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Identifying Suitable Farmland: A Case Study in Hall County, GA

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Introduction

Counties that have a high percent of farm operators over the age of 65 and are indicated to have a "significant decrease" in number of farms are vulnerable to community impacts associated with a loss of farmers and farms. At the same time, finding suitable land to farm is a common struggle among many beginning farmers. By modeling which counties are most vulnerable to loss of farmers/farms and determining which parcels of land within these counties contain land suitable for farming, beginning farmers searching for suitable farmland can potentially have a resource to help guide their parcel search efforts and ultimately safeguard counties from a further loss of farms due to aging operators. Building on a previously conducted model, this GIS project uses slope data, prime farmland soils data, land cover data, and parcels data to identify parcels of land that could be suitable for use as farmland in a county identified as vulnerable to continued loss of farms (Jones, 2017).

Methodology: Vulnerable County ID

In order to conduct this model, I first identified which counties in the US fit the description of being vulnerable to farm loss as indicated by having >45% of the farm operators over the age of 65 (Figure 1) and a "significant decrease" in farms between the 2007 and 2012 USDA Ag Censuses (Figure 2). I used an SQL expression to select for counties that had both of these attributes after first joining a US Census Bureau table of counties with USDA 2012 Ag Census downloadable data (Figure 3). After determining the counties that fit the description of vulnerable to a loss of farms, I investigated which of these counties had available parcel data compatible with use in ArcGIS. Hall County, Georgia (Figure 4) was selected for this study because it was located in the state that had the second most vulnerable counties and was the only vulnerable county within that state to have available parcel data (Texas being the state with the first most vulnerable counties did not have any available parcel data).

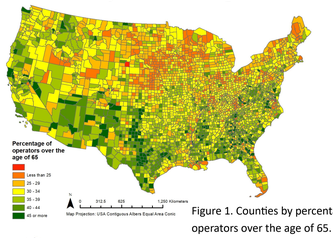

Figure 1. Counties by percentage of operators over the age of 65.

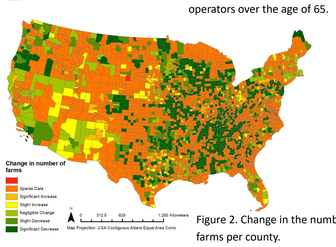

Figure 2. Change in the number of farms per county.

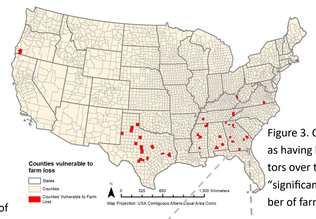

Figure 3. Counties identified as having both >45% of operators over the age of 65 and a "significant decrease" in number of farms

Figure 4. Hall County, Georgia

Methodology: Finding Suitable Farmland

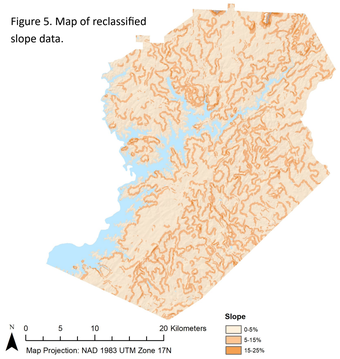

Figure 5. Map of reclassified slope data.

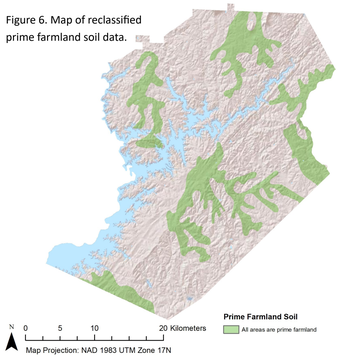

Figure 6. Map of reclassified prime farmland soil data.

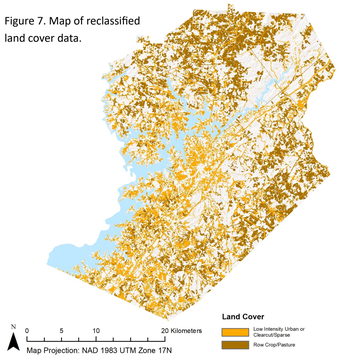

Figure 7. Map of reclassified land cover data.

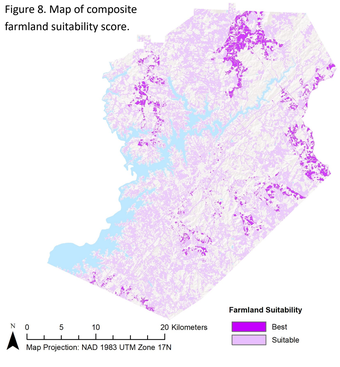

Figure 8. Map of composite farmland suitability score.

Slope data was computed from the USGS NMD Digital Elevation Model for the state of Georgia. In general, the most suitable land for farming will have very little slope, between 0-15%. Orchards can be an exception to this, in which slopes greater than 15% are still considered suitable. As such, I reclassified slopes between 0-5% as a 2, 5-15% as a 1, and 15-25% as a 0 (Figure 5). Slopes greater than 25% were not considered in this model.

Prime farmland soil data was obtained from the STATSGO Soils data layer (a composite data layer formed by generalizing more detailed soil surveys). Soils considered as "all areas are prime farmland" received a score of 2, and all other data was reclassified to a 0 (Figure 6). It is pertinent to note, however, that many areas of land considered "not prime farmland" are still used for farming. As such, this factor is weighed less heavily than land cover in the overall suitability score.

Land cover data was collected via satellite imagery. Land classified as Row Crop/Pasture received a score of 2, and Low Intensity Urban and Clearcut/Sparse land received a score of 1 (Figure 7). All other land cover types were classified as "no data" as they were not deemed suitable for use as farmland in any way, and thus should be excluded from this model entirely.

Overall, given the reclassification for each category of information (slope, prime farmland soil, and land cover) a composite score was calculated in order to determine the 10x10m raster cells that contained land that could be suitable for farming (Figure 8). In the calculation of the composite suitability score, land cover data was weighed more heavily than either slope or prime farmland soil due to the fact that both slope and soil can be more easily manipulated than land cover in order to be suitable for farming. The last element of this model used parcels as "zones" with which to calculate zonal statistics to determine how many acres of suitable farming land was contained in each parcel.

Findings

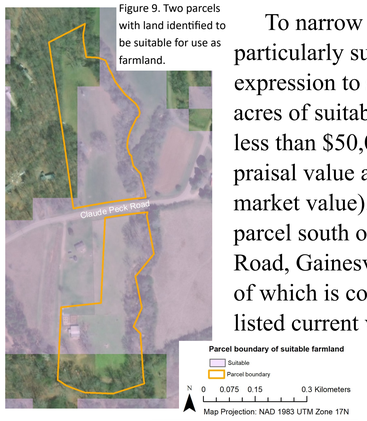

Figure 9. Two parcels with land identified to be suitable for use as farmland.

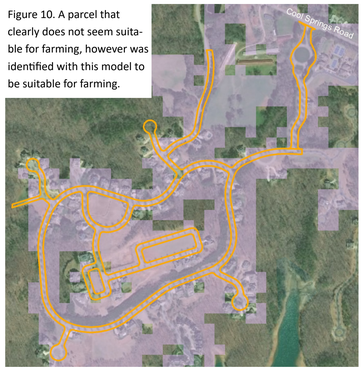

Figure 10. A parcel that clearly does not seem suitable for farming, however was identified with this model to be suitable for farming.

To narrow the model findings to parcels that seemed particularly suitable for beginning farmers, I used an SQL expression to select for parcels that had greater than 2.5 acres of suitable farmland but with a current value that is less than $50,000 (current value, however, is just tax appraisal value and does not take into consideration actual market value). Figure 9. illustrates two such parcels. The parcel south of Claude Peck Road (4378 Claude Peck Road, Gainesville, GA 30506) is 4.79 acres in size, 3.41 of which is considered suitable for farming, and has a listed current value of $47,045. The parcel north of Claude Peck Road (4381 Claude Peck Road, Gainesville, GA 30506) is 4.78 acres in size, 3.11 of which is considered suitable for farming, and has a listed current value of $1,371.

Figure 10., however, illustrates some of the limitations of this model. This parcel, located at 0 Grand Marina Circle Gainesville, GA 30506, includes the road access for a housing development and thus, while it contains land that this model shows to be suitable for farming (low slope and is considered low intensity urban), it is in fact clearly not suitable for farming.

Conclusions

Overall, this project was intended to pilot whether or not modeling parcels that contain suitable farmland could effectively be done using conditions such as slope, prime farmland soils, land cover and parcels data. It is clear that while this model does produce results that can be useful in identifying parcels that contain land suitable for farming, it also produces some results that are not helpful in this regard. In addition to the inherent fallibility that all the datasets used for this model have with regards to being moderately outdated and relatively coarse, another limitation of this model is that it does not take into consideration whether or not any of these parcels are available for lease or purchase. Beginning farmers can, however, find this model useful by cross referencing any parcels that do go up for sale or lease with parcels that fit certain parameters (acreage of suitable farmland, location and price) as determined by this model.

Sources:

2012 Ag Census, July 2018, USDA National Agricultural Statistics Service; published by USDA NASS, accessed December 4, 2018

Counties (and equivalents), 2018, US Census Bureau; published by US Census Bureau, accessed December 4, 2018

Georgia Land Use Trends 2008 Land Cover, January 2010, Natural Resource Spatial Analysis Laboratory (NARSAL); published by University of Georgia NARSAL, accessed Dec 4, 2018

Hall County Parcels 2005, 2005, Hall County with assistance from the Carl Vinson Institute of Government; published by Hall County, accessed Dec 4, 2018

Jones, S., 2017, Farm Hunting: Finding Suitable Cropland and Orchard Parcels in Harvard MA; published by Tufts University GIS Poster Expo, accessed Nov 29, 2018

State Soil Geographic (STATSGO) Database, August 1998, National Cooperative Soil Survey; published by US EPA, accessed Dec 4, 2018

Slope of Georgia, 1997, Jonathon Musser; published by US Geological Survey, accessed Dec 4, 2018