

Measuring Lot Vacancy in Detroit: A Comparative Analysis of Factors Contributing to Urban Blight, 2009-2013

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Introduction

This project concentrates on the City of Detroit, Michigan during the timeframe of 2009-2013 (Figure 1). Following the Great Recession of 2007-2008, Detroit has experienced accelerated rates of urban decline, as illustrated in Figures 2A and 2B. With the intention of reducing blight within the city, city initiatives to demolish vacant properties have opened up vast acres of open land. City planners and officials hope to identify vacated lots which could potentially be suitable for redevelopment, and rehabilitation. This study explores the idea that blighted areas can be identified using geospatial analysis, and linked to a causal factor. Effective planning can halt the spread of blight, while tackling the root of the cause.

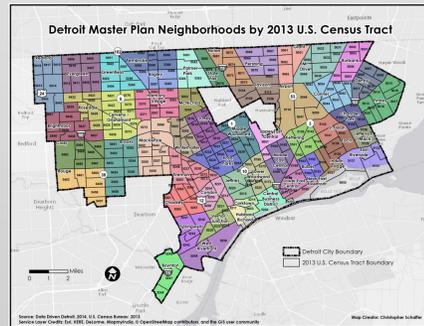


Figure 1. Study Area



Figure 2A. Brightmoor Neighborhood, 2009



Figure 2B. Brightmoor Neighborhood, 2013

Data and Data Sources

The first phase of geospatial correlation and analysis is data attainment, appropriate to the referenced study area of Detroit. Initial datasets were obtained through the City of Detroit, non-profit affiliate Data Driven Detroit (DDD), and the U.S. Census Bureau American FactFinder website. A complete list of acquired datasets and their sources are described in Table 1.

Table 1. List of Acquired Data

| Dataset | Year(s) | Source | URL |
|--|-----------|---------------------|---|
| Demolition Activity | 2009-2013 | Data Driven Detroit | http://portal.datadrivendetroit.org/ |
| Detroit Major Crime Data | 2013 | City of Detroit | E-mail from Garlin Gilchrist II (Deputy Technology Director) |
| Detroit Master Plan Neighborhoods | 2014 | Data Driven Detroit | http://portal.datadrivendetroit.org/ |
| Detroit Residential Parcel Survey | 2009 | Data Driven Detroit | http://portal.datadrivendetroit.org/ |
| Education Attainment | 2009-2013 | American FactFinder | http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml |
| U.S. Census Bureau, 5-Year American Community Survey | 2009-2013 | American FactFinder | http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml |
| Motor City Mapping Parcel Survey | 2013-2014 | Data Driven Detroit | http://portal.datadrivendetroit.org/ |
| Poverty | 2009-2013 | American FactFinder | http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml |
| U.S. Census Bureau, 5-Year American Community Survey | 2009-2013 | American FactFinder | http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml |
| Employment Status | 2009-2013 | American FactFinder | http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml |
| U.S. Census Bureau, 5-Year American Community Survey | 2009-2013 | American FactFinder | http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml |
| Tax Foreclosures | 2002-2013 | Data Driven Detroit | http://portal.datadrivendetroit.org/ |

Methodology

As the fundamental topic of discussion, lot vacancy data was analyzed to show the overall extent of change throughout the city. To make the data comparable, local datasets were compiled and aggregated into census tracts using a variety of geoprocessing tools including spatial join, table join, and dissolve in Esri's ArcGIS Desktop software platform. A complete spatial model (Figure 3) details the data processing flow used to complete the overall analysis.

The first step of analysis involved the comparison of survey results from 2009-2013 at the parcel level using a Python-developed script (Figure 4). Next, the 2013 Detroit parcel survey data was aggregated into the 2013 census tracts for lot and structure vacancy. To achieve this, survey data from DDD, and other city-specific datasets (demolitions, foreclosures, crime) were spatially joined and normalized based on count occurrences for parcels, population, and structures, between the years of 2009-2013. Following successive spatial joins for each dataset, U.S. Census American Community Survey (ACS) 2009-2013 data was then normalized and joined to the census tracts for unemployment, poverty, and education attainment. The results produced a final 2013 tract results shapefile which could be analyzed using geospatial quantile mapping. Weights were assigned and applied, in the reverse order of their correlation rank, to produce a weighted field. This field then served as the basis for which a Hot Spot Analysis could be performed to map blight locations using census tracts. The final analysis was achieved using the Getis-Ord_Gi* function in ArcGIS.

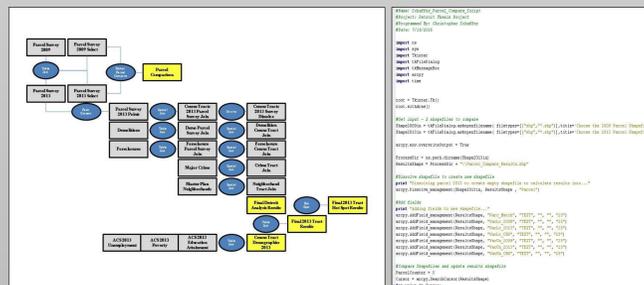


Figure 3. Spatial Model

Figure 4. Python Parcel Compare Script

Timeline

The project idea was developed in December, 2014, with the idea of analyzing Detroit lot vacancy using historical imagery and remote sensing techniques. Initial results, at the neighborhood level, were largely inconclusive due to image quality and availability. As a result, the project was modified in March 2015 to use existing DDD vector survey data from 2009-2013 for analysis. A subsequent literature review, conducted in June 2015, provided me with the idea of analyzing the blight phenomenon through comparative methods.

Throughout the methodology phase, project methods were modified and adjusted to meet existing project deadlines, as appropriate. Developing a schedule with realistic deadlines is a critical planning aspect that ensures project validity and accuracy.

Results

Although rapid change has been detected between 2009-2013, the results fail to acknowledge the reason (Figure 5). To examine the statistical distribution of lot vacancy and each contributing factor, a parallel coordinate plot (Figure 6) was prepared. In addition, individual bi-variate maps were created to represent comparisons from a geographical standpoint (Figures 7-13). Each variable is represented using a 3-class quantile classification that distributes values into an equal number of groups. A representative ranking system for high values was based on the number of census tract occurrences for both lot vacancy, and each variable. The final rankings were: 1. Pop 25+ years, no HS Diploma, 2. Vacant Structures, 3. Demolitions, 4. Pop Below Poverty Level, 5. Foreclosures, 6. Major Crime, and 7. Unemployment. All variables were weighted to determine hot spots for where blight is located, with potential to spread. These results are provided in Figure 14.

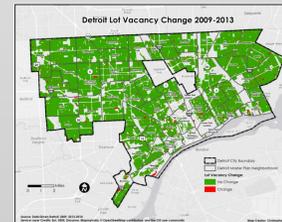


Figure 5. Detroit Lot Vacancy Change 2009-2013

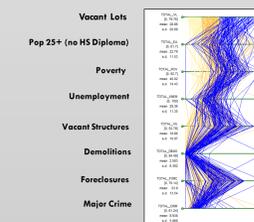


Figure 6. Parallel Coordinate Plot

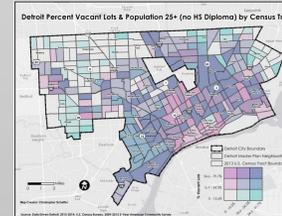


Figure 7. Pop 25+ (no HS Diploma) Bi-Variate Map

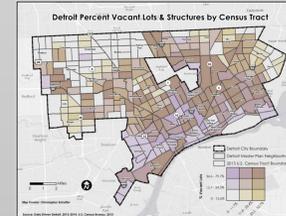


Figure 8. Vacant Structures Bi-Variate Map

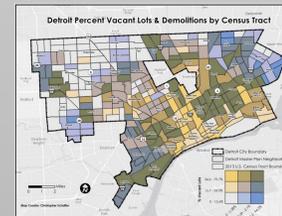


Figure 9. Demolitions Bi-Variate Map

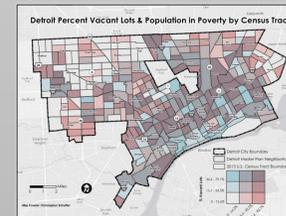


Figure 10. Pop in Poverty Bi-Variate Map

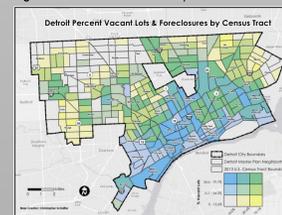


Figure 11. Foreclosures Bi-Variate Map

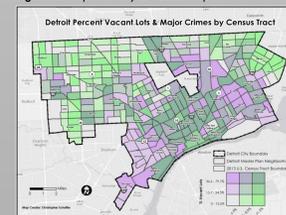


Figure 12. Major Crime Bi-Variate Map

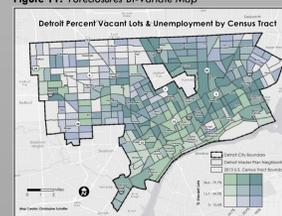


Figure 13. Unemployment Bi-Variate Map

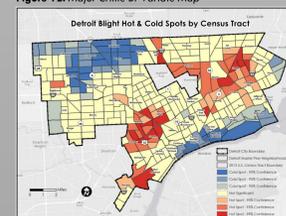


Figure 14. Blight Hot & Cold Spots

Discussion

The overall design of the analysis was based on the premise that factors of urban decline contribute to urban blight and lot vacancy. Although blight can be defined as urban decay or decline, it neglects to provide the general framework for understanding the progression of blight, and the factors that contribute to it. As the Detroit Blight Removal Task Force continues with its initiative to demolish vacant structures, little is being done to analyze causes for remedial action.

The importance of these results stems from the effort to target blight areas for improvement and development, while providing insight into why blight is occurring in particular areas. Depending on the relationship of the variable, more focus could be made to change how these contributions are affecting distinct neighborhoods. Variable findings of education, unemployment, poverty, and crime may lead to more effective policy development, decision making, and enforcement.

Ultimately, city leaders and citizens can use this information to plan efficiently and organize methods for rehabilitation in the form of affordable housing, gardening, commercial development, and parks. However, an analysis is only as precise as the data that was used to generate it. Throughout this project, every effort was made to ensure data accuracy and consistency by choosing the most reliable methods. As with all statistical analysis, there is room for error, especially when survey data has been aggregated and compared with census-level estimates. A follow-up analysis would be helpful in determining the extent to which dataset uncertainty affects the validity of the results of this project.

Conclusion

This project effectively analyzes geospatial and statistical relationships that define blight within the City of Detroit. The results of this project can be utilized by policymakers to make valid decisions in combating blight, and planning rehabilitation efforts. According to this comparative analysis, the population 25+ (no high school diploma) variable has the strongest relationship with lot vacancy, while unemployment has the weakest relationship. Efforts should be concentrated on public school funding to ensure educational success. Additional funding for affordable housing may prove to be a wise investment that negates poverty, while reducing overall blight.

This analysis may be better assessed by combining vacant lot and vacant structure data, and analyzing future demolitions, as opposed to past demolitions. As such, a subsequent analysis may prove to be more accurate in determining blight trends. In addition, school location data may further enhance the analysis because low educational attainment was so closely tied to higher rates of blight.

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