THE BIG (Green) APPLE

IDENTIFYING SUITABLE ROOFTOPS FOR URBAN AGRICULTURE IN FOOD DESERT HARLEM, NEW YORK CITY

URBAN AGRICULTURE: THE ONE HEALTH APPROACH

With an ever increasing human population of 7.7 billion, the need to meet rising food demand at the least cost to biodiversity has become a crucial focus of conservation. Studies investigating sharing land for agriculture and biodiversity versus sparing land for conservation have shown land sparing as the optimal strategy for reconciling food production and biodiversity conservation. Urban rooftop agriculture allows for application of land sparing while also benefiting populations that are isolated from agricultural land.

Rooftop green infrastructure has environmental benefits other than sparing biodiversity such as reducing storm-water runoff, mitigating the urban heat island effect and reducing the need for energy intensive cooling systems. They can also provide access to fresh foods for local communities, and bring communities together in a positive way, such as through school programs.

WHY HARLEM?

New York City is the most populated city in the United States, and is also home to some of the greatest food insecurities and inaccessibility. Poor neighborhoods most commonly have establishments that do not often provide access to fresh fruits and vegetables, which provides a lack knowledge and awareness about the importance of healthy eating. Studies have looked to implement rooftop urban agriculture within New York City in boroughs such as Brooklyn, Queens and the Bronx; however, there is a lack of attention to East and Central Harlem, which have been identified as food deserts. This is exhibited by its higher abundance of convenience food retailers and fast food establishments carrying unhealthy foods with lower access to supermarkets. This study seeks to determine the most suitable building rooftops to implement urban agriculture by first identifying suitable rooftops then applying factors such as population density, access to food retailers, distance to schools and accessibility by public transit.

METHODS & DISCUSSION

Suitable buildings to support rooftop agriculture were identified through selection of certain attributes. A weighted suitability analysis was performed by reclassifying factors on a scale from least suitable (1) to most suitable (5). Zonal statistics was performed on the suitable buildings layer to find a final suitability score for each building. Six buildings scored over 3.5 and were deemed most suitable. These rooftops were further investigated through satellite imagery, and five buildings were confirmed suitable based on roof slope. These results could have major implications for public health and to implement rooftop agriculture in an area that would provide social and environmental benefits.

FINAL MAP

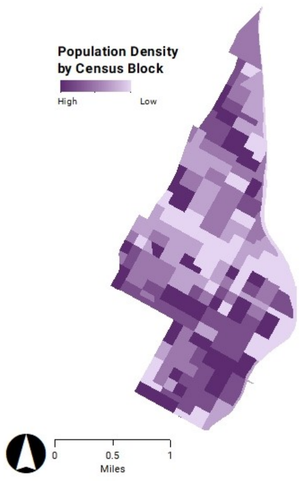
The following weights were given to each factor:

- 10% Proximity to Schools
- 25% Convenience Store Density
- 15% Population Density
- 25% Supermarket Density
- 25% Proximity to Bus Stops

COMMERCIAL OR MANUFACTURING ZONED BUILDINGS → TEN FLOORS OR LESS → BUILDING AREA OVER 5,000 SQUARE FEET → CONSTRUCTED PRIOR TO 1968 → BUILDING CLASSES WITHOUT UTILITY USAGE → BUILDINGS WITH GREEN ROOF POTENTIAL

SUITABILITY FACTORS

POPULATION DENSITY

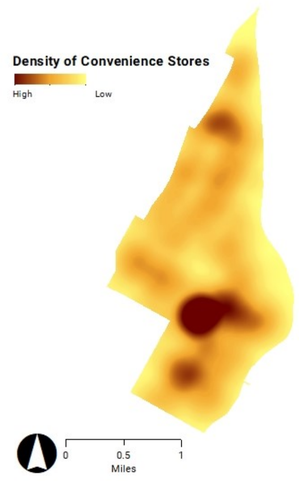


Higher population density leads to greater food insecurity and inaccessibility. Population per square mile data was converted from polygon to raster and reclassified for suitability.

SUPERMARKET DENSITY

Higher density of supermarkets with fresh produce indicates less of a need for locally sourced agriculture. Kernel density was run on supermarket data from the NYC food retailers shapefile and reclassified for suitability.

CONVENIENCE STORE DENSITY

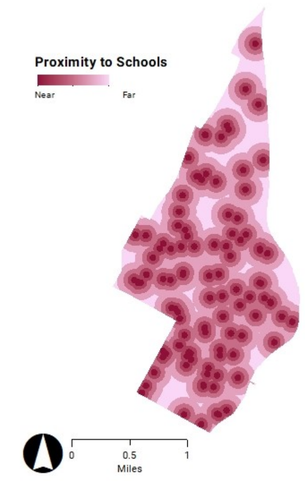


Higher abundance of fast and processed food establishments contribute to lack of nutritional balance in diets, higher obesity rates and therefore, lower resistance to disease. Kernel density was run on fast food establishments from the NYC food retailers data and reclassified for suitability.

PROXIMITY TO BUS STOPS

Lack of accessibility to public transit is an important factor in urban agriculture suitability because it highlights the necessity for local, readily available fresh foods. Euclidean distance was run on NYC bus stops and reclassified for suitability.

PROXIMITY TO SCHOOLS



Student involvement in agriculture can increase their acceptance of fruits and vegetables while encouraging participation in healthy after school activities. Euclidean distance was run on higher education and k-12 schools points layer, then reclassified for suitability.

HANNAH BARTLING

GIS FOR CONSERVATION MEDICINE

PROJECTION: NAD 1983 STATE PLANE NEW YORK LONG ISLAND

DATA SOURCES: NYC OPEN DATA, NYC PLANNING, OPEN DATA NY, NYC DOITT, ESRI

THANK YOU TO CAROLYN TALMADGE FOR HER PATIENCE, GUIDANCE AND SUPPORT THIS SEMESTER

Tufts UNIVERSITY | Cummings School of Veterinary Medicine