

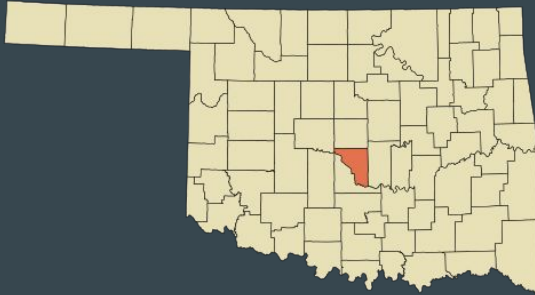
Exploring Impacts of the Moore Tornado Through GIS

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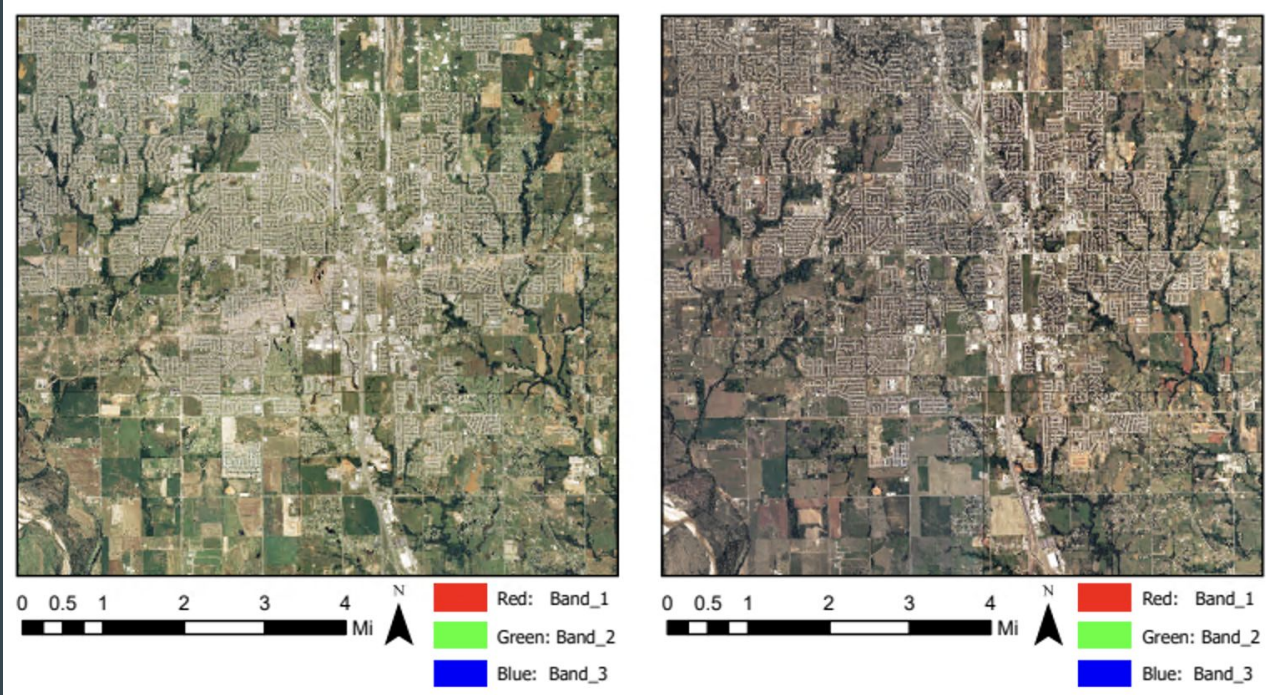
What is the Moore Tornado?

- Occurred on May 20th, 2013 in Moore, OK
- EF5 Tornado (Wind speed > 200 MPH)
- Killed 24 people, injured 212
- Destroyed > 1,000 homes
- Illustrate impacts through satellite, elevation, radar, and census data



Sources: Ks0stm (Wikimedia commons), NWS

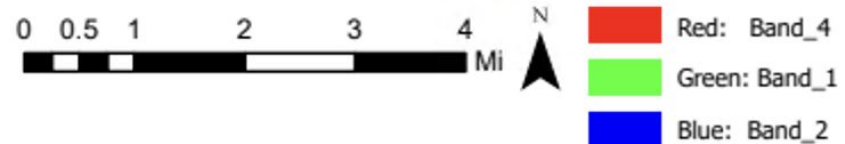
True Color NAIP: 2013 & 2011



These images show true color NAIP satellite imagery of Moore from June 10, 2013 (left) and May 5, 2010 (right). The Moore tornado track is clearly visible on the 2013 imagery.

False Color NAIP

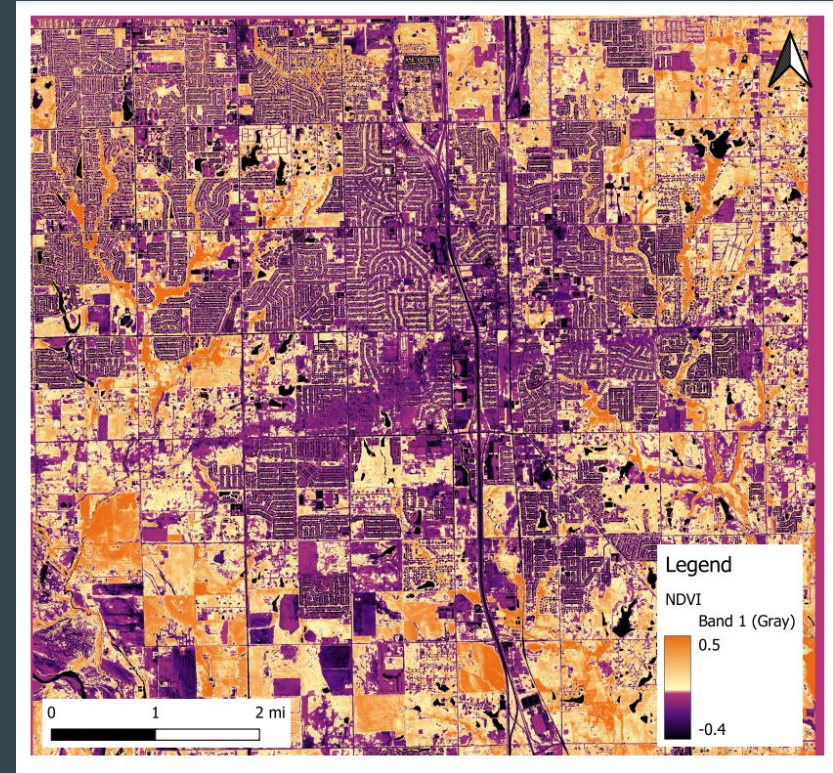
This false-color image sets Near Infrared (NIR) as red, red as green, and green as blue. This image is meant to better show the tornado track. NIR also emphasizes vegetation, so forested areas are highlighted in red.



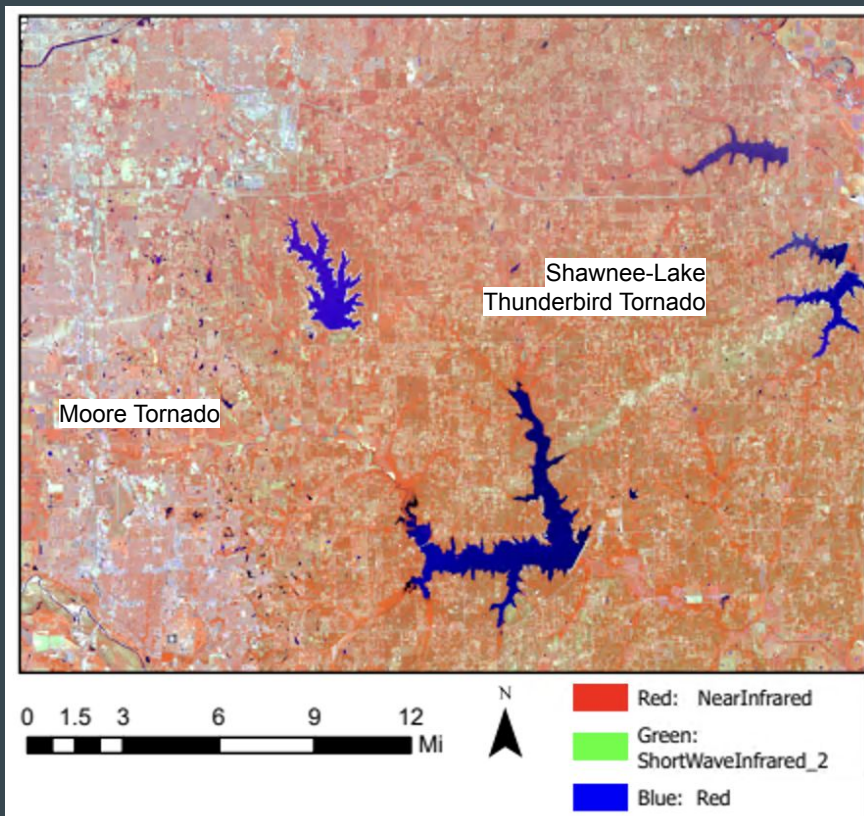
False Color NAIP: NDVI

Normalized Difference Vegetation Index

- $NDVI = \frac{NIR - Red}{NIR + Red}$ bands
- Used to understand plant density (photosynthetically active plants have higher NDVI values)
- Used Raster Calculator to apply the index and changed symbology using the histogram to emphasize the path of the tornado



False Color Landsat: SWIR and NIR

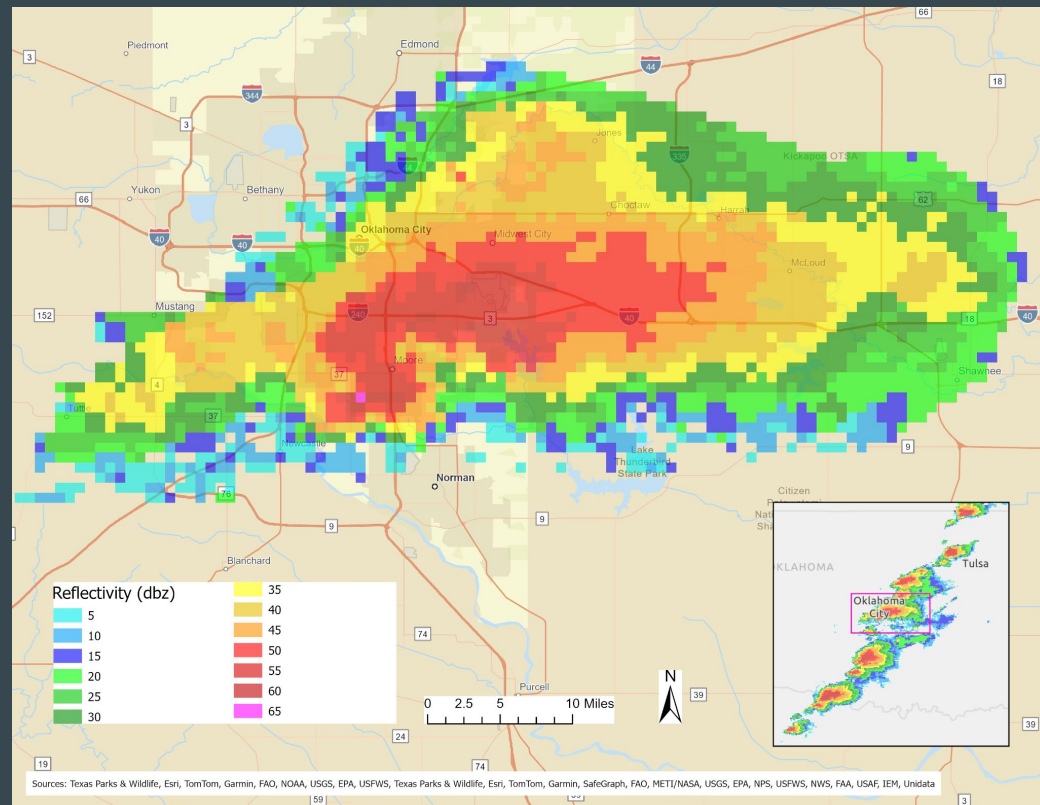


This false-color image from June 12, 2013 sets red as NIR, green as SWIR, and blue as red. This band combination enhances the visibility of tornado tracks, as SWIR is particularly effective at highlighting bare soil.

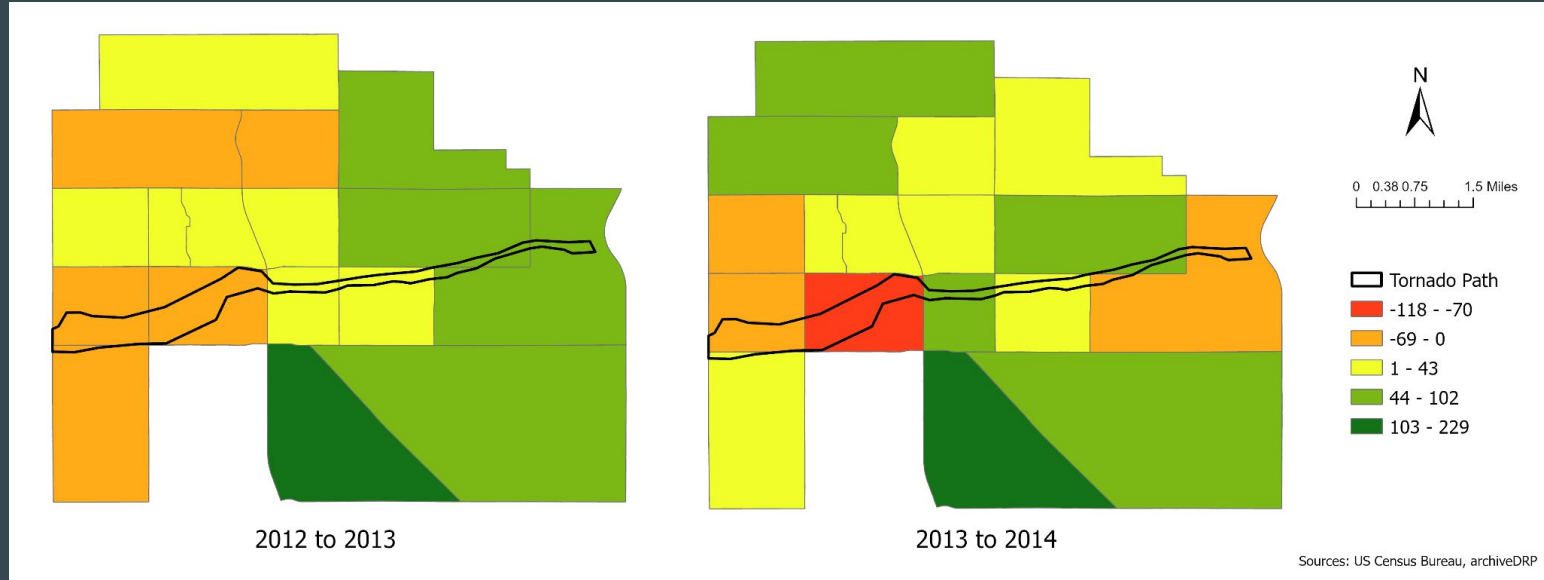
Using Landsat imagery, we noticed the Shawnee-Lake Thunderbird tornado, which was an EF5 tornado that occurred the day before.

False Color NEXRAD: Isolated Moore Supercell

Oklahoma City Radar Reflectivity at 3:20pm on May 20th when the tornado was over downtown Moore. Used Extract by Mask and Con tools to clip the radar raster to the irregular polygon boundary of the Moore storm, highlighting its classic tornadic supercell structure.

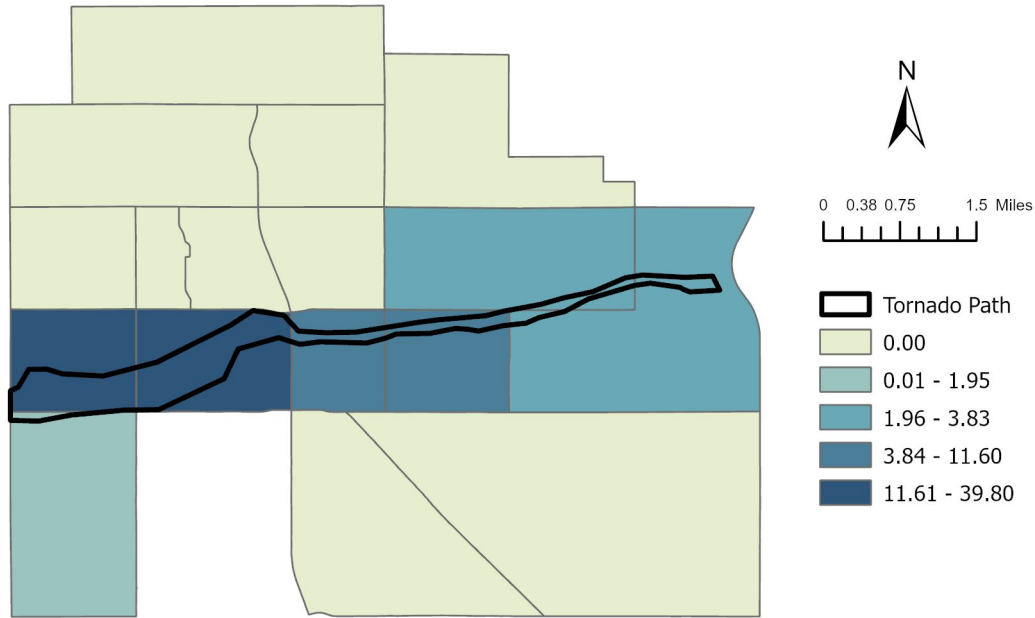


Census Data Analysis: Change in Number of Housing Units



In the year before the tornado, the areas where housing units decreased were fairly random, but in the year after the tornado the number of housing units decreased almost exclusively in the damage path of the tornado.

Analysis from Vector Shape: Percentage of tract within path

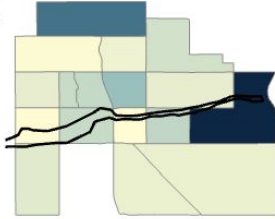


Sources: US Census Bureau, archiveDRP

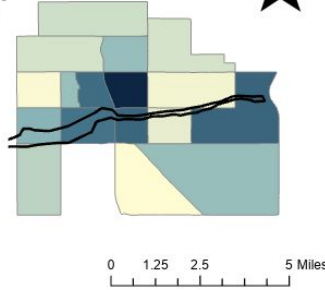
This map shows how much of each census tract in the city of Moore was enclosed within the tornado path. The tract with the highest percentage also had the highest decrease in the number of housing units.

Population Shifts after the tornado

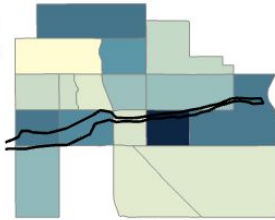
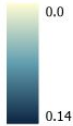
Percent of Residents Recently Moved from a Different State (2012)



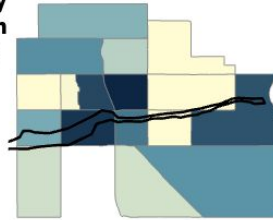
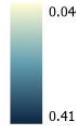
Percent of Residents Recently Moved from Within Cleveland County (2012)



Percent of Residents Recently Moved from a Different State (2014)

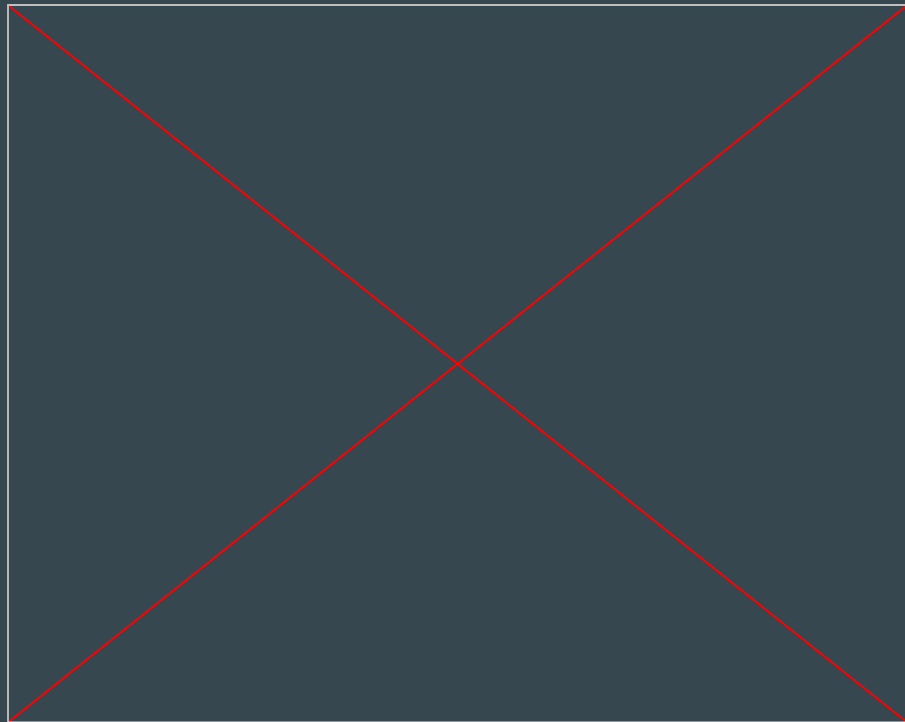
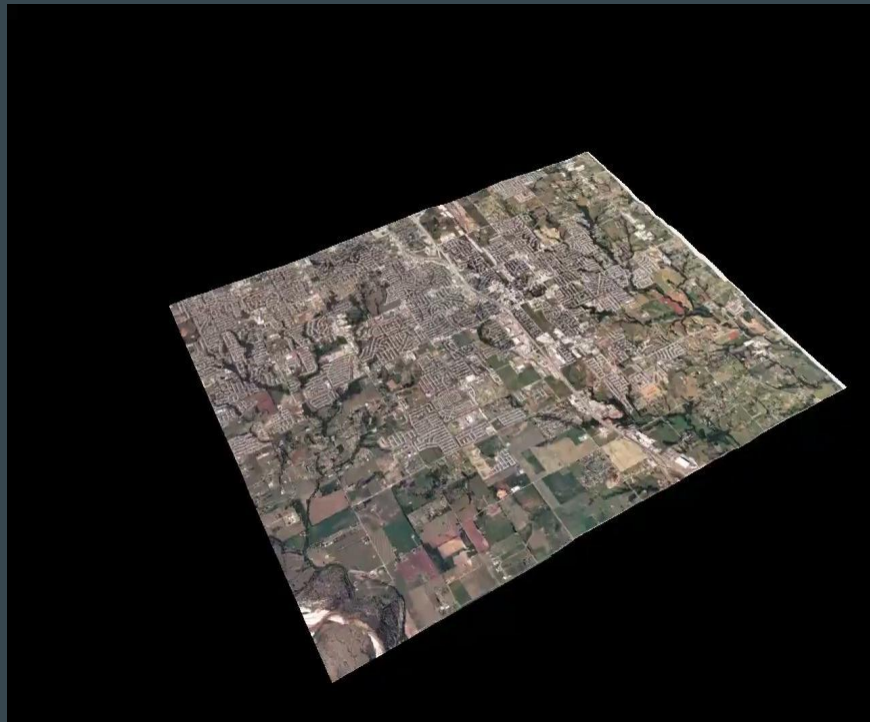


Percent of Residents Recently Moved from Within Cleveland County (2014)



Note: Percent scales are different for each map – people are moving significantly more from within the county *as well as* significantly more in 2012 than 2014.

Video Animation



Webmap

To create this webmap, we combined our NAIP imagery from before and after the tornado with data regarding the path of the tornado, the extent of the damage and debris field, and images of the tornado damages at different locations on the map.

<https://umich.maps.arcgis.com/apps/instant/compare/index.html?appid=681fde20da4d491099da1d2143d886b4>

Sources: mgaffner_WDT, Weather Decision Technologies, 2013; mharlowDRP; archiveDRP