Kooper Howerter

Lab 7 Report

Park Siting Report

Introduction:

The ultimate goal of this project was to find the most suitable locations for a park in the county of our choosing. After choosing a county, the type of park being built had to be decided, as something like a golf course requires a very different environment than a community garden or children's playground. Then, whatever variables that affect where the park should be located had to be determined and collected. By using these variables, we could analyze which block groups in our county could best support the park.

Study Area:

Frederick County is a medium sized county with a population around 80,000. The county is the northernmost in Virginia, with a majority of land located in the Shenandoah Valley. The county also contains parts of the Blue Ridge Mountains in the East and the Allegheny Mountains in the West. The 'hub' of the county is the independent city of Winchester, which is by far the biggest population center in the area. The biggest strength of the area in regard to siting a park is that there are lots of open, scenic areas in the valley and around the mountains that would be perfect for a multipurpose recreational park. I think that a park with a little bit to offer for almost everybody could easily be placed in this county. The park could have a playground, a picnic area, a body of water to fish and swim in, fields for sports or other events, and even a hiking trail if placed nearer to the hills or higher peaks of the area. From the parks and recreation site I gathered that there are already several similar parks in the area, but they are mostly centered around Winchester itself, leaving a lot of potential for park areas in the rest of the county.

Variables:

The first variable affecting how suitable a block group is for a park is the types of land cover in the area. A successful recreational park requires a specific environment. Forest types, water, open fields, and areas with shrubs all provide an easy opportunity to be transformed into a park with usable land and a scenic environment. Developed areas with buildings, farmland, and other unusable land should be avoided. These types are not only less useful for a great park but are more difficult to even create the park on. For example, purchasing private homes or buildings, removing them, and planting trees, flowers, etc. would be time consuming and very expensive.

The overall terrain of the block group should be considered for the siting. In general, we want to avoid a completely flat area. A flat area may be good for a sports field, but for a multipurpose park like the one being created, it would be a major negative. A flat area is very boring for a park, and in Frederick County especially, there are beautiful hills, mountains, and downhill streams that the park could be built around or nearby. If needed, some land leveling could be done for the center of the park, but the county has a good mix of flat areas near the sloped sections. Good slope changes will also help avoid some potential problems of flooding and will be less desirable to be bought up for future neighborhoods or land development. Lastly, a great hiking trail would be a perfect addition to a multipurpose park.

Bodies of water are essential to the placement of the park. We definitely want to prioritize areas with streams, ponds, or lakes that all offer so much for a great park. They all provide a scenic area to picnic or sit by, and a chance to fish or swim. They improve the ecosystem of the park, giving ducks, frogs, etc. a place to live. A trail could be built to follow a stream up or down a slope. If a pond or lake is big enough, the park could even allow boating. Overall, bodies of water are extremely diverse in what they provide to a park.

Existing road infrastructure is another important factor in siting the park. There must be roads to connect the population to the park site, but generally a large road density in the area is a negative. The roads could cut through a potentially great site, making it very expensive if not impossible to build there. Also, nearby roads to a park can greatly ruin the scenery and create noise pollution for the park visitors.

Population density is similar to road infrastructure in that there must be a decent amount, but in general a high population density will signal a poor block group for the site. If there is an extremely low population density, a big park project will not make much sense since there will hardly be anyone nearby to utilize it. In high density areas, there are large hurdles to overcome in order to build the park. For example, homes and private land may have to purchased and repurposed, while also relocating the owners. In Frederick county, there are only a few extremely high-density groups in the city of Winchester, while most other block groups have moderate densities.

Conservation Easements are protected areas with some natural significance that cannot be developed on. These lands are typically held by organizations like the Virginia Outdoors Foundation, who hold them to preserve the landscape for future generations. They are often turned into parks that help in their mission of preserving the environment of the area. Even if not using these areas themselves for a park, these easements would serve as scenic backdrop for a park that we can ensure will not be developed on.

It makes little since to have parks bunched up together in the same block group. Therefore, the last variable is the location of pre-existing parks in the county. We want to ensure that if we find a great location, it is not right across the street from a similar park. The park should be spaced out from the others, where there is a demand or a need for it.

Methods:

The first major process in completing the analysis of the most suitable block groups was collecting all of the necessary data we would use. The block groups, population data, and roads were easily accessible on the census website. The block groups specifically were vital to the analysis, because each variable would be analyzed and scored based on which group it is in. The landcover, terrain, and bodies of water were all found on the NRCS geospatial data gateway. The Frederick County website was very useful in finding the data of conservation easements and existing parks in the county, and also had different versions of some of the data found elsewhere, like the bodies of water.

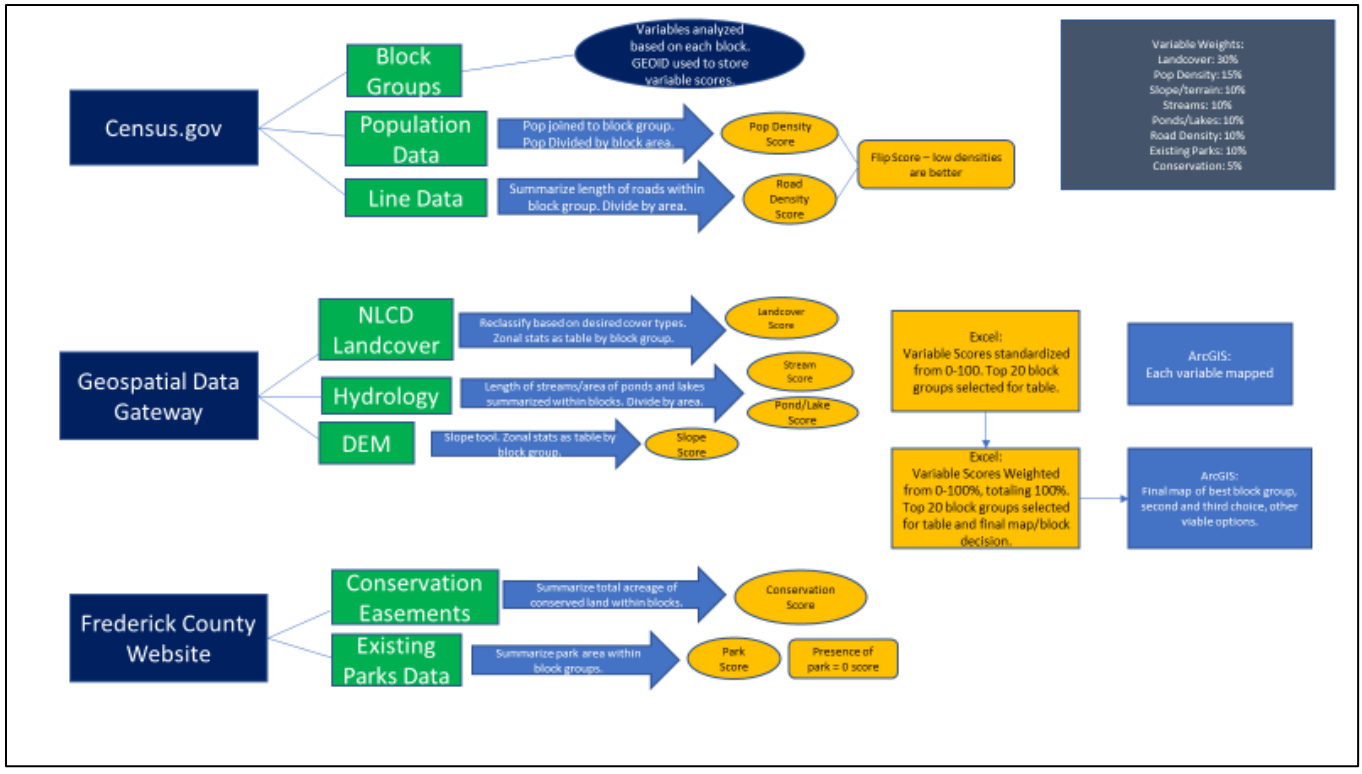
With the correct tools in ArcGIS Pro, the actual analysis for each variable was fairly straight forward. All of the downloaded data had to be projected the same and then clipped or masked to the area of the Frederick County/Winchester Block Groups. After reclassifying the NLCD landcover data to make desired areas 1 and unusable land 0 and then using the slope tool on the DEM data, the zonal statistics tool gave us the analysis we needed for these raster sets. This table provided the landcover and slope scores based on each block group. The rest of our data was in vector format, so the summarize within tool was essential for these variables. This gave us how much of the variable of interest was in each block group. If necessary, we created a new field that divided the amount of the variable we were focusing on by the size of the block group to get the density. After this, we had all the data needed from ArcGIS and could move the results over to excel to better manipulate.

Once all the data for each variable was organized by block group in excel, each had to be standardized so all the scores range from 0 to 100. After this, we could see the highest total scores before weighting each variable based on importance. To do this, every variable had to be placed in a hierarchy so we could give each a percentage weight that all totals up to 100%. To start, landcover

type was given the biggest weight of 30%. Landcover is extremely vital to the placement of the park and is the easiest way to gauge if the park will work somewhere. Population density was given the second biggest weight of 15%. It is very important to ensure that there are enough people in the area for a park to be successful, but it is extremely difficult and impractical to try and build a park with a high density. Streams, lakes/ponds, terrain, and road density were all given a 10% weight. Each variable is an important factor in the park's scenery, accessibility, success or necessity. It is difficult to emphasize one of these factors above the others in importance, so they were all given an impactful but not massive weight. Lastly, conservation easements were given the smallest weight of 5%. These areas could help us find a good park location and contribute to its uses, but this is not a vital aspect and a park could be just as successful and not be near one.

After the weighting, we could now sort every block group by its suitability for a park. The top 20 were selected as the most usable. These blocks were highlighted back in ArcGIS to create a final map that displays the block groups that should be recommended for a successful multipurpose park.

Flowchart of the siting process:



Results and Discussion:

Tables:

Variable Scores Before Weighting, Top 20 Block Groups

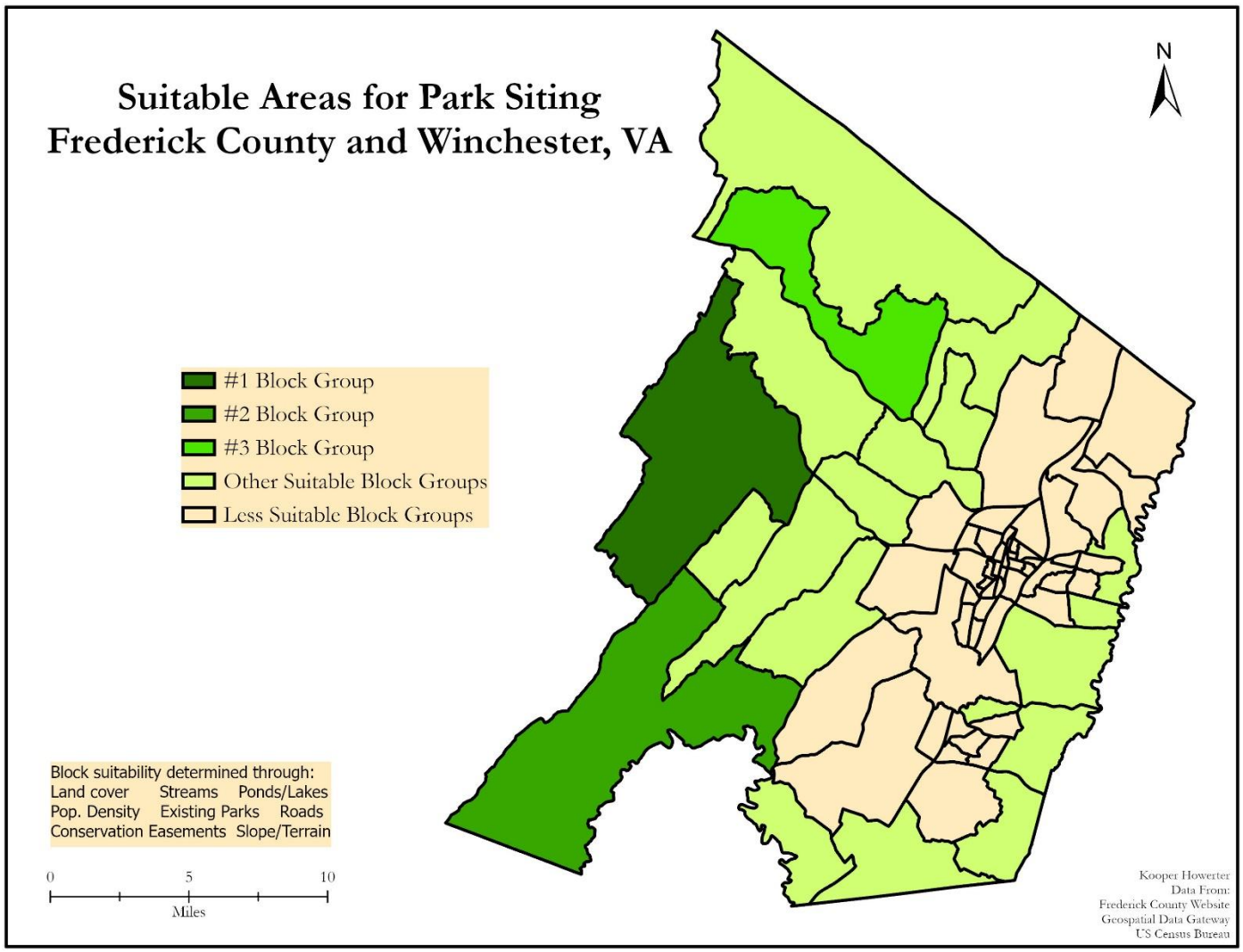
GEOID	Landcover Score	Slope Score	Stream Score	Lake & Pond Score	Population Score	Road Density Score	Parks Score	Conservation Score	Total Unweighted Score
510690504001	94.74582312	86.55864301	62.94903773	36.93534464	99.9305097	97.47920258	100	51.53973938	630.1383002
510690504004	98.94194864	100	56.90220797	4.770359008	100	100	100	38.09747861	598.7119942
510690503002	87.72373103	64.56426885	81.27178378	18.53910781	99.84457705	94.22442797	100	68.73600555	614.903902
510690504002	100	99.15008272	42.94133789	26.43666771	97.6239741	89.25104196	100	0.109404615	555.512509
510690504003	91.11359686	61.06229748	77.77982561	39.8911429	99.66329102	95.33083374	100	0	564.8409876
510690505002	84.73304711	58.53591835	65.07427476	28.04672723	99.01181401	92.26980567	100	34.57071702	562.2423041
510690508012	68.74142554	44.12755225	79.79038421	96.84626728	98.73112514	88.45052977	100	0	576.6872842
510690503001	96.00467174	74.72707548	78.87254721	14.73727412	99.99100459	98.66553404	0	45.97167058	508.9697778
510690502002	61.71670149	43.84424649	66.59745004	90.63950649	99.19742202	87.1365683	100	0	549.1318948
510690505005	77.12336804	60.42783041	48.36398933	16.02719768	99.40672829	98.55464238	100	15.08325627	514.9870124
510690503003	79.16731095	58.69216879	64.57788099	100	98.9701071	91.00522237	0	6.215466192	498.6281564
510690505001	67.65310655	56.41394296	49.44483353	29.56404352	99.19271292	94.10809635	100	6.231993228	502.6087291
510690511013	64.12122408	44.07858582	84.52168856	29.90626728	93.52195271	79.46579516	100	13.00222401	508.6177376
510690510005	63.72840278	36.5855185	69.84981221	14.17069281	94.63146976	86.59801148	100	0	465.5639075
510690508032	62.51736825	29.08908849	68.48800586	55.55631724	76.77349582	76.52779405	100	0	468.9520697
510690502001	59.11785188	35.24576051	39.04472868	32.81623052	99.14114722	93.81935959	100	0	459.1850784
510690507002	48.2065876	35.45983035	75.33266984	21.33054771	99.4381893	90.08837855	100	6.259729983	476.1159333
510690508021	51.05086828	28.44686857	78.03744251	23.36744256	99.01522422	84.4642887	100	0.831790043	465.2139249
510690507001	41.94337978	36.90819044	56.26533312	27.07195662	98.47093063	89.24058049	100	66.55416839	516.4545395
510690509001	48.91985107	28.28975671	70.16763529	38.26404004	97.9709188	83.40516881	100	0	467.0173707

Weighted Variable Scores and Total Weighted Score, Top 20 Block Groups

GEOID	Landcover(30%)	Slope(10%)	Stream(10%)	Lake&Pond(10%)	PopDensity(15%)	Roads(10%)	Parks(10%)	Conservation(5%)	Total Weighted Score
510690504001	28.42374694	8.655864301	6.294903773	3.693534464	14.98957645	9.747920258	10	2.576986969	84.38253316
510690504004	29.68258459	10	5.690220797	0.477035901	15	10	10	1.90487393	82.75471522
510690503002	26.31711931	6.456426885	8.127178378	1.853910781	14.97668656	9.422442797	10	3.436800277	80.59056499
510690504002	30	9.915008272	4.294133789	2.643666771	14.64359612	8.925104196	10	0.005470231	80.42697937
510690504003	27.33407906	6.106229748	7.777982561	3.98911429	14.94949365	9.533083374	10	0	79.68998268
510690505002	25.41991413	5.853591835	6.507427476	2.804672723	14.8517721	9.226980567	10	1.728535851	76.39289469
510690508012	20.62242766	4.412755225	7.979038421	9.684626728	14.80966877	8.845052977	10	0	76.35356978
510690503001	28.80140152	7.472707548	7.887254721	1.473727412	14.99865069	9.866553404	0	2.298583529	72.79887883
510690502002	18.51501045	4.384424649	6.659745004	9.063950649	14.8796133	8.71365683	10	0	72.21640088
510690505005	23.13701041	6.042783041	4.836398933	1.602719768	14.91100924	9.855464238	10	0.754162814	71.13954845
510690503003	23.75019329	5.869216879	6.457788099	10	14.84551606	9.100522237	0	0.31077331	70.33400987
510690505001	20.29593196	5.641394296	4.944483353	2.956404352	14.87890694	9.410809635	10	0.311599661	68.4395302
510690511013	19.23636723	4.407858582	8.452168856	2.990626728	14.02829291	7.946579516	10	0.650111201	67.71200501
510690510005	19.11852083	3.65855185	6.984981221	1.417069281	14.19472046	8.659801148	10	0	64.0336448
510690508032	18.75521048	2.908908849	6.848800586	5.555631724	11.51602437	7.652779405	10	0	63.23735541
510690502001	17.73535556	3.524576051	3.904472868	3.281623052	14.87117208	9.381935959	10	0	62.69913558
510690507002	14.46197628	3.545983035	7.533266984	2.133054771	14.91572839	9.008837855	10	0.312986499	61.91183382
510690508021	15.31526048	2.844686857	7.803744251	2.336744256	14.85228363	8.44642887	10	0.041589502	61.64073785
510690507001	12.58301393	3.690819044	5.626533312	2.707195662	14.77063959	8.924058049	10	3.32770842	61.62996801
510690509001	14.67595532	2.828975671	7.016763529	3.826404004	14.69563782	8.340516881	10	0	61.38425323

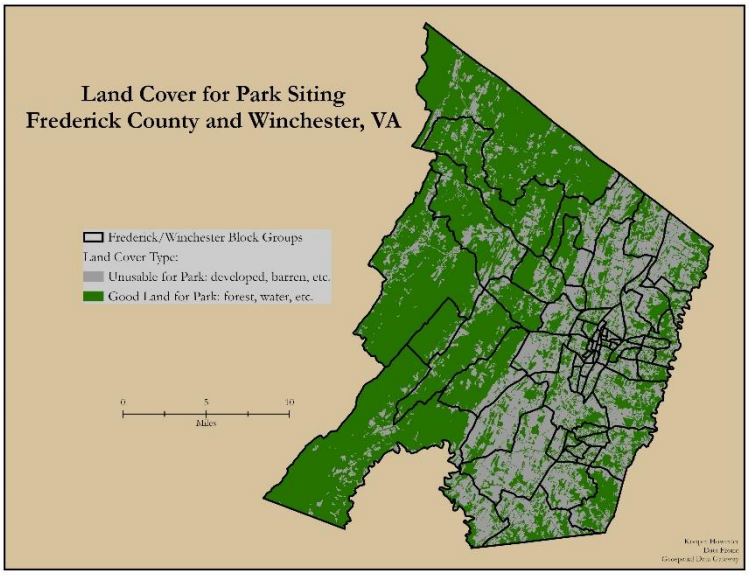
When we look at the tables of unweighted and weighted block group scores, we see that there are a good number of groups that scored very well in almost every, if not all variables. This provides a wide selection of areas to choose from, so if during the development process there was some hurdle, there would be various other options for the park. One thing to note from the tables is that some of the highest scoring block groups have relatively low pond and lake scores. A useful aspect of the analysis is that if the community or county calls for a specific variable, like they really want to build near a lake, we could bump one of the higher scoring pond/lake groups up the list or even give that variable a bigger weight and redo the last step of our analysis. Also, from the table we see one block group that would have an extremely high score (would be in the top 3) but already has a park, so it got 0 of the points for that variable. If there was still demand for another park in this area, or it was considered big enough to have two parks, that variable could potentially be lifted or ignored.

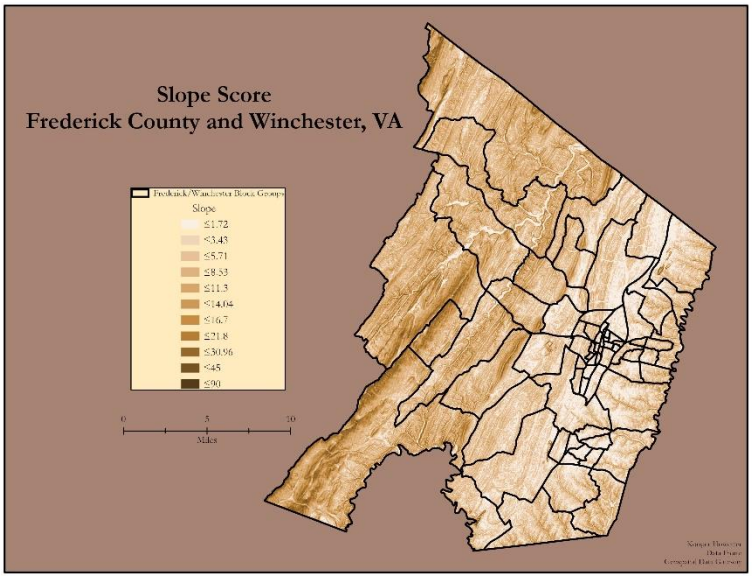
Final Siting Suggestion Map:

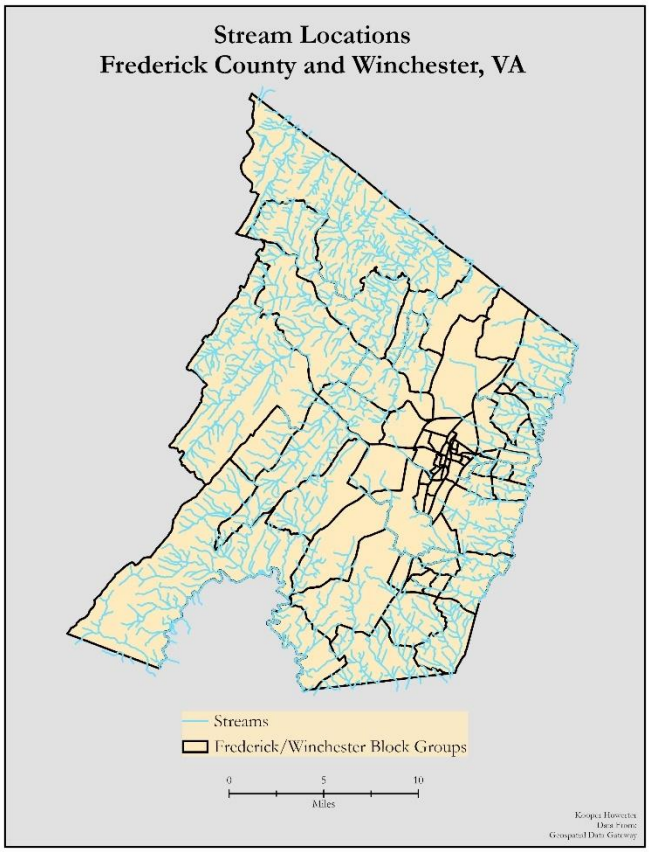


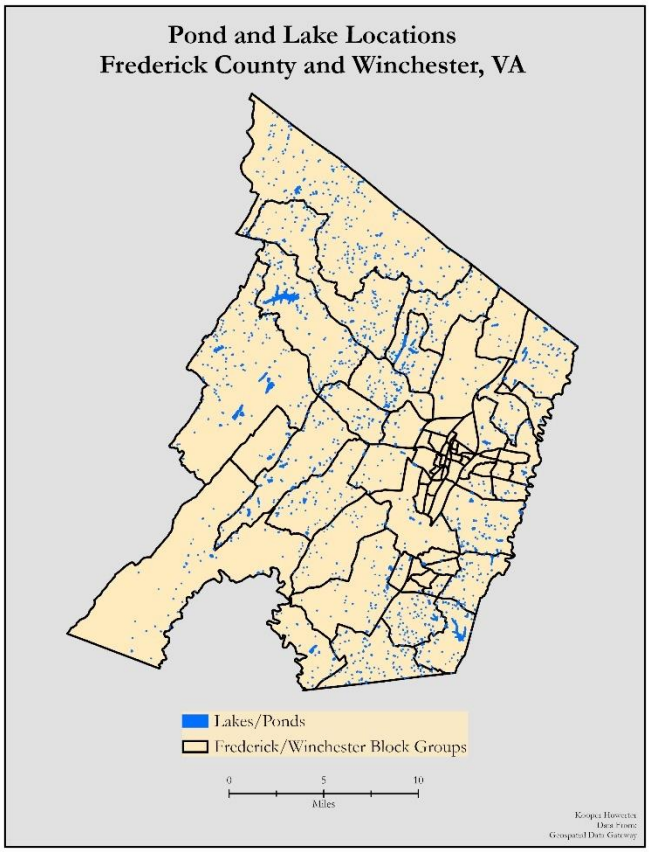
Looking at the final map, we see exactly where the best scoring block groups are located in the county.

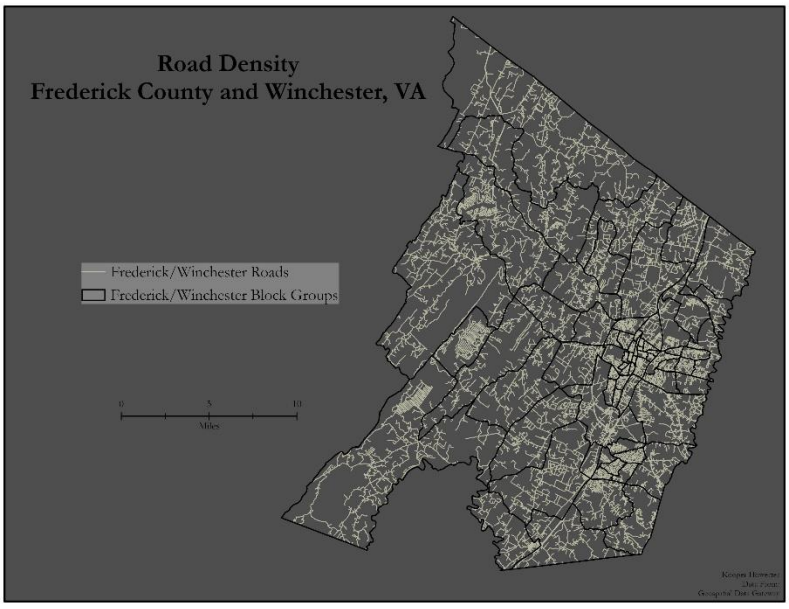
Appendices:

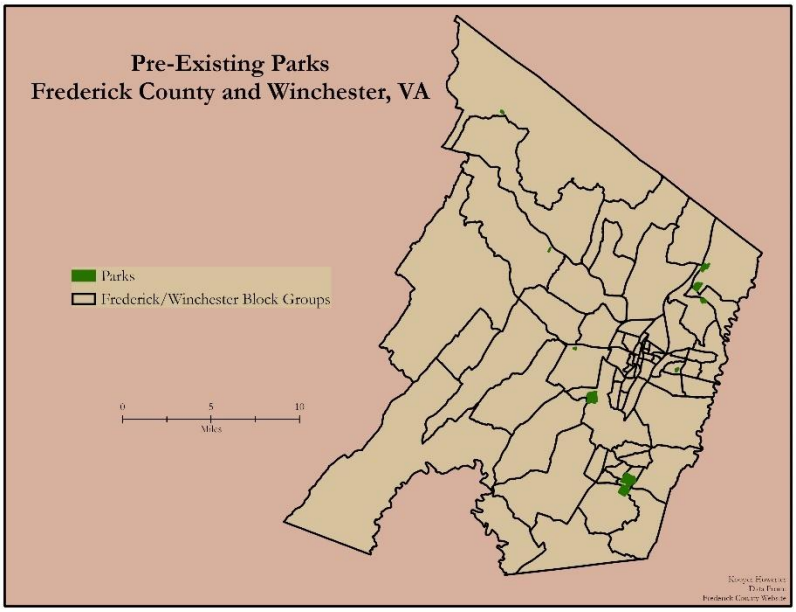


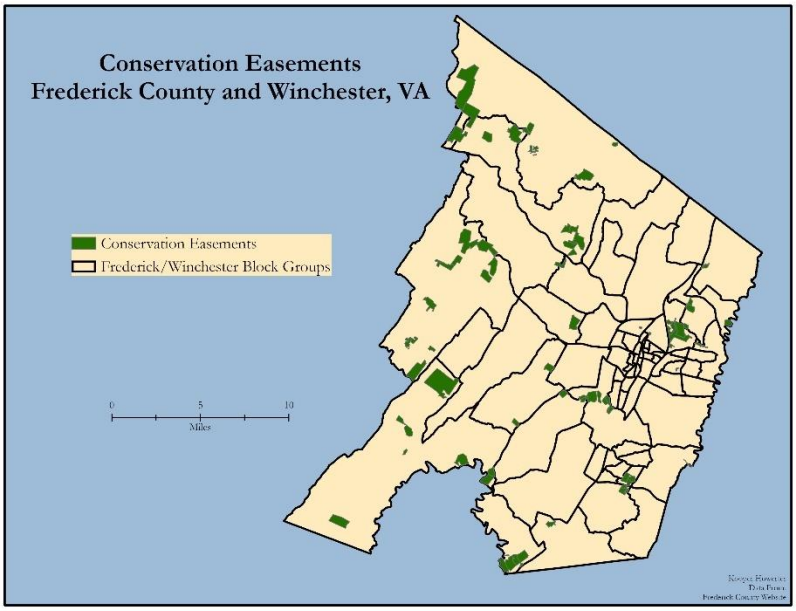


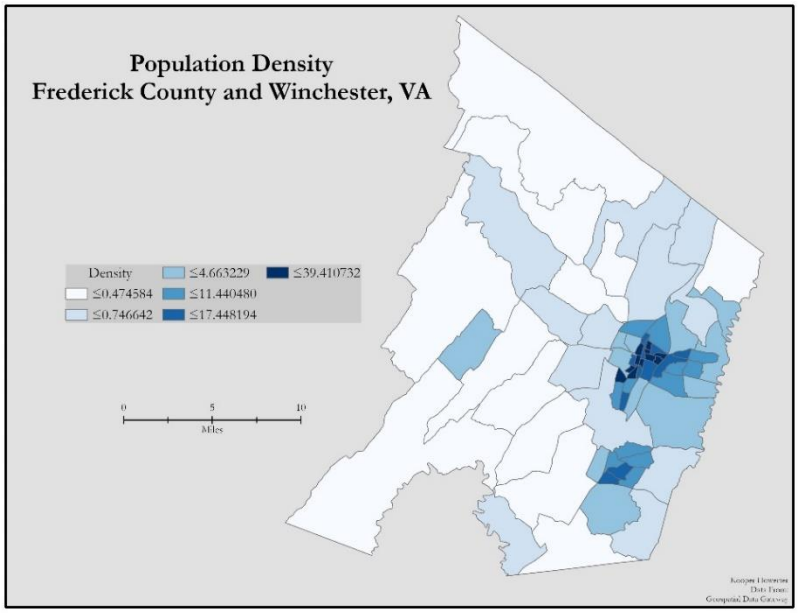

Stream Locations
Frederick County and Winchester, VA
Streams
Frederick/Winchester Block Groups
0
5
10
Miles


Pond and Lake Locations
Frederick County and Winchester, VA
Lakes/Ponds
Frederick/Winchester Block Groups
0
5
10
Miles


Road Density
Frederick County and Winchester, VA
Frederick/Winchester Roads
Frederick/Winchester Block Groups
0
5
10
Miles


Pre-Existing Parks
Frederick County and Winchester, VA
Parks
Frederick/Winchester Block Groups
0
5
10
Miles


Conservation Easements
Frederick County and Winchester, VA
Conservation Easements
Frederick/Winchester Block Groups
0
5
10
Miles


Population Density
Frederick County and Winchester, VA
Density
≤0.474584
≤0.746642
≤4.663229
≤11.440480
≤17.448194
≤39.410732
0
5
10
Miles