URBAN DEVELOPMENT OF DELAWARE COUNTY, OHIO

1999 Through 2019

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Introduction

Delaware County, Ohio has been under a significant amount of development in the past 20 years. Just in the last few years, the incorporated residential building permits in Delaware County have risen by 50.92%. Ranging from 306 permits in 2016 to 601 permits in 2019 according to the Delaware County Regional Planning Commission. This project will focus on the percent change of urban classified areas from 1999 to 2019.

Study area

Delaware was the area of interest, so a subset image had to be created. Using satellite data downloaded from United States Geological Survey and TIGER/Line Shapefiles from the United States Census Bureau, a polygon area of interest (AOI) was placed around the border of the shapefile and a subset image was created.

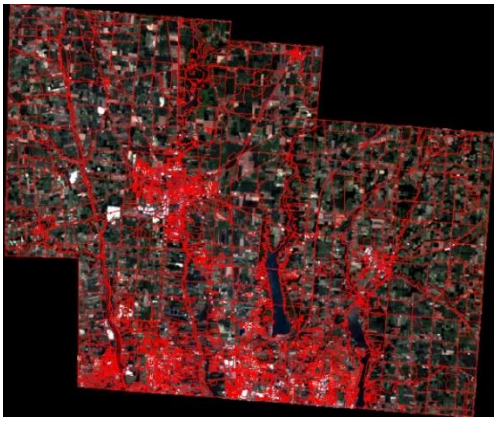

Image 1. Delaware County Border

A problem trying to use current data with Landsat 7 is that there is a scan line corrector on all of the images in which creates black diagonal lines throughout the image rendering it useless. Thankfully there are de-striping techniques that were able to be used on the image from 2019. Applying the focal analysis tool in ERDAS on the image and ignoring values of zero, this corrected the gaps enough to where Delaware was capable of being used after five renditions of this.

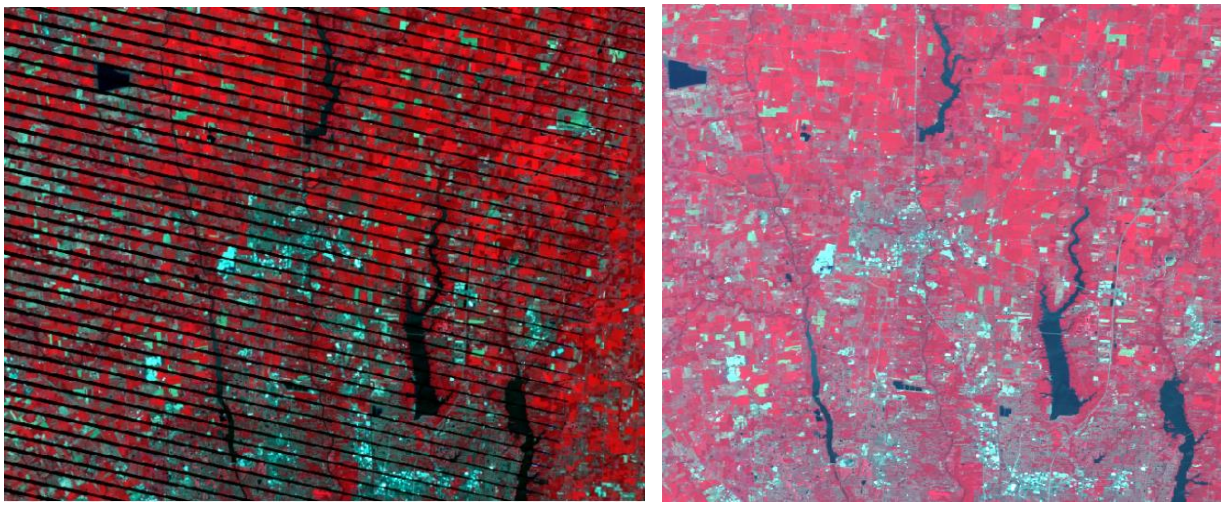

Image 2. Destriping the Image

Satellite Data

This study area fell under one Landsat scene: WRS Path/Row 019-032 (Image 2). I chose a Landsat 7 ETM+ scene each from July in 1999 and 2019. I wanted to pick the best time when it would be clear to differentiate areas that had vegetation and those that did not. The data obtained was at the Level-1, UTM WGS84, 30m pixels from United States Geological Survey.

Results

The results of classifying both images from 1999 and 2019 shows a clear expansion of urban areas throughout multiple areas in the county using the minimum distance method. Going off the pixel count for urban classification alone, we see a 50.84% increase of the urban classification count from 206,416 to 311,364.

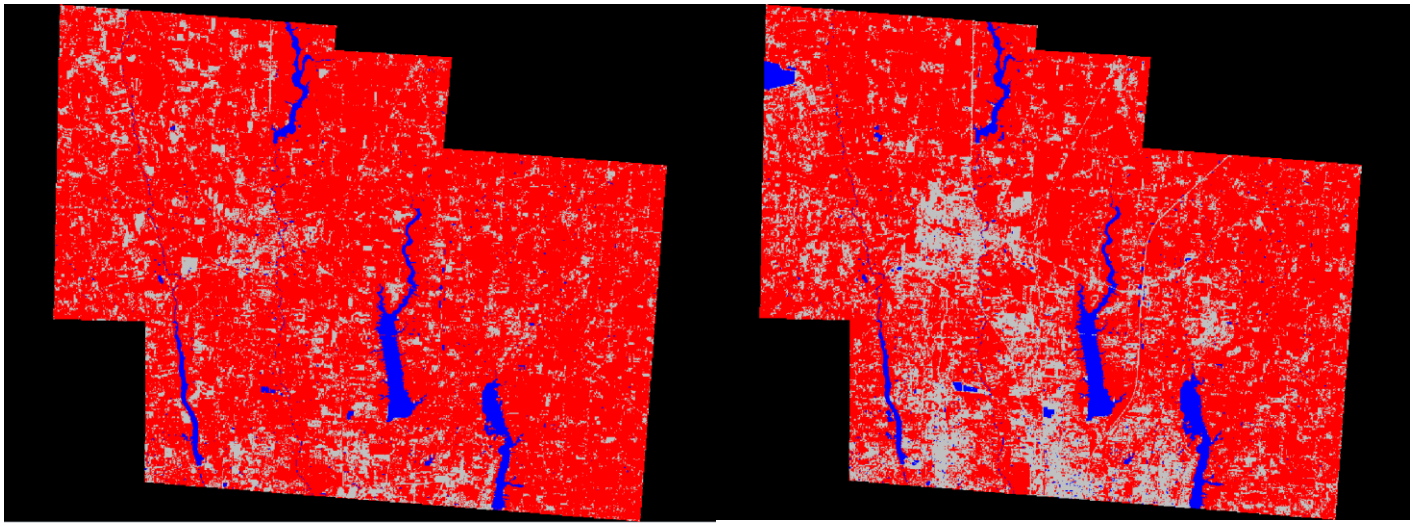

Image 3. Classified Delaware 1999 (left) and classified Delaware 2019 (right).

dela1999midist.img : Layer_1

Row	Histogram	Color	Red	Green	Blue	Opacity	
12	40960		0	0	1	1	Water
20	206416		0.753	0.753	0.753	1	Urban
10	221369		1	0	0	1	LightFields
0	415732		0	0	0	0	Unclassified
16	854519		1	0	0	1	Vegetation

delawaremindist.img : Layer_1

Row	Histogram	Color	Red	Green	Blue	Opacity	
15	0		0	0	0	0	
17	0		0	0	0	0	
12	51121		0	0	1	1	Water
13	67596		1	0	0	1	LightFields
18	311364		0.753	0.753	0.753	1	Urban
0	415732		0	0	0	0	Unclassified
16	893183		1	0	0	1	Vegetation

Here are the results of the pixel count. I classified agricultural fields that were beyond lighter than others since it would not be captured in the classification from vegetation. As you can see, the urban classification numbers raise by roughly 50% and the Vegetation totals drop by about 100,000 pixels.

Discussion

With more data and higher resolution if would be possible to gather a more accurate answer. There are obvious errors of classifications of rural areas within the Delaware County. Some agricultural fields were matching the same reflectance as urban areas with how bright they were. It's possible that those farms were being treated with chemicals or being tilled to give it a different display from the rest. Nevertheless, Delaware county has shown great progress in the last couple decades and the expansion follows suit with the increase of incorporated residential building permits.

Conclusion

Land classification is a good starting point to look at how land use has changed over time. It is clear that there are issues that affect the land cover mapping from remote sensing data. Not knowing of these may result into an inappropriate land cover representation. In terms of accuracy and precision for effective land use land cover information from remote sensing data, higher spatial resolution would be more effective. In this situation, the classification does a good job showing the expansion of the cities in Delaware over the 20 years.

References.

Usgs. “Metadata - LANDSAT_ETM_C1 - LE70190321999189EDC00.” EarthExplorer, https://earthexplorer.usgs.gov/metadata/12267/LE70190321999189EDC00.

“County Development.” Regional Planning Commission, https://regionalplanning.co.delaware.oh.us/data/development/.

Data downloaded from GEOG 5225 course website: https://osu.instructure.com/.