Land Use and Land Cover Change of Maricopa County, Arizona

Team

Kyleigh Miklos, Connor Olds, Isabel Heard, Abbey Haynes

Research Question

How did land cover change in Maricopa County, Arizona from 2001 to 2021, specifically looking at urbanization change?

Contents

This report consists of four documents submitted:

- Workflow (attached separately)
- Results (attached separately)
- Presentation (attached separately)
- Analysis (this summary document)

Datasets Used

Two datasets were used to complete this project: the 2001 and 2021 datasets from the MRLC website. These years were chosen to compare maps with a significant timeframe in between and we settled on years two decades apart.

Purpose

This summary document will describe the changes in land cover in Maricopa County, Arizona, US from 2001 to 2021. This research is to determine which areas of Maricopa County became urbanized in 20 years. It can be used as a guide for other rapidly growing metropolitan areas.

Data Preparation

1. A vector layer was added with the outline of Maricopa County.
2. The land use raster data and the Maricopa County boundary data were both projected onto the same coordinate plane (Albers Equal Area).
3. The national land use raster data was clipped using the boundaries of Maricopa County for easier processing.

Methods/Creation

1. Once both the 2001 and 2021 data sets were clipped into the Maricopa County region
2. The change detection wizard was used to select for all areas that were considered undeveloped in 2001 and developed in 2021.
3. Analyzed percentages of land cover in both datasets
    a. Quantified changes from undeveloped to developed land
    b. Quantified changes from low in density development to higher intensity development

Analysis

The highest amount of land cover change from 2001 to 2021, as visualized in the Land Cover Change map, occurred near major cities in Maricopa County. Phoenix, Mesa, and Peoria saw the most change. Upon further analysis, the changes occurred on the outskirts of these three cities with the center of Peoria being the closest to the change.

In both 2001 and 2021, most of Maricopa County's area was classified as shrub/scrub land use (71.2% area/6,567 square miles in 2001; 67.7% area/6,245 in 2021). Consequently, most of the urbanization took place in areas that were designated as shrub/scrub land, which is to be expected since much of the county is under that designation. Another notable result from analysis concluded that a high percentage of developed land transitioned from either urban open space or low intensity developed land into a higher intensity of development. Overall, there was approximately 2.1% increase in urban land use.

Results

The map of Maricopa County Land Cover 2001 shows a lot of developed land in the highly populated areas. Surrounding those areas is mostly cultivated crops. Yet, we see that there is a lot of developed open space in many parts of the Phoenix, Peoria, and Mesa area.

We then created the Maricopa County Land Cover 2021 map to examine how much the land had changed. The areas surrounding the three cities seemingly have more developed land around them. Especially where the developed open space used to be. Which makes sense, Maricopa is the fastest growing county in the United States.

With that, we created our Land Use Change Map to investigate which areas become more urbanized. Most of the urbanization occurred surrounding the three most populated cities. This is understandable, as you need more developed land to house your growing population.

Discussion

This study utilized the Change Detection Wizard Tool and Categorical Change Detection Method to explore the land cover change trends in Maricopa County, Arizona, US. The most change was seen near three significant metropolitan areas: Phoenix, Mesa, and Peoria.

Phoenix being cataloged was not a surprise as it is the capital of Arizona with a population of 1.68 million people, according to the 2020 census. However, we were intrigued to find that Mesa and Peoria were also in the midst of the most land cover changes. Phoenix's population is more than three times Mesa's population (about 518,800) and slightly more than six times Peoria's population (roughly 203,650).

When looking at the 2001 and 2021 map side by side, you can see more of the red categories, signifying developed land in increasing intensity. Some regions that were a lighter shade of red in 2001 became a darker shade of red in 2021, indicating a surge of development in already developed regions. These changes demonstrate further urbanization of cities as more and more people move in.

Additionally, there are also fragments of land cover change in the western part of Maricopa. These areas are relatively close to sections classified as types of wetlands. This alludes to people wanting to live close to a natural water source, especially with Arizona's dry, hot climate.

The trends in these locations are not a coincidence. They are likely due to having lower housing prices and natural resource costs (i.e. water, electricity, gas) than Phoenix. Surrounding suburbs of cities also usually have more space for development, giving residents the luxury of having access to urban amenities while not living there full time. This is beneficial for people looking for jobs, those with growing families, or folks searching for a warm place to retire.

Conclusion

This study examined the land cover change of Maricopa County from 2001 to 2021. Maricopa County was chosen for this study as it is the fastest growing county in the United States. With the drastic population change, we were curious how that would change the landscape of the county over time.

Pulling from three different data sources, and using the change detection wizard tool in ArcGIS, we were able to capture urbanization change. We found that there was more developed land in 2021 surrounding the most populated cities in the county. Examining urbanization and land cover change is important for understanding the many environmental impacts and the growing population in Maricopa County.