

# Growing With Purpose: A GIS Model for Future GUTS Installations

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## Introduction

Greening UToledo through Service (GUTS) aims to create native landscapes around the University of Toledo campus, increasing biodiversity and sustainability, through the help of undergraduate service learning volunteers. However, previous methods of determining placement of these installations were based on instinct rather than a data-driven approach. The purpose of this research is to use Geographic Information Systems (GIS) to identify new garden locations with the highest community impact. By using building capacity as a proxy for human density and applying a negative weight to existing gardens, this model prioritizes areas around campus that lack these native installations.

## Methods

To find the best locations for new gardens, a spatial analysis was performed in ArcGIS Pro using the University of Toledo campus data. Because direct data on foot traffic was unavailable, building capacity was used as a proxy to estimate human density.

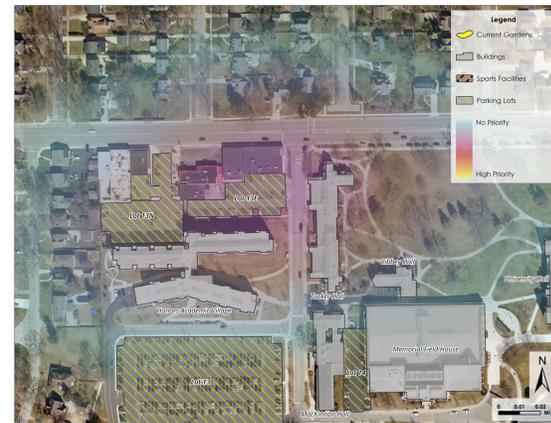
The model was built using the following logic:

- **Parking Lots:** Weighted on a 1–5 scale based on the physical size of the lot.
- **Buildings without Capacity:** For structures missing data, an estimated value between 0 and 5 was assigned.
- **Existing Gardens:** To prevent new gardens from being clustered in the same areas, current garden locations were given a weight between -5 and 5 based on their distance from buildings, parking lots, and sports facilities.
- **Intelligent Averaging:** All factors were combined into an *Average\_Weight* field that was scaled 1–5. To account for missing building data, an “intelligent average” function was utilized to calculate priority based only on available valid inputs, preventing null values from skewing the results.

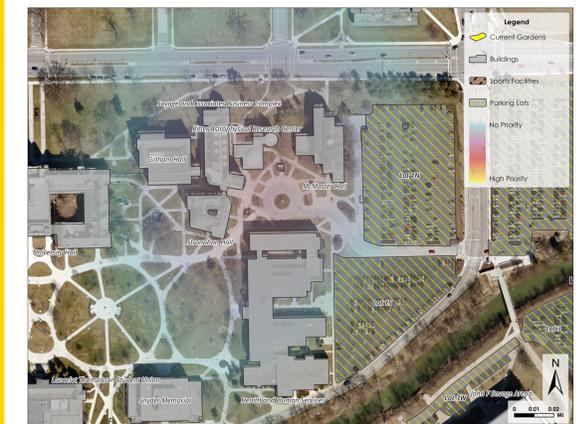
This data was then visualized as a Heat Map to identify the highest priority zones for native installations.

## Conclusion

This research shows how GIS can be used to make sure new installations are placed where they are actually needed on the University of Toledo campus. Instead of just picking subjective spots, the model uses building and parking data to find the areas with the most people and the fewest existing native plants. By following this map, GUTS can be more efficient with its volunteers and resources. These results provide a clear plan for where to plant next to make the campus more biodiverse and make sure the student body actually sees and enjoys the new green spaces.



**Figure 2:** Heatmap of the Honors Academic Village / Tucker Hall area on the NW end of campus.



**Figure 3:** Heatmap of the Ritter / Stranahan area on the NE end of campus.



**Figure 1:** Heatmap of priority for future GUTS installations.



**Figure 4:** Heatmap of the McComas Village / Ottawa House area on the SW end of campus. This area shows the highest priority for a future GUTS installation.



**Lot 10 Rain Garden:** A thriving native installation featuring a diverse seasonal bloom of forbs, grasses, and sedges.

**Companion Site**



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