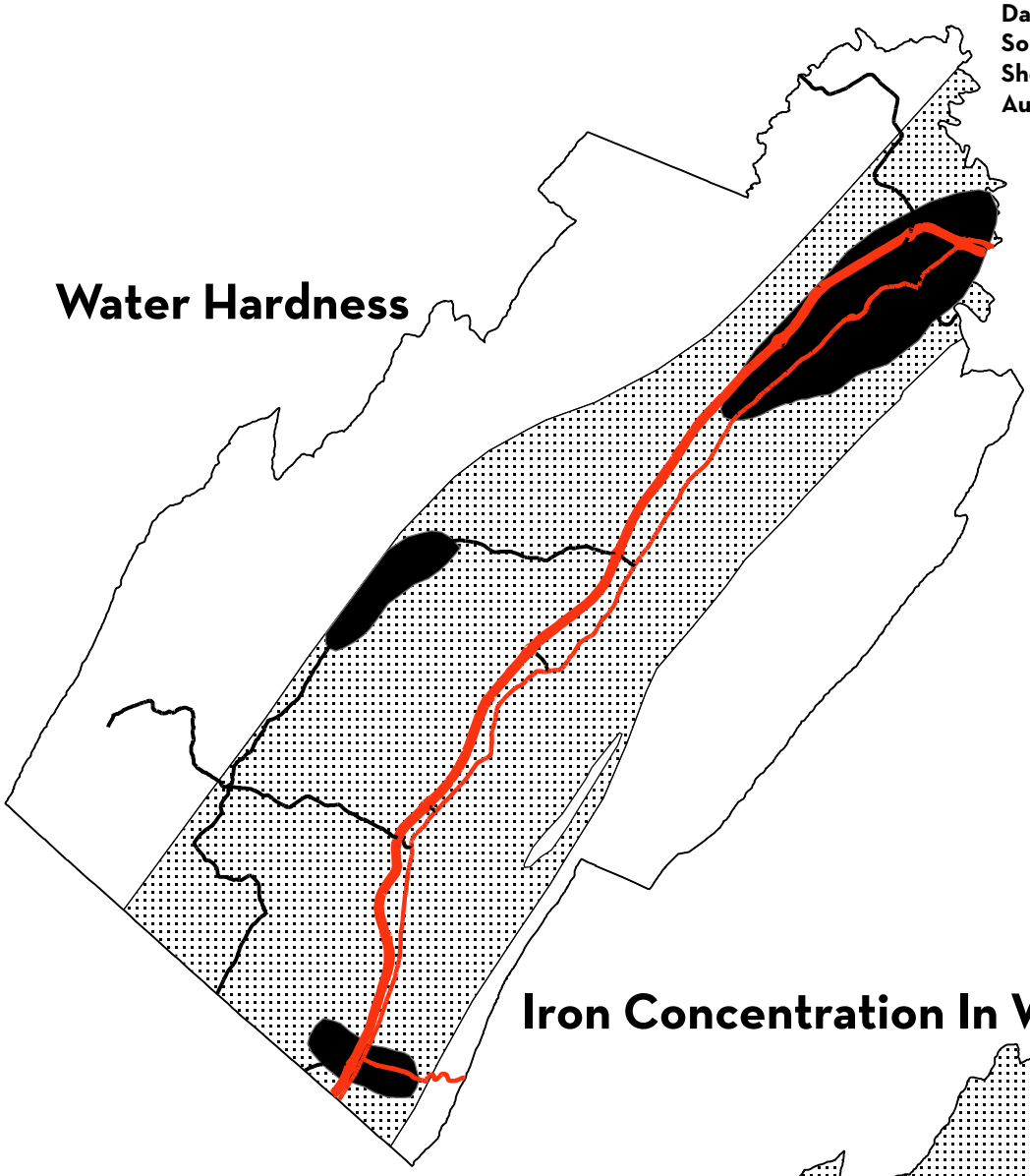
Groundwater Resources In Shenandoah County 1977

Date: May 5, 2020
Sources: Shenandoah County Groundwater Study
Shenandoah County GIS Department
Author: Tyler Hinkle

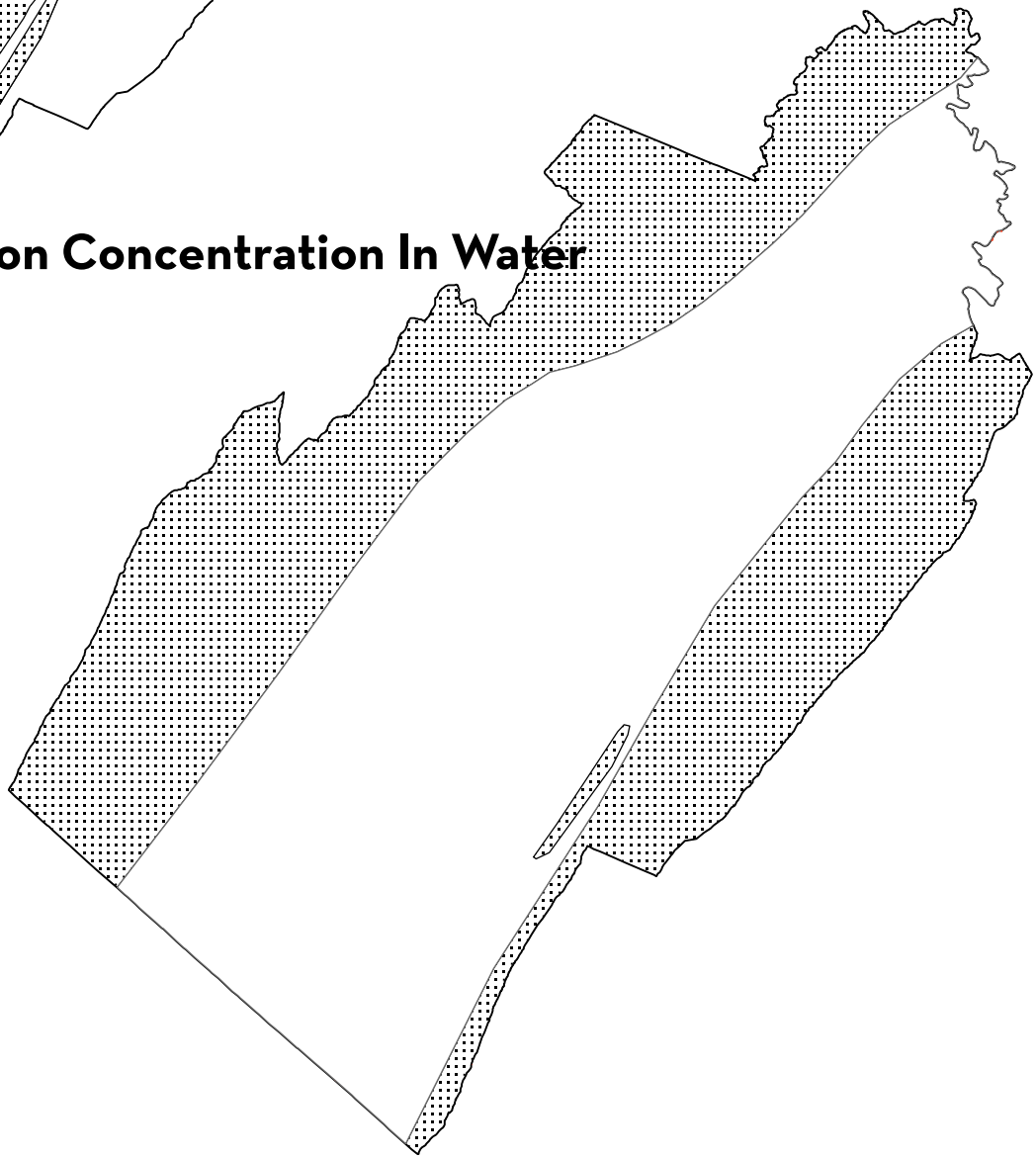
0 2.5 5 10 Miles

N

Water Hardness



Iron Concentration In Water



Legend

Roads

ROAD_TYPE

- Interstate
- Primary
- US Route

Groundwater Hardness

Volume

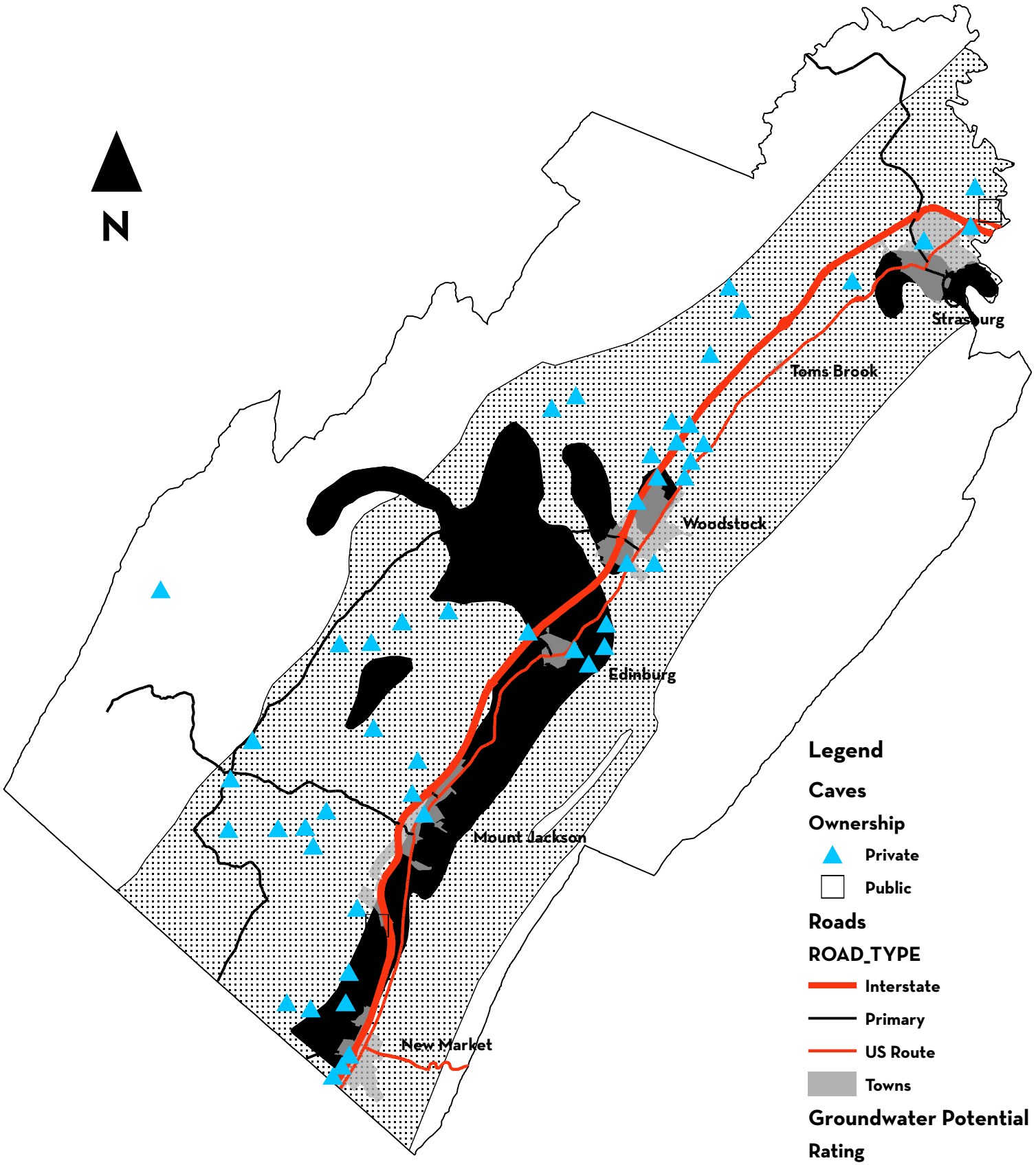
- 60-120 mg/l
- Above 180 mg/l
- Excess Of 300 mg/l

Iron In Groundwater

Iron

- 0.0 To 0.3 mg/l
- Above 0.3 mg/l

Groundwater Potential In Shenandoah County 1977



Date: May 5, 2020
Sources: Shenandoah County Groundwater Study, Shenandoah County GIS Department
Author: Tyler Hinkle