Adopt-a-Pixel3Km

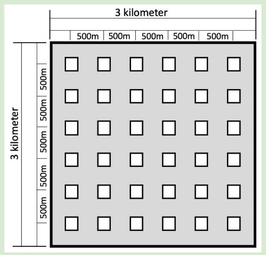
A 2025 case study of *Cumming, Georgia*

Rinnah Shindano (ORCID)

map

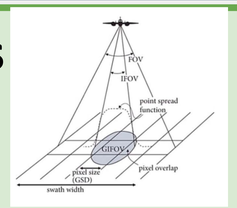
Image chips from Landsat Time-Series

AaP3Km methods



Sample an area on Earth

remote Sensing ground to Satellite platforms



Discussion

This case study exemplified the challenges of using remote sensing to assess land coverage in areas with dense forest coverage. Majority of the land coverage is obstructed by the canopy cover, leading to data being misinterpreted. In Cumming, GA, developed areas lie within this canopy cover but that details was lost in some of the satellite areas. This led me to the conclusion that the forests in my AOI are a limitation due to their height and density. The collected data also illustrated the rise of development in Cumming,GA. Information from graphs and map layers of Dynamic World, ESRI, and World Cover presented a pattern as to which areas are being suburbanized and how the area is changing. These resources highlight the land cover change that correlates to the recent population spikes. Lastly, the Landsat Time-Series represents the consistency of my AOI and how change in land cover has been gradual, with significant spikes only being in certain areas.

Conclusions | Recommendations

This research highlighted how that in order to accurately define an area, we must use a variety of satellite data along with citizen science. When analyzing the different maps and my personal observations, I noticed if you just looked at one source the data would be a misinterpretation of the area. A scientist can have a completely different understanding of an area depending on what map they chose to observe. Satellite information from one source is not enough to sufficiently define area, but instead data from many different angles. Lastly, this project reinstated the importance of citizen science,. The globe observations provided data granule scale, that allowed for very specific data. These classifications provided the most accurate representation of land cover, and were the most detailed. Citizen science also resulted in so much data being available from around the world, data that would be impossible for one scientist to collect. Apps like Globe Observer are the future of research and discovery.

References

Nelson, P.V., Low, R., Kohl, H., Overoye, D., Yang, D., Huang, X., Chellappan, S., Azam, F.B., Carney, R.M., Falk, M., Garriga, J., Schelkin, L., Boger, R. and Schwerin, T. (2024) 'GLOBE Observer: A Case Study in Advancing Earth System Knowledge with AI-Powered Citizen Science', *Citizen Science: Theory and Practice*, 9(1), p. 33. Available at: https://doi.org/10.5334/cstp.747.

"ESA WorldCover 10m 2021." *European Space Agency*, 2021, https://esa-worldcover.org. Accessed 16 July 2025.

"Dynamic World." *Google Earth Engine & World Resources Institute*, 2022, https://dynamicworld.app. Accessed 16 July 2025.

"ESRI 10m Land Cover 2021." *ArcGIS Living Atlas of the World*, Environmental Systems Research Institute, 2021, https://livingatlas.arcgis.com. Accessed 16 July 2025.

"GLOBE Observer." *NASA GLOBE Program, NASA*, https://observer.globe.gov. Accessed 16 July 2025.

"Landsat Missions." *U.S. Geological Survey*, https://landsat.usgs.gov. Accessed 16 July 2025.

Community Chronicles Background

This research focuses on the more rural parts of Cumming, GA. Located in Forsyth County, the AOI's centroid is lies at approximately (34°14'22.5"N,-84°06'10.8"). The studied area includes suburban residential neighborhoods, undeveloped farmland, forests, and commercial zones. This AOI has historically been characterized by undeveloped farmland and dense forests, with residential areas littered within; However, in recent years there has been a spike in development and population. The environmental changes in Cumming,GA are largely driven by the rapid urbanization that has recently occurred. Through both personal observations and those from residents, I've gathered that this development has led to habitat loss and fragmentation, increased rainfall, rising temperatures, increased frequency of unpredictable weather events, and shrinkage of forest cover. Despite these changes, my observations show that land cover changes have been gradual, and the area stays true to popular trends.

Descriptive statistics

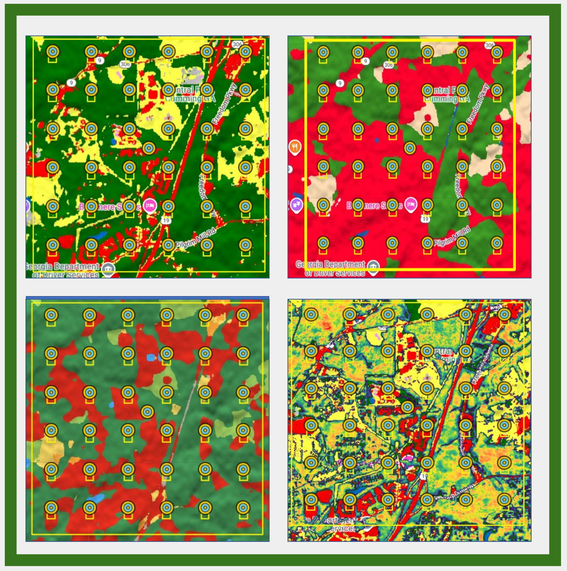
There were 37 observations sites observed in the 3km area. 3 sites were inaccessible(21,30,31) and the other 34 sites show similar results. The majority of the points were either dominated by canopy cover or built up areas-with slight deviations of grasslands.

I **wonder** how accurately satellites can classify land cover in a area with such dense canopy cover.

Result Summary

Through comparing my personal globe observations to several satellites, 2 relationship mainly stood out in the data. The most surprising relationship I discovered was how dense canopy cover often led to satellite images to not be able to accurately classify land cover, while my globe observations were able to properly define the land cover. I first noticed this phenomenon when I was interpreting images with satellite data on Collect Earth online. Many of the images of my AOI points were interpreted of 100% canopy cover, but I knew (through personal observations) that these sites weren't in forests-these sites were in developed areas. Diving further into this opposition, I noticed that the Worldview-4, WorldCover, and Dynamic world data often had the strongest tendency to define an area as completely canopy cover even if there were built-up areas. Conversely ESRI data had the most accurate classification of land cover, showing that there were roads and subdivisions within this canopy cover.

The 2nd most prevalent relationship was one of 2 extremes. These 2 extremes were either an area being defined as 100% built-up or 100% canopy cover. This result can be easily noticed in my poster by how majority of the points are either all green(canopy cover) or all red(built-up). Hypotheses on why this could be were explained by the 3km Dynamic World map. This map can be described as green with red cut-outs. There are almost "pockets" of development. The dynamic world map emphasizes how my AOI is built within forests and development is a result forest clearing. The ESRI helps show that there is development within these forests, but in many areas drastic shrinkage of forest cover has occurred to supplement suburbanization. The best example of this are points 1 and 2 where 100% canopy cover changes to 100% built up areas in the span of one year. Aside from these 2 distinct relationships, the other results fall uniform. Most of the data has stayed consistent over the years, and land cover changes have been minimal.



Platform	Landsats 5-9	WorldView-4	Sentinel-1/2				GLOBE Observer						Collect Earth Online
Primary Sample Unit	Landsat Time Series Graph	1m Tree Canopy Meta	World Cover 10m		Dynamic World 10m	ESRI 10m	Up	Down	west	south	east	north	high resolution image interpretation
0													
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													