



Geography 419 – Spring 2025

Revisiting Black Mountain Through Advanced LiDAR Analysis

Brock Ittig

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LiDAR Presentation



- My demonstration uses LiDAR collected and rendered of **Black Mountain**, one of Kentucky's highest mountain peaks
- Building on a project that I initiated nearly 2 years ago, I used the LiDAR data to further enhance this effort
- Applying LiDAR data to this project generates greater context by uncovering detailed physical characteristics of the terrain, revealing surface features, elevation changes, and potential environmental obstacles that are not visible in traditional map layers.
- LiDAR enhances our understanding of the operational environment and offers valuable insights for EMS planning, rescue logistics, and infrastructure development.

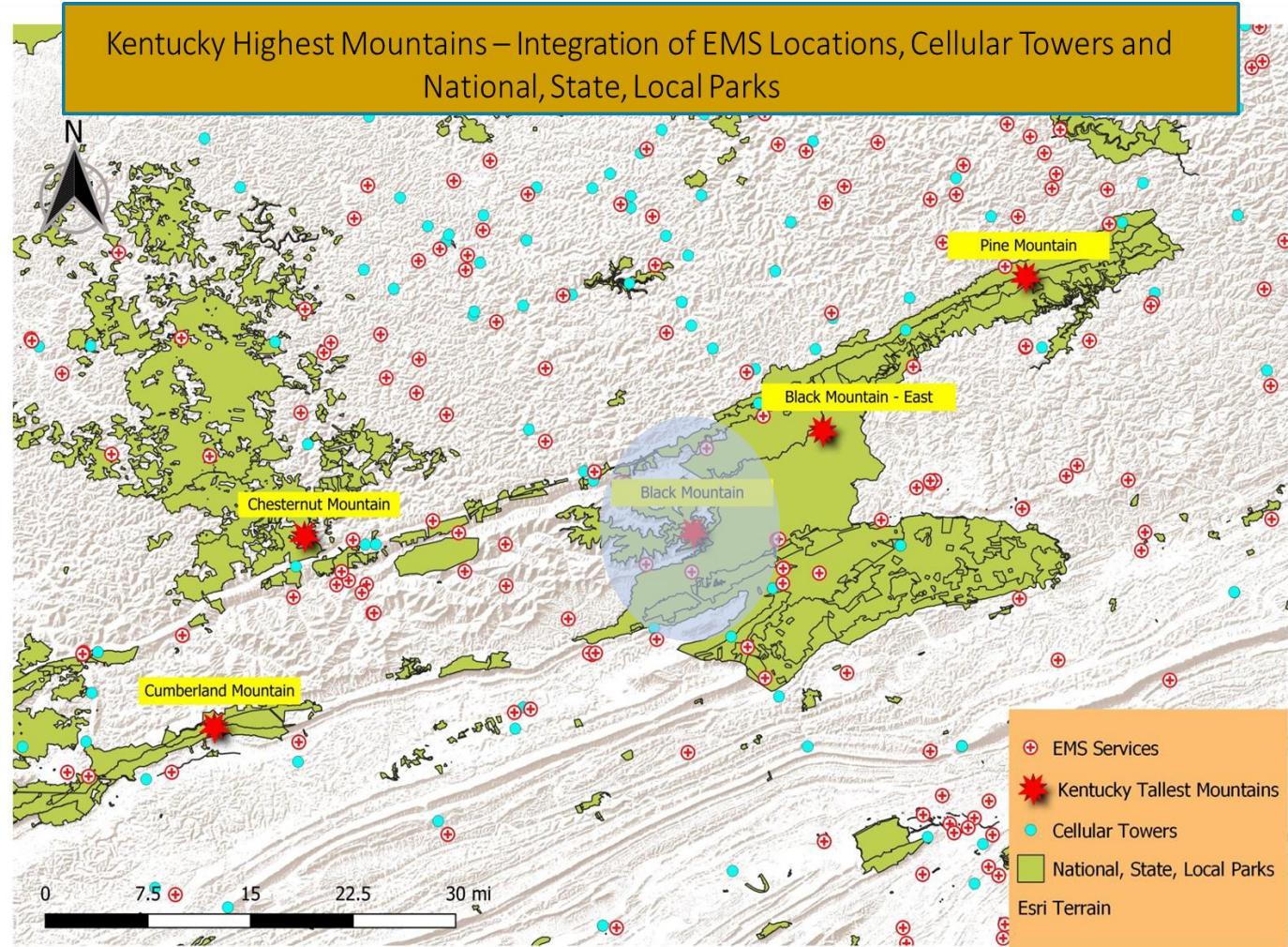




LiDAR Presentation – My Project



- This project aimed to support emergency response and park service operations across some of the state's most challenging and remote terrain
- Kentucky's five highest peaks—**Black Mountain, Black Mountain East, Cumberland Mountain, Pine Mountain, and Chestnut Knob Mountain**—each present unique environmental, geographic, and infrastructural challenges.
 - Integrated and visualized multiple geospatial datasets to provide actionable insights for emergency medical services (EMS), local governments, state and national park authorities, and environmental organizations. Specifically, we sought to:
 - Identified gaps in cellular communication coverage
 - Located an alternative communication infrastructure
 - Displayed potential impact areas from severe weather events
 - Highlighted topographical and infrastructural obstacles that may delay EMS response



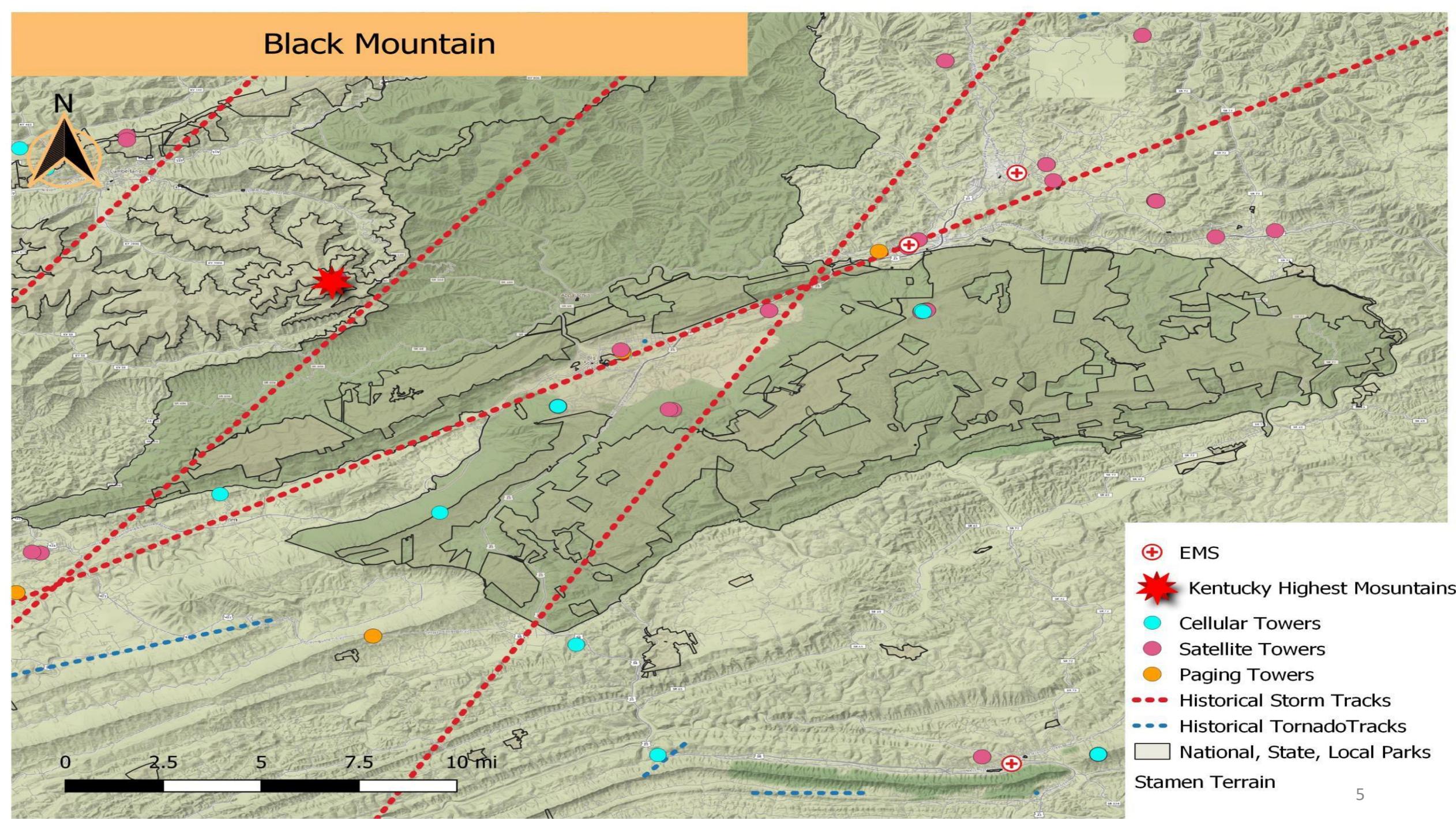


Introduction to LiDAR & Tools



- Data used from [KyFromAbove - Kentucky's Aerial Photography & Elevation Data Program](#)
- Tools used for visualizations: ERDAS IMAGINE 2023, ArcGIS Pro, Python, YouTube

Black Mountain





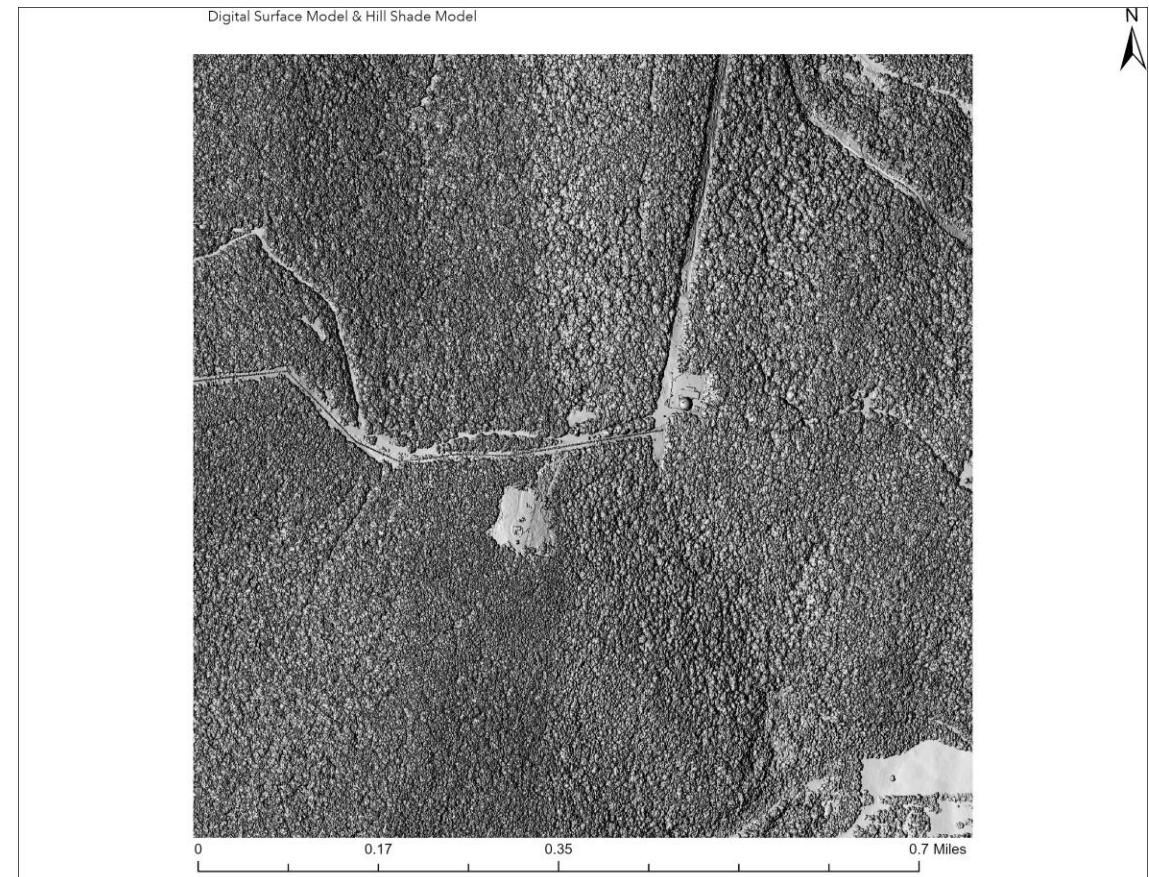
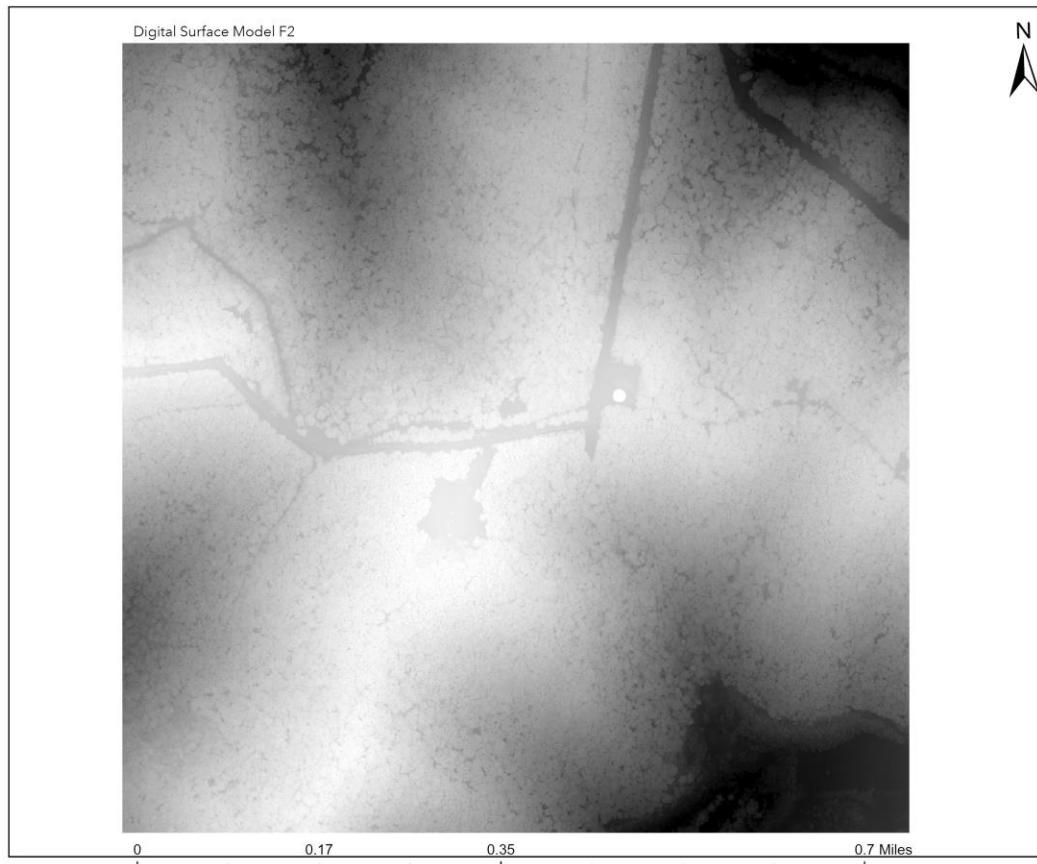
ERDAS IMAGINE – RGB Visualization

True-color LiDAR point cloud of Black Mountain, revealing trails, summit structures, and dense forest canopy.



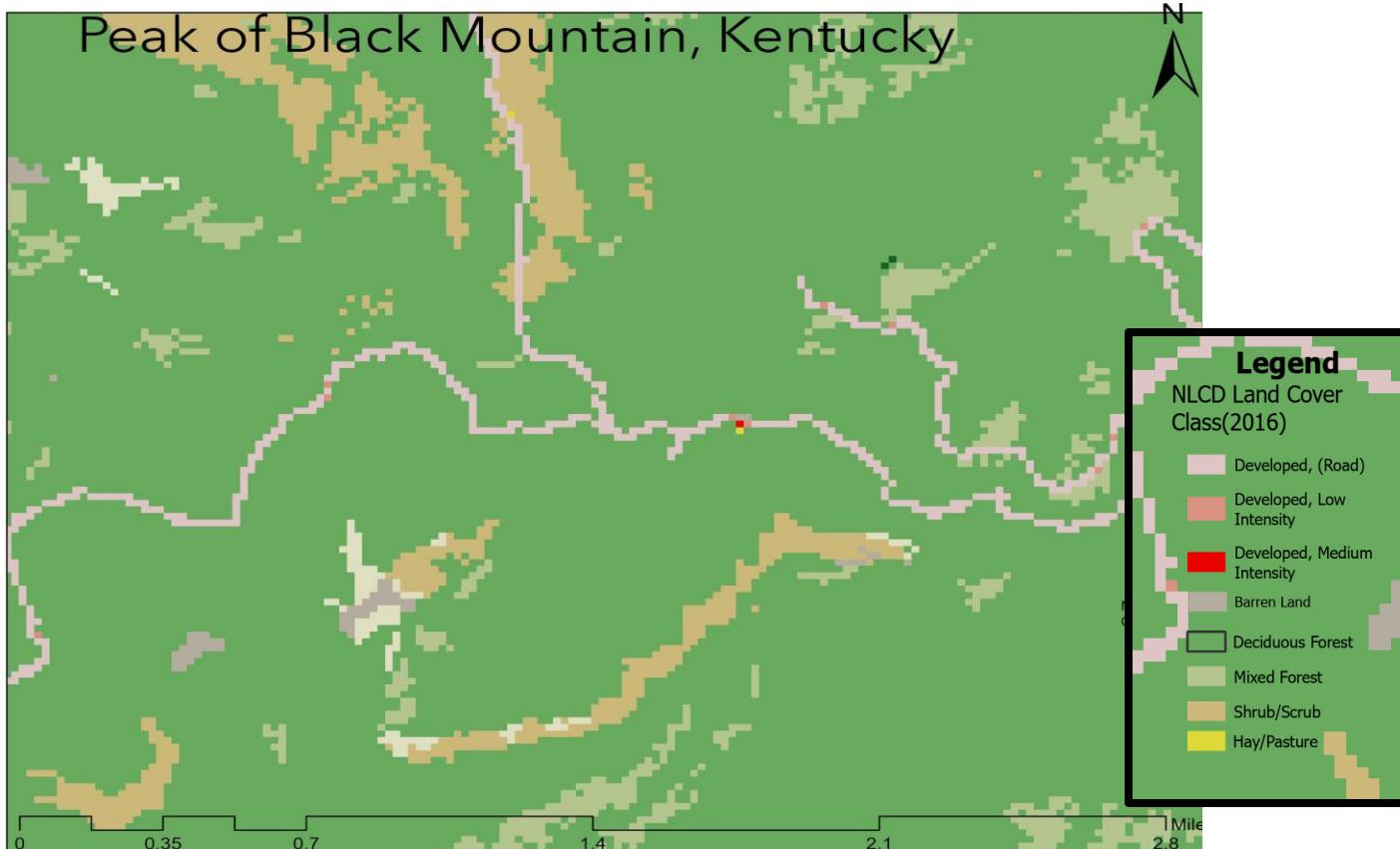


DSM and Hill Shade Visualization





Finding the percent and area for each land cover class on Black Mountain



Land cover classification from **NLCD** data, identifying forest types, barren areas, and developed surfaces across Black Mountain.

Dominant Land Cover at Summit

- 65.61%, 262.3 sq mi of Deciduous Forest
- 15.7%, 62.8 sq mi of Mixed Forest
- 3.56%, 14.2 sq mi of Barren Land
- 3.53%, 14.1 sq mi of Developed, (Road)
- 2.84%, 11.4 sq mi of Shrub/Scrub

Work-Flow: Clipped NLCD raster to the Black Mountain AOI, used ArcPy to summarize pixel counts by land cover class, then converted values to percent and square miles using python

Data: U.S. Geological Survey. National Land Cover Database (NLCD) 2016 Land Cover Conterminous United States. U.S. Department of the Interior, 2019. www.mrlc.gov/data.



Key Takeaways



- Highlights Accurate Elevation Data
 - Captures precise ground elevations through heavy forest canopy
- Detailed Topographic Mapping
 - High-resolution topographic maps to see ridges and valleys
- Differentiations of Vegetations and Surface Features
 - Strip away features to see Bare Earth
- Environmental and Land Use Insights
 - Forest health, flood risk areas, and erosion patterns
- Improved Visualization and 3D Model
 - Fly through terrain



Animation (ArcGIS Pro)



Link: <https://youtu.be/0C5DWYTe65Y>

Collected and created
by Brock Ittig



Fly Through Of Black Mountain Summit LiDAR

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