Using ArcGIS to Identify Potential Urban Farm Locations in Tarrant County

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ABSTRACT

For this project, we used GIS remote sensing technology to locate and identify potential locations for urban farming. The purpose of this project is to recognize and assist in the issue of food deserts in areas such as the DFW (Dallas Fort Worth) metroplex. A food desert refers to any area with limited or no access to affordable, nutritious food. This may include a lack of access to farmers' markets, vegetable shops, or fresh produce. This project aims to recognize and assist in the issue of food deserts in urban areas with a particular focus on the East Fort Worth/Arlington area of Tarrant County. Several relevant datasets including high spatial resolution commercial remote sensing and other relevant spatial (such as property appraisal datasets, land temperature data) and non-spatial datasets. These will be combined in a GIS environment to identify empty plots of land that could be used for the purposes of urban agriculture while assessing their potential for food growth. Once these plots of land are identified, we will use ArcGIS to assess ecosystem services provided by these urban farms, such as the impact on climate and urban heat.

BACKGROUND

In many of the U.S.'s most urbanized areas, it is common for neighborhoods to lack access to fresh, affordable, and nutritious food. This may include a lack of access to fresh produce, fruits and vegetables, or local markets. A proposed solution to the growing issue of food deserts is urban agriculture: the practice of producing and distributing agricultural products- such as fresh produce or even livestock- in urban and suburban areas. Furthermore, the replacement of natural land cover with concrete and buildings contributes to the urban heat island effect. Increasing plots of vegetative cover can help combat increasing temperatures.

OBJECTIVE

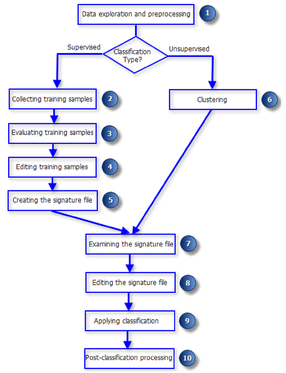
The objective of this research is to identify potential plots of land to establish urban farms and asses their environmental impacts.

DATA

High resolution satellite imagery (50 cm-2 m) was obtained from the Pleiades satellite, specifically focused on east Tarrant County. In addition to this, we used land appraisal data from 2022 that provided both spatial and non-spatial information on each property within the county. To identify changes in land surface temperatures of Opal's Farm, an already established urban farm, we analyzed 30 m resolution Landsat data. Additionally, we collaborated with Executive Director of Healthy Tarrant County Collaboration, Linda Fulmer, who provided us with ample field data on potential sites.

METHOD

To identify the potential areas for urban agriculture, supervised classification was used through the program ArcGIS. The image was divided into four classes: barren land, water, forest, and developed land. From this point, the appraisal data is analyzed and any barren land belonging to a church is identified as a potential location for urban agriculture. Using a weighted ranking system, sites were judged based on available garden space, parking, and the presence of fencing to isolate the most ideal candidates. Additional factors such as zoning, surrounding infrastructure, and proximity to flood zones were also considered. To assess the environmental impacts urban agriculture, we examined the change in land surface temperature at Opal's Farm in Tarrant County.



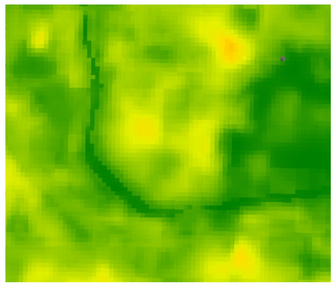


Figure 1 - Land surface temperature map of Opal's Farm, 2015

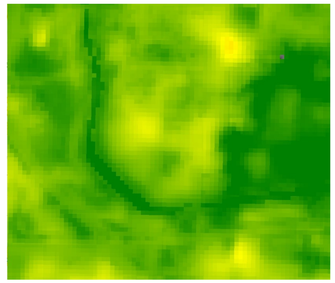


Figure 2 - Land surface temperature map of Opal's Farm, 2021

RESULT

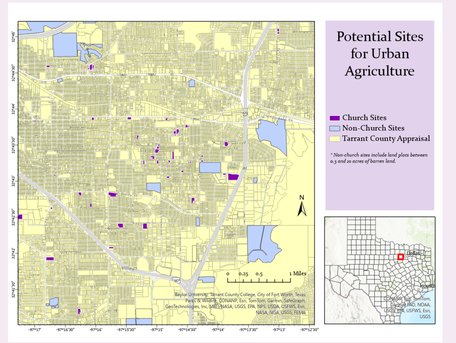


Figure 3 - Potential sites for urban agriculture in Tarrant County.

After classifying the satellite imagery into four classes, we isolated barren land between 0.5 and 10 acres in size. We then performed a spatial query to pinpoint corresponding Tarrant County land plots containing suitable amounts of barren land. As displayed in Figure 3, we identified 99 church sites and 261 non-church locations to potentially host urban agriculture. Of the identified church sites, we performed a suitability analysis to further narrow down the most qualified land plots. We were able to delineate between locations based on acreage, the presence of fencing, and whether the land fell within certain flood zones. Figure 4 depicts the suitability level of land plots based on these weighted factors. To analyze the potential ecological services of these sites, we compared land surface temperature data from Opal's farm. In 2015 the land surface temperature map depicted higher temperatures compared to data from 2021. Over time, the land surface temperature of Opal's farm has gradually decreased, likely due to the introduction of more vegetative cover

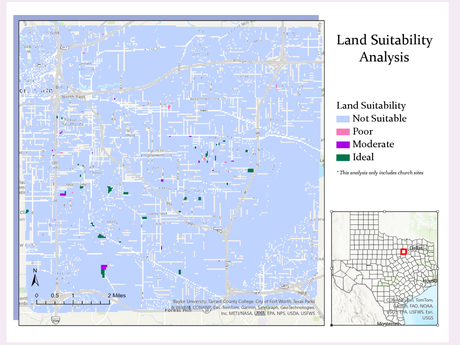


Figure 4 - Land suitability analysis map of Tarrant County.

CONCLUSION

ArcGIS analysis techniques helped identify prospective sites, including both church and non-church locations, to host urban agriculture. These farms have the potential to increase access to fresh food among underserved populations and provide beneficial ecosystem services throughout Tarrant County.