Spatial-Temporal Trends in Foreclosures, 2005-2016: Brooklyn Park, Minnesota

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Brooklyn Park

Resilient Communities Project

University of Minnesota
Driven to Discover℠

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The contents of this report represent the views of the authors, and do not reflect those of RCP, CURA, the Regents of the University of Minnesota, or the City of Brooklyn Park.

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By Jeff Kropelnicki, Owen Murray, and Carter Stone

Introduction:

Since the early 2000's, the City of Brooklyn Park Minnesota has faced and dealt with a housing foreclosure crisis. From 2005 to 2016, 5,426 of the single family homes were foreclosed - approximately 24% of homes in the city. This brings up the question: Where in Brooklyn Park were the foreclosures typically located? When did they happen? To answer this, our paper uses several spatial-temporal analysis techniques - density mapping, hot spot analysis, emerging hot spot analysis, and an analysis of time patterns in foreclosures to identify problem areas. The main objectives of this study are: to assess the overall spatio-temporal trends in foreclosures in the city of Brooklyn Park, to analyze the seasonal trends of foreclosures in the data, and to assess a ripple effect of foreclosed homes or revitalized homes (and the impact that these events may have in terms of future foreclosures).

Methodology:

All of the foreclosure data was exported from ArcGIS as a .CSV file. The .CSV file was then open in Rstudio, Rstudio is an IDE used to write code in the R programing language. R was used to make changes to foreclosure dates to make day, month and year its own column, convert all address data to lowercase so that it matched the parcel data for a join. The main R package used was Dplyr this is used for data cleaning, joins and summarising. R was used to make all tables shown on pages 1-4 and all plots on pages 4 and 5.

Some examples of R code used:
•foreclosures <- read_csv ("/Desktop/GIS5564_Urban_GIS/ Project/ foreclosures..csv")
•parcels <- read_csv("/Desktop/GIS5564_Urban_GIS/Project/parcel.csv")
•parcels <- unite(parcels, FULLADDRESS, BLDG_NUM, STREETNAME, sep = " ", remove = TRUE)
•year <- foreclosures_work %>% group_by(FCLS_YR) %>% summarise(what_year = n()) %>% arrange(FCLS_YR)
•plot(month, type="l", xlab = "month", ylab = "Number of Foreclosures", main = "Total Foreclosures In All Months")

In addition to data management strategies using R, a number of analysis tools were used from the ArcMap toolbox. They are listed below, with some of the settings used for each tool so that the methods in this study can be replicated.

Kernel Density For Foreclosures (repeat for layers of years 2005-2016)
- Input Layers: Points for individual foreclosure years

Kernel Density For Housing Units in city of Brooklyn Park:
- Input Layers: Brooklyn Park Parcel Points (Excluding points that had no residential uses)

Hot Spot Analysis 2005-2008:
- Input Layers: Polygon layer containing 600 ft cells of foreclosure rates for years 2005-2008
- Input Field: Float points of foreclosure rates per cell
- Conceptualization of Spatial Relationships: Fixed Distance Band
- Distance Method: Euclidean Distance
- Apply False Discovery Rate

Hot Spot Analysis 2009-2016:
- Input Layers: Polygon layer containing 600 ft cells of foreclosure rates for years 2009-2016
- Input Field: Float points of foreclosure rates per cell
- Conceptualization of Spatial Relationships: Fixed Distance Band
- Distance Method: Euclidean Distance
- Apply False Discovery Rate

Emerging Hot-Spot Analysis:
- Input: Space time cube using 1312 ft bins, time step of 1 year
- Input Field: Spacetime cube

Background:

Brooklyn Park Homes and Population:

Brooklyn Park has more than twenty two thousand homes and the oldest home in the city was built in 1856. From 1950 to 2015, the city grow by an average of 338 homes per year. The largest boom in housing was in 1978 with 1,202 built in the year, followed closely by the year before 1976 where 911 homes were built. Before 1985 most of the homes were built south of 85 Avenue North. The construction of homes north of this avenue was prominent after the 1990s. Before the year 1990 there were approximately 14,300 homes in the city. Comparing data obtained through Hennepin County of the construction year of homes to each home to the foreclosure records shows that 3,719 of the 5,462 foreclosures were homes built before 1990, 69% of the total. Homes built in the peak construction year of 1978 also had the most foreclosures with 351 of 1,202 homes foreclosing. The average age of a home that had a foreclosure between 2005 and 2016 was 28.81 years old. Looking at newer homes, homes built in 2005 had the highest with 169 followed closely by homes built in 2004, with 140.

	YEAR_BUILT	Number_of_Homes_built
1	1940	27
2	1941	6
3	1942	4
4	1943	1
5	1944	5
6	1945	15
7	1946	29
8	1947	21
9	1948	39
10	1949	21
11	1950	137
12	1951	52
13	1952	47
14	1953	52
15	1954	116
16	1955	173
17	1956	209
18	1957	242
19	1958	524
20	1959	135
21	1960	224
22	1961	92
23	1962	305
24	1963	237
25	1964	198
26	1965	266

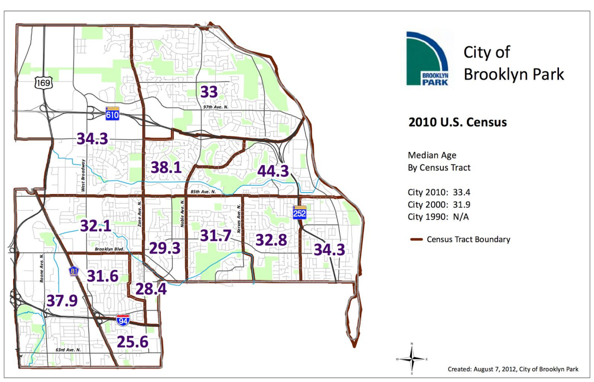
	YEAR_BUILT	Number_of_Homes_built
1	1966	189
2	1967	192
3	1968	318
4	1969	301
5	1970	154
6	1971	218
7	1972	401
8	1973	518
9	1974	395
10	1975	390
11	1976	554
12	1977	918
13	1978	1209
14	1979	613
15	1980	392
16	1981	487
17	1982	654
18	1983	723
19	1984	700
20	1985	473
21	1986	654
22	1987	450
23	1988	483
24	1989	310
25	1990	304
26	1991	247

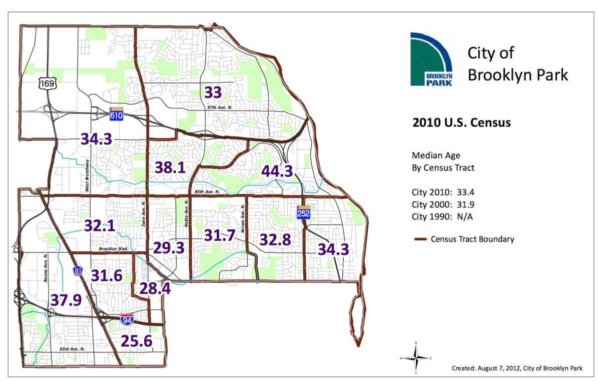
	YEAR_BUILT	Number_of_Homes_built
1	1992	282
2	1993	383
3	1994	465
4	1995	469
5	1996	538
6	1997	470
7	1998	410
8	1999	471
9	2000	368
10	2001	263
11	2002	239
12	2003	410
13	2004	609
14	2005	515
15	2006	453
16	2007	243
17	2008	124
18	2009	168
19	2010	71
20	2011	76
21	2012	137
22	2013	158
23	2014	151
24	2015	151
25	2016	2

	YEAR_BUILT	Number_of_Foreclosures
1	1968	79
2	1969	75
3	1970	37
4	1971	57
5	1972	142
6	1973	278
7	1974	108
8	1975	80
9	1976	152
10	1977	246
11	1978	351
12	1979	169
13	1980	102
14	1981	136
15	1982	207
16	1983	206
17	1984	175
18	1985	106
19	1986	111
20	1987	51
21	1988	117
22	1989	44

	YEAR_BUILT	Number_of_Foreclosures
1	1990	52
2	1991	31
3	1992	25
4	1993	38
5	1994	65
6	1995	74
7	1996	73
8	1997	50
9	1998	37
10	1999	63
11	2000	50
12	2001	35
13	2002	34
14	2003	72
15	2004	140
16	2005	169
17	2006	90
18	2007	49
19	2008	14
20	2009	7
21	2010	1
22	2012	1

There is a clear line in Brooklyn Park north and south of 85 Avenue North. Looking at Brooklyn Park's 2010 U.S. Census Demographic Report, there are some differences across this boundary line. Median household income in the four census tracts north of 85th Avenue North are all over $85,000 a year and the median age is over 33 years old. If we compare that to the density maps below it is clear the the homes north of 85th Avenue North were hit with less foreclosures. But median household income and age do not paint a clear picture either, as the three hardest hit areas are in neighborhoods where the median household income was over $50,000 and the median age of the home near 32 years old. The data suggests that older homes south of 85 Avenue North were most at risk.





A quick look at what type of home was hit with foreclosure may provide some insight into foreclosure trends. The Hennepin County parcel data gives the type of home for 4,896 of the

5,426 foreclosures. To see how it is broken down refer to table below. The largest number of foreclosures are listed with the attribute Residential with a total of 3,433 foreclosed, followed by Townhouses with 800, followed by Condominiums with 401 foreclosures.

	Home_Type	count
1	Residential	3433
2	Townhouse	800
3	Condominium	401
4	Residential-Zero Lot Line-DB	129
5	Double Bungalow	94
6	Disabled	19
7	Apartment	8
8	Residential Lakeshore	6
9	Disabled Joint Tenancy	2
10	Vacant Land - Residential	2
11	Resd'l Misc & Bed & Breakfast	1
12	Triplex	1
13	Total	4896

Foreclosure and time:

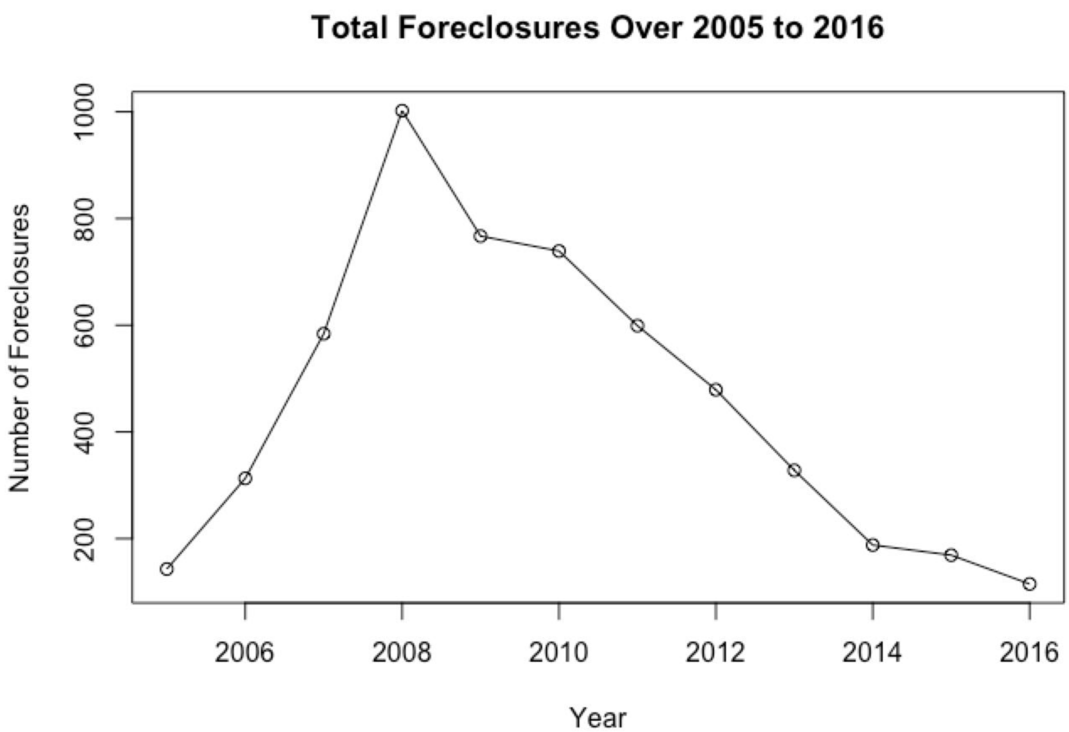
Beginning in 2005, there were 143 foreclosure in the city and at the peak in 2008 there were 1,002, that is 18% of all the foreclosures in one year. Below are graphs showing the number of foreclosures by year, month and day, along with a graph showing the range for each year. These graphs can help to understand if there were any patterns in foreclosures by season. When looking at the Total Foreclosures in All Months, foreclosures peak in May, stay high through July and then decrease. The month of May had the most foreclosures over the 11 year period with 505, second was July with 487 and third was June with 472. This can be seen in the tables below.

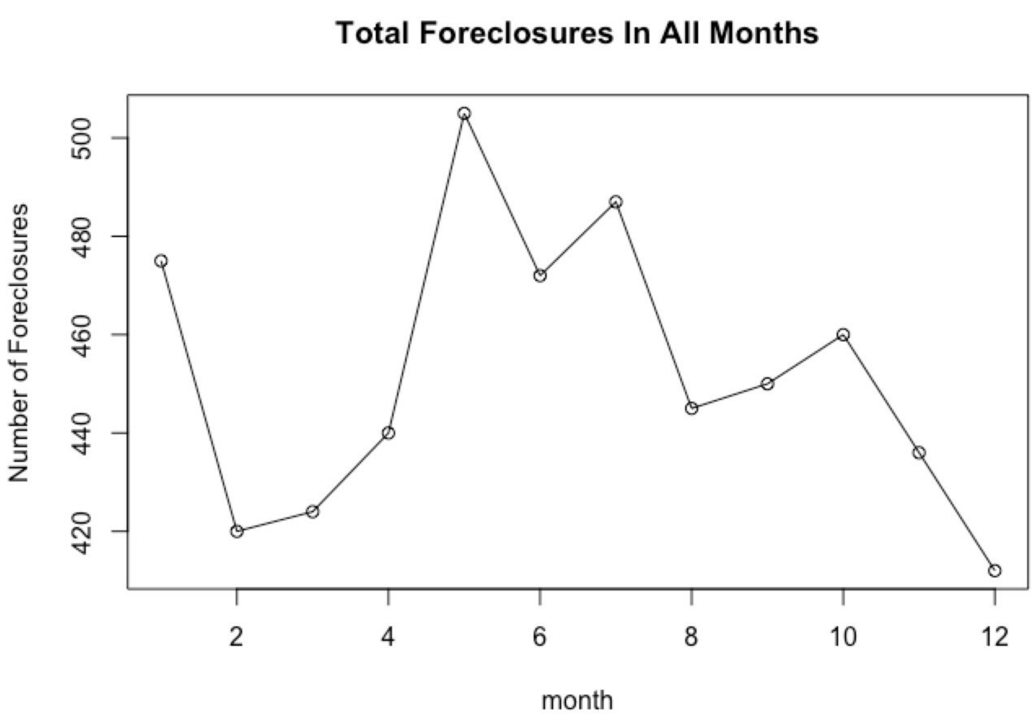
	Year	Foreclosure
1	2005	143
2	2006	313
3	2007	584
4	2008	1002
5	2009	767
6	2010	739
7	2011	599
8	2012	479
9	2013	328
10	2014	188
11	2015	169
12	2016	115

	Month	Foreclosure
1	01	475
2	02	420
3	03	424
4	04	440
5	05	505
6	06	472
7	07	487
8	08	445
9	09	450
10	10	460
11	11	436
12	12	412

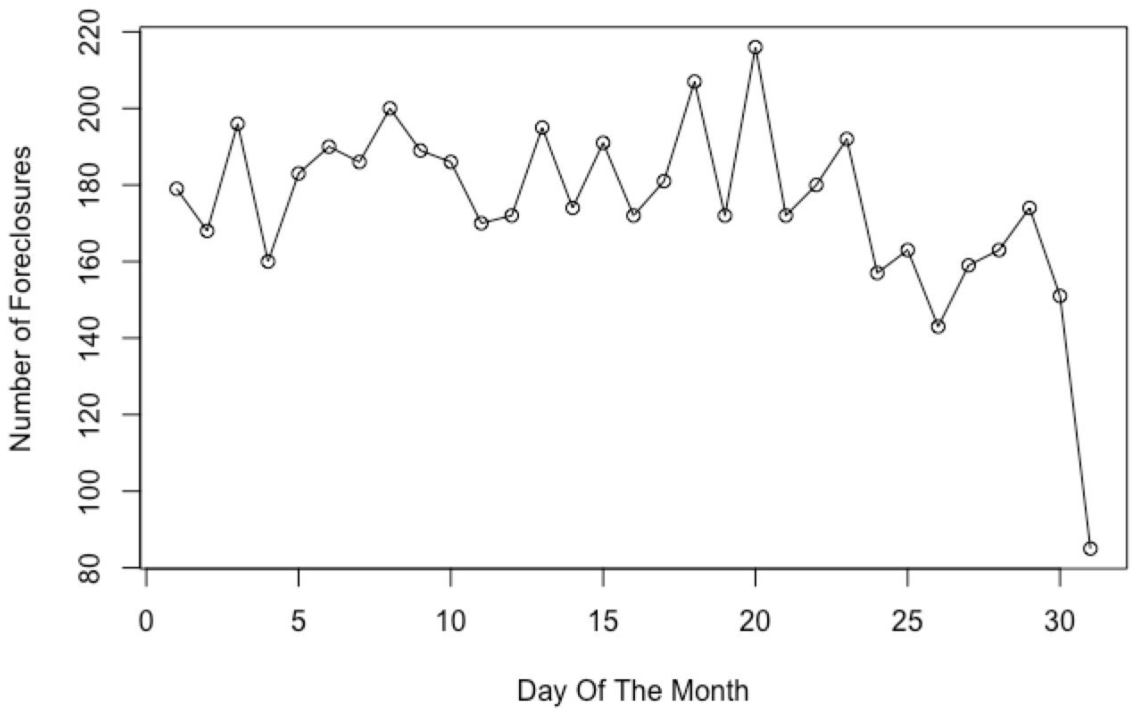
	Day_of_Month	Foreclosure
1	01	179
2	02	168
3	03	196
4	04	160
5	05	183
6	06	190
7	07	186
8	08	200
9	09	189
10	10	186
11	11	170
12	12	172
13	13	195
14	14	174
15	15	191

	Day_of_Month	Foreclosure
1	16	172
2	17	181
3	18	207
4	19	172
5	20	216
6	21	172
7	22	180
8	23	192
9	24	157
10	25	163
11	26	143
12	27	159
13	28	163
14	29	174
15	30	151
16	31	85

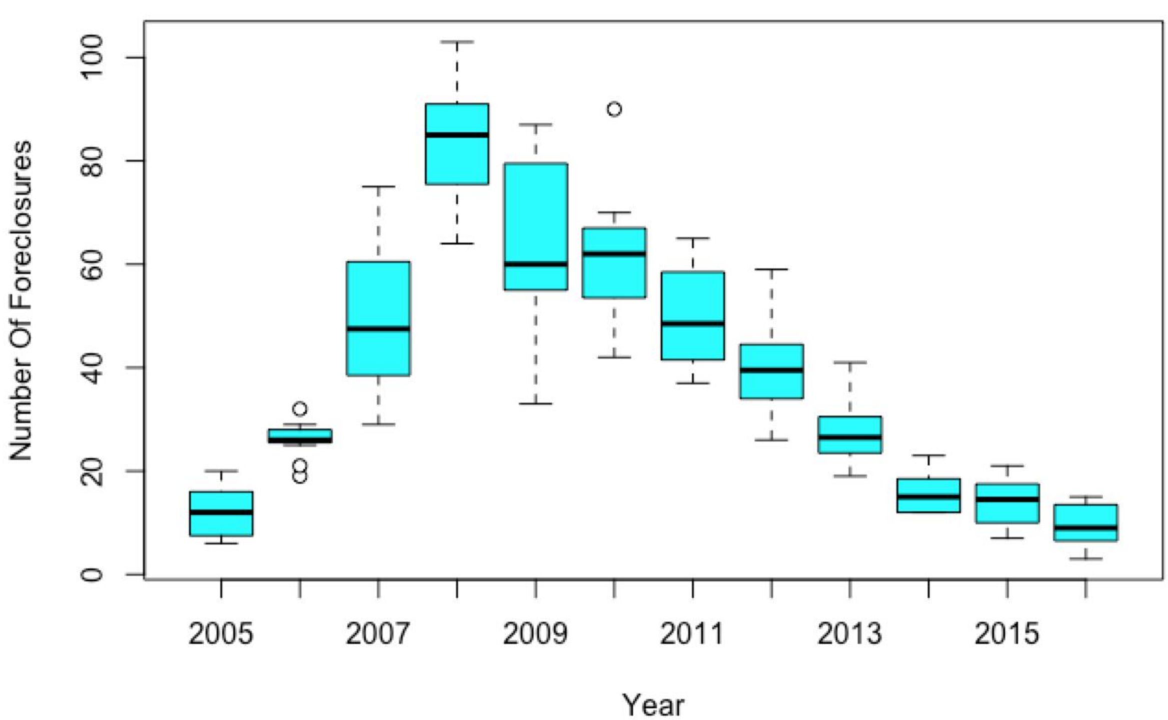

Total Foreclosures Over 2005 to 2016
Number of Foreclosures
200
400
600
800
1000
2006
2008
2010
2012
2014
2016
Year


Total Foreclosures In All Months
Number of Foreclosures
420
440
460
480
500
2
4
6
8
10
12
month

Total On Each Day Of The Month



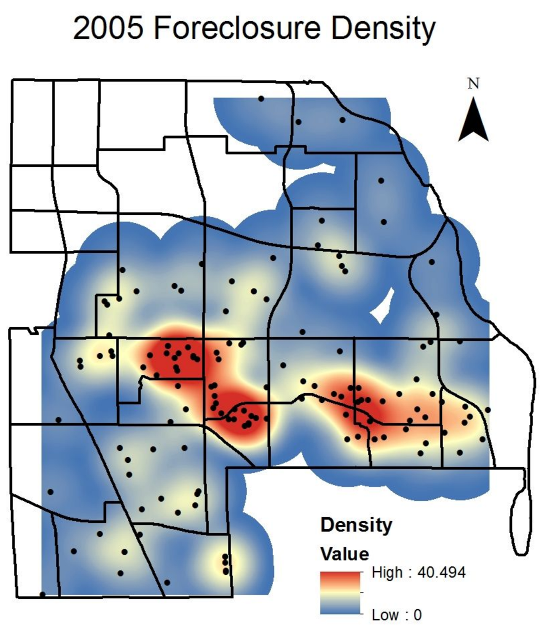
Number Of Foreclosures Per Month By Year

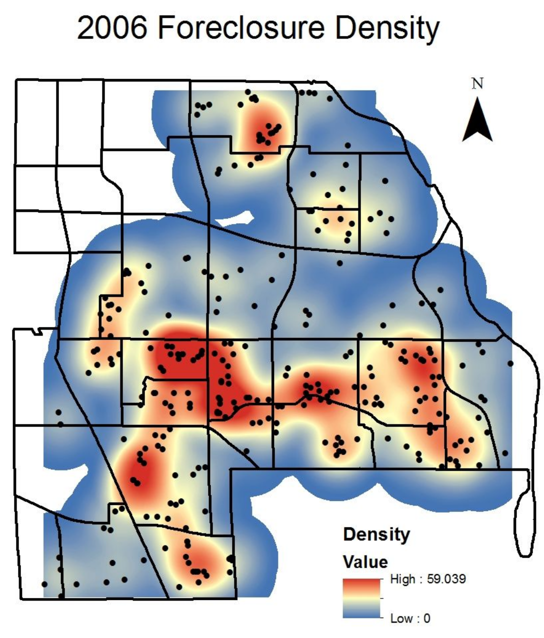


Analysis Results:

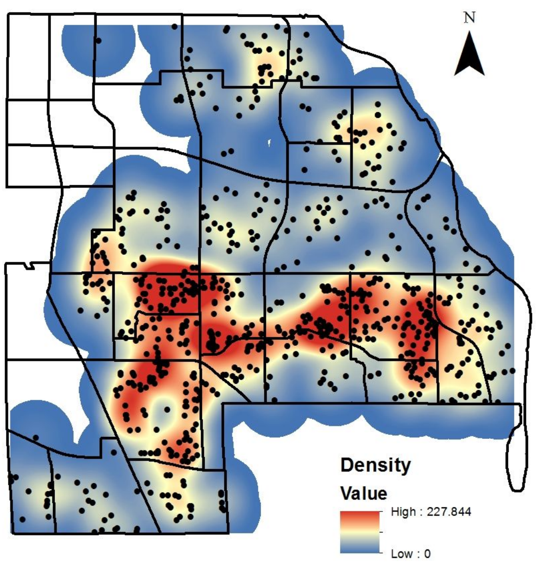
Kernel Density:

It is also helpful to understand what types of homes suffered and how time affected foreclosures. Below are density maps for each years from 2005 to 2016 created in ArcMap. These maps use kernel density, a tool that calculates a magnitude-per-unit area from point features using a kernel function to fit a smoothly tapered surface to each point. It tests how close together points are based on the mean distance. The areas in red show where the most foreclosures occurred closest together.

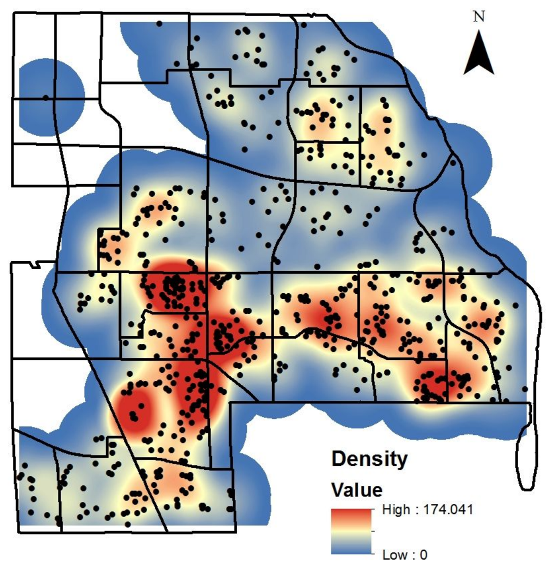




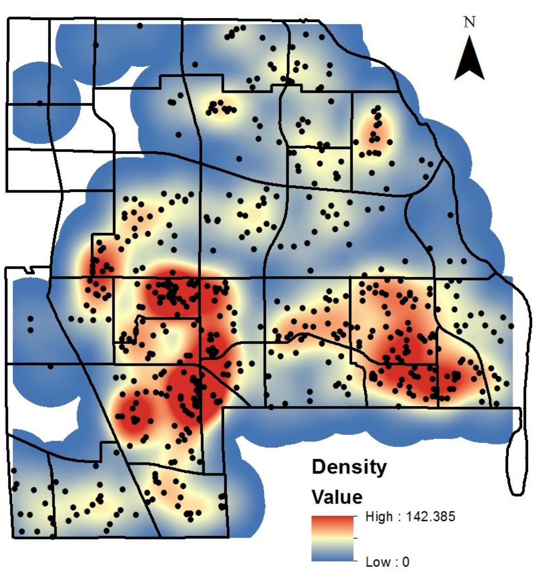
2009 Foreclosure Density



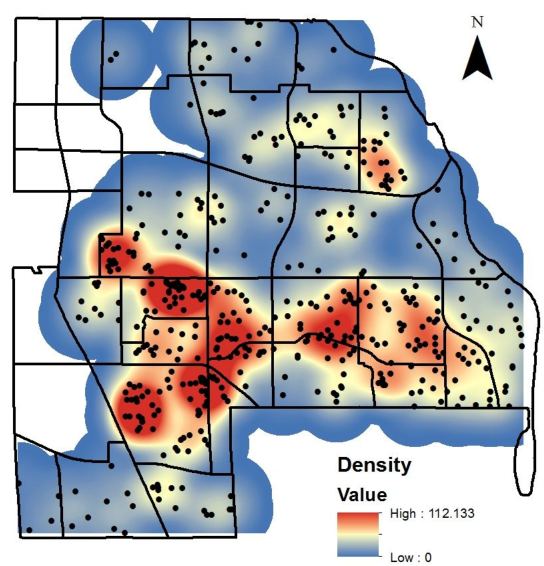
2010 Foreclosure Density



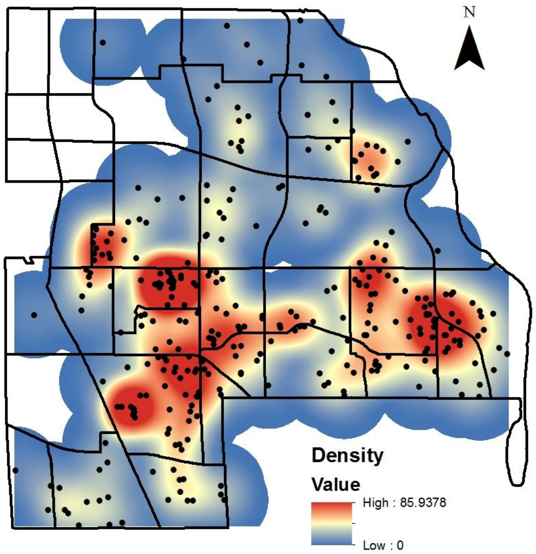
2011 Foreclosure Density



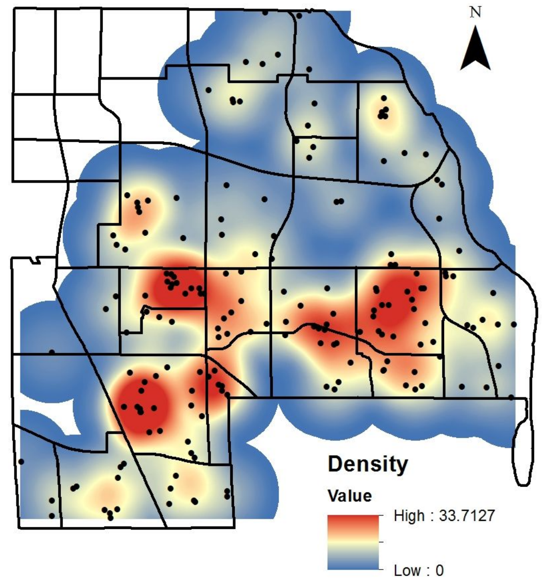
2012 Foreclosure Density



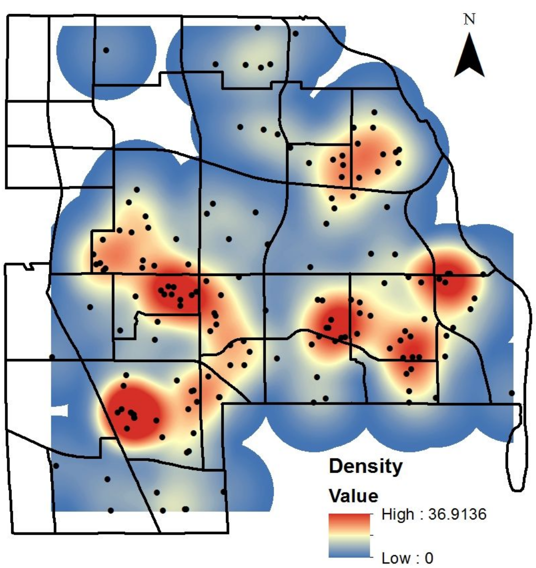
2013 Foreclosure Density



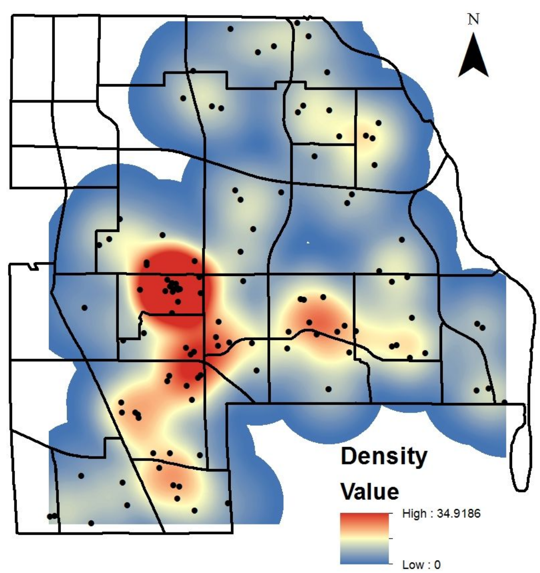
2014 Foreclosure Density

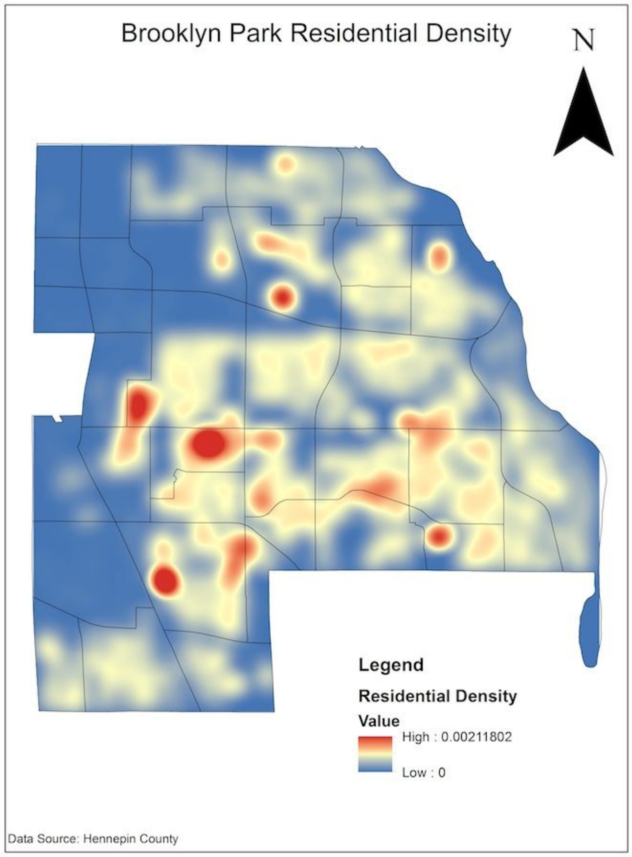


2015 Foreclosure Density



2016 Foreclosure Density





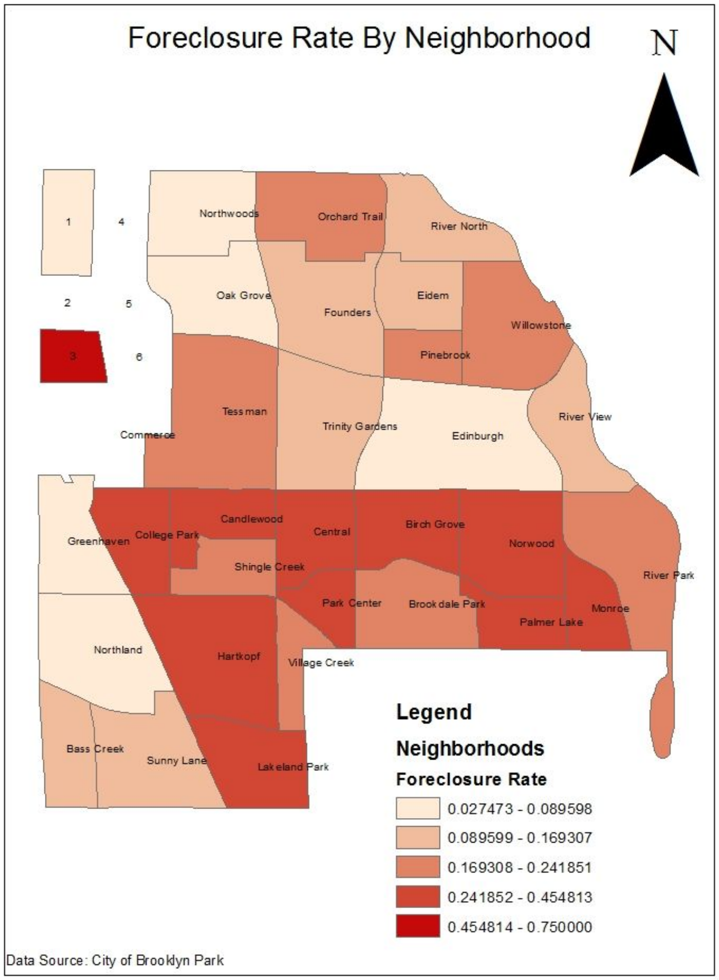
Looking at the data for number of foreclosures per year and looking at the density maps it is clear that 2007 to 2011 were the worst years all having over 500 foreclosures here we can see how foreclosure density spreads and moves across the lower end of Brooklyn Park south of 85 Avenue North. The most dense areas of foreclosures are in the older neighborhood discussed above.

Across varying types of analyses using various methods, it is clear that there are spatial trends in foreclosures South of and North of 85th Avenue North. For example, the kernel density maps for each year in the 2005-2016 period indicate that the area south of this dividing line always shows more density in foreclosures. A kernel density map of units throughout the city does in fact exhibit greater density in housing in this area. Given that the kernel density map of units throughout the entire city tends to show more pockets of intense density in units below 85th Avenue North, the fact that the kernel density maps for foreclosures in each year show these trends might suggest that the foreclosure density occurs more intensely in areas where housing density also occurs.

This may be partly true, however, it does not entirely explain patterns seen in a map below displaying the foreclosure rate for the 2005-2016 period (number of foreclosures per number of units) This map has the potential to account for confounding variables in neighborhoods related to housing density. neighborhood exhibits higher foreclosure rates below 85th Avenue North.This map of foreclosure rates has the potential to account for confounding variables in neighborhoods related to housing density. For example, the area where the

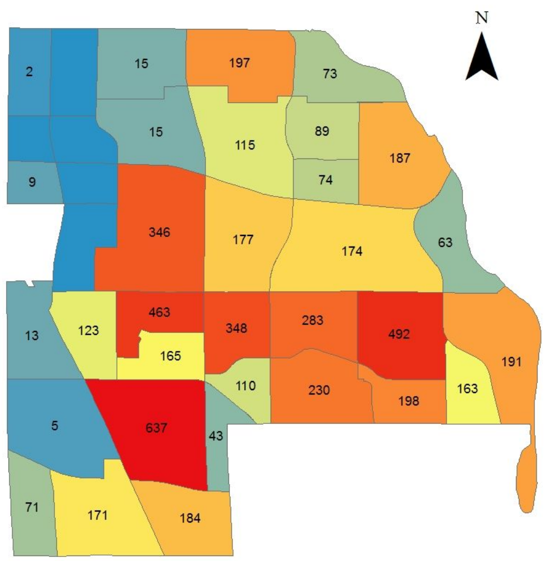
Edinburgh neighborhood is located shows low density in foreclosures as does the map displaying kernel density for housing in the city overall. Edinburgh shows one of the lowest foreclosure rates with a rate of .09. It also consistently shows low density in foreclosures. It is known that a large part of the Edinburgh neighborhood is a golf course. However, we are able to account for such a factor with a foreclosure rate map, which would suggest that although Edinburgh has a lower density of housing, this may not be a big factor in the fact that it consistently has low foreclosure rates.

Comparing the foreclosure rate map to the kernel density maps of foreclosures, the three neighborhoods with the highest ratio of foreclosures (excluding neighborhood “3” which has a foreclosure rate of .75), Candlewood, Central and Hartkopf exhibit foreclosure rates of .45, .39, and .33 respectively. In addition to the three neighborhoods with the highest foreclosure rates being in this area, the foreclosure rate map also shows a clear cut line that runs along the 85th Avenue North, with neighborhoods with higher foreclosure rates in dark south of the line, and neighborhoods with lower foreclosure rates north of the line. Overall trends in density seem to be progressively less intense after the year 2008 leading up to 2016.

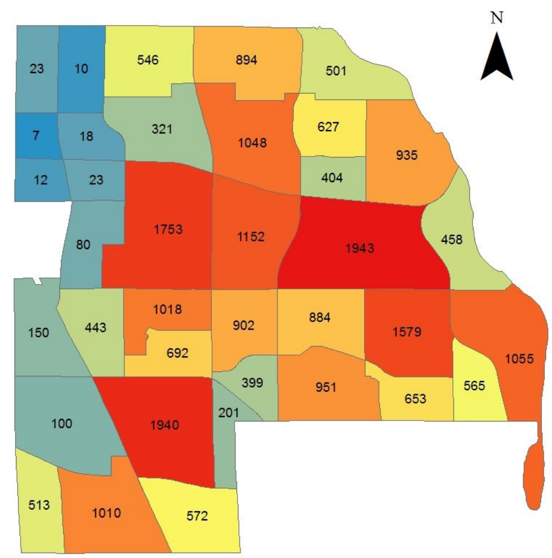


A closer look at some of the neighborhoods hardest hit and how many foreclosures happened per neighborhood may also help when analyzing this data. Below is a map showing the number of parcels in each neighborhood and the number of homes that had a foreclosure between 2005 and 2016.

Number Of Foreclosures Per Neighborhood

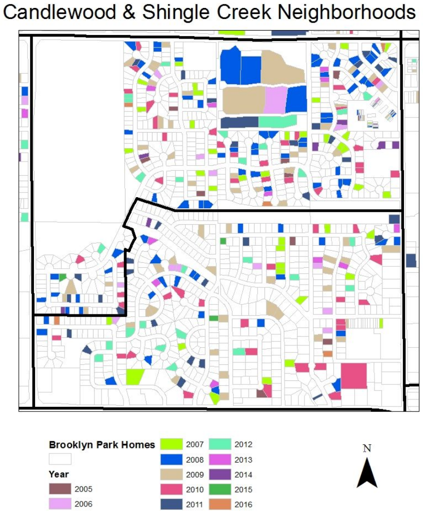


Number Of Parcels In Each Neighborhood

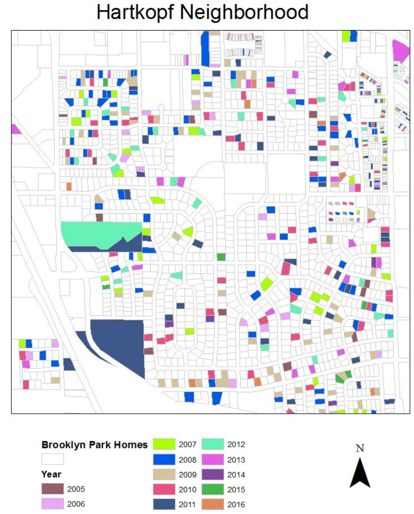


Looking at the map showing the number of parcels the three north of 85th Avenue North are the second, third and fifth largest neighborhoods in the city but the number of foreclosures that happened in these neighborhoods are low. Seeing what neighborhoods look like gives a good idea of what homes were foreclosed on, and just how bad it was. Below are the neighborhoods that were hit the hardest. The maps show every home that went through a foreclosure.

Foreclosures Years 2005 To 2016
Candlewood & Shingle Creek Neighborhoods

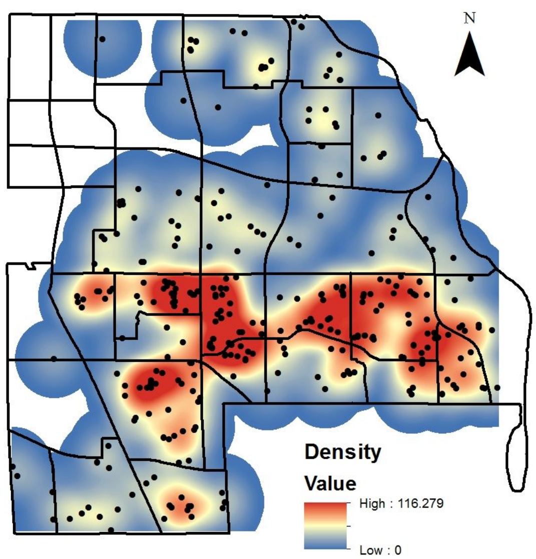


Foreclosures Years 2005 To 2016
Hartkopf Neighborhood



It may also be relevant to look at addresses that had more than one foreclosure. There were 293 homes that had more than one foreclosure from 2005 to 2016. Twelve of them had three and the rest were two. Below is a density map that shows where these 293 homes are.

Homes With More Than One Forelocure

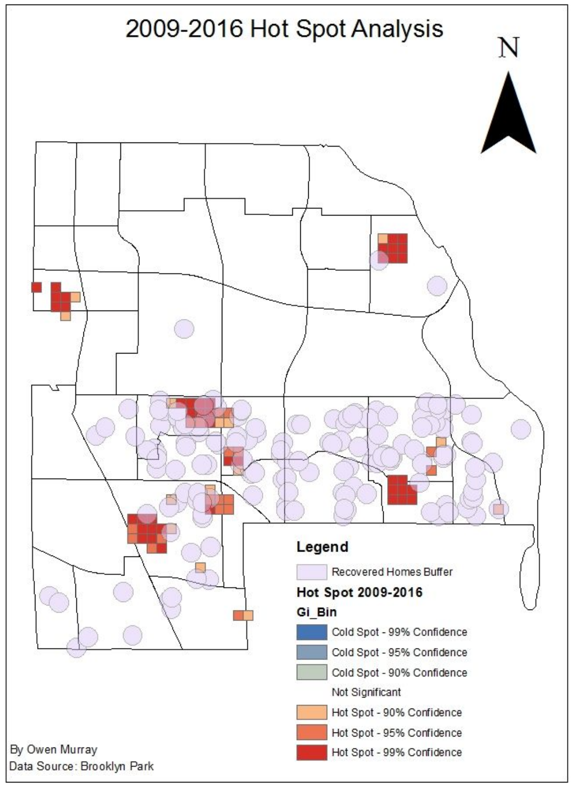


The density map displaying homes foreclosing more than once shows a higher density of homes foreclosing more than once south of 85th Avenue North. These trends seem to line up with other maps of kernel density of foreclosures for the 2005-2016 period, as well as the trends in foreclosure rate per neighborhood. In fact, the foreclosure rate map and the map showing foreclosure density of multiple foreclosures seem to correspond in the intensity of their values. For example, where the foreclosure density for multiple foreclosures map shows a lower intensity in the Shingle Creek neighborhood, so is the foreclosure rate value for Shingle Creek. The same holds true for the Brookdale park neighborhood. Additionally, in neighborhoods such as Central and Park Center where the density map of multiple foreclosures shows higher intensity, the foreclosure rates for these neighborhoods are also high. This apparent correspondence between high and low density of multiple foreclosures and high and low foreclosure rates, and the fact that the multiple foreclosure density occurs almost exclusively south of 85th Avenue North, indicate that there must be some factor causing multiple foreclosures in this area. Because foreclosure rate by neighborhood is able to account somewhat for density factors, a visually identical correspondence between the foreclosure rate neighborhood map and the density of multiple foreclosures map suggests that a main factor in more than one foreclosure occurring for a single address is that address being below 85th Avenue North, and being in certain neighborhoods (as opposed to others) in this area of the city.

Hot Spot-Analysis (Getis-Ord Gi*)

A Hot Spot- Analysis, also known as a Getis-Ord Gi*, was performed with the intention of analyzing spatial clustering patterns for foreclosures before and after 2009, a year in which the city of Brooklyn Park began an initiative to recover foreclosed homes. Said homes were purchased by the city of Brooklyn Park, revitalized and recovered, and then resold. A Hot Spot-Analysis of different time periods of foreclosures may provide some information on the efficacy of such initiatives. In the two hot spot maps shown below, the features evaluated by the Getis-Ord Gi* statistic are cells of foreclosure rates over 600 square feet. This float value was obtained by dividing the number of foreclosures that occurred in each 600 square ft area by the total housing in the area. The Getis-Ord Gi* statistic assesses each cell containing a value for foreclosure rate in comparison to the values of neighboring cells. A cell is considered statistically significant if its values and the values surrounding it have clustering of either high or low values that would not be the cause of chance in a normal distribution. The Gi-Bin value in in the legend of the maps shows the confidence level for the 600 ft area cell to be a statistically significant hot spot or cold spot. A hot-spot would indicate spatial clustering of high values, and a cold spot spatial clustering of low values. The data produced by this study as an input for these hot spot analyses is controlled for biases in a few ways. First of all, the input is a layer of polygon features containing the foreclosure rate (foreclosed homes per number of homes) for an area of 600 feet, ruling out some clusters that would be considered hot spots more due to density in housing that being areas of actual statistical significance in foreclosures or non-foreclosures. In addition, the tool setting “False Discovery Rate” was applied, so as to control for spatial biases that come up when running statistics on geospatial data.

The two maps Hot Spot Analysis 2005-2008 and Hot-Spot Analysis 2009-2016 are overlain with buffered points. The points were buffered by a distance of 600 feet and indicate addresses that were recovered and resold by the city beginning in 2009. The points in the hot spot analysis for 2005-2008 indicate the foreclosed home before it was purchased by the city, and the same points in the 2009-2016 map indicate the location of homes after they were revitalized and in some cases, resold.



While the results of a Hot-Spot Analysis overlaid with buffered points of revitalized homes it is by no means a sound quantifiable measure of the ability of revitalized homes to decrease foreclosures in the surrounding area in the city, visual comparison of the 2005-2008 Hot Spot map and the 2009-2016 Hot Spot map would suggest interesting patterns with relation to where homes were revitalized and where high statistical significance cells indicating clusters of high foreclosure rate values per 600 feet occur in both time periods before and after revitalized homes began to be sold and occupied.

Visually there seems to be an overall decrease of statistically significant hot spots after the year 2009 in some areas of the city. Hot Spot cells appear to decrease most notably in the Norwood, Monroe and River Park neighborhoods. The foreclosure density in the River Park for years 2005-2016 was lower than the average rate of .22, however the Monroe and Norwood neighborhoods ranked above this average in foreclosure rate with an average of .29 and .31, respectively. These three neighborhoods combined shared nearly one-third of recovered homes. Palmer Lake, on the other hand, has a higher than average foreclosure rate of .30 and visually shows an increase in hot spot cells with high confidence levels in the 2009-2016 Hot Spot analysis. Interestingly enough this nearly 1800 square foot area of hot spot cells just barely intersects the 600 ft buffer of a revitalized home. With this exception, no other revitalized home is within at least 600 feet of these hot spots appearing after 2009.

However, this is not a viable way to affirm the success of revitalization initiatives with respect to a decrease in foreclosure. For example, the Hartkopf and Candlewood neighborhoods, which contained the third and second highest amount of revitalized homes, visually seem to show both lower and higher clusters of high confidence hot spots after the year 2009. In addition, the Willowstone neighborhood North of 85th Avenue North, in which 2 homes were revitalized, and which had a below average foreclosure rate, shows the appearance of a nearly 1800 square foot area of high confidence hot spots after 2009, whereas before 2009, there were no hot spots indicated for this neighborhood. Density maps also show a trend towards lower density in foreclosures leading up to 2016. How much of this decrease in foreclosures is due to initiatives taken on by the City of Brooklyn Park is not necessarily quantifiable by our methods.

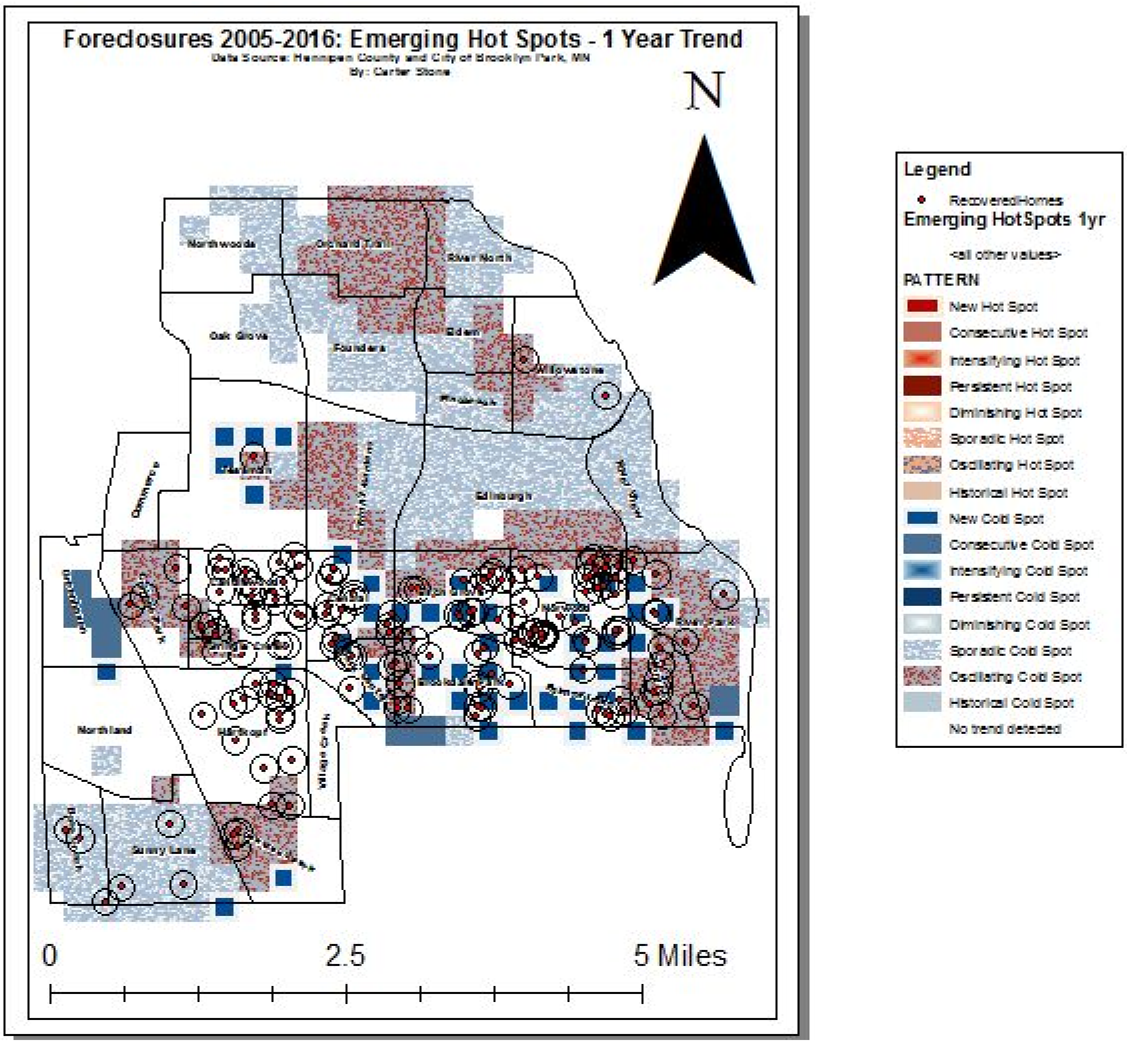
In addition to analyzing trends in the 2005-2008 and 2009-2016 Hot Spot Analysis Maps and how they coincide with spatial clusters of revitalized homes, also useful may be a comparison between the proportion of revitalized homes per neighborhoods and how these compare to the 2005-2016 Emerging Hot Spots 1 - Year Trends map. Nearly half of the revitalized homes were distributed amongst the Central, Park Center, Birch Grove, Palmer Lake, Norwood and River Park neighborhoods. These neighborhoods are all clustered together and share boundary lines below 85th Avenue North. In addition, the 2005-2016 Emerging Hot Spots 1 - Year Trends map displays a very dense concentration compared to the rest of the city of emerging cold spots. The emerging cold spots each cover a cell area of 1312 feet. An emerging cold spot in this specific map indicates a yearly trend in the emergence of clustered low values of foreclosures. In other words, taking into account statistical patterns over space and foreclosures in the 2005-2016 period, a yearly trend is an emergence of areas with low clusters in the number of foreclosures that would not occur in normal distribution due to chance.

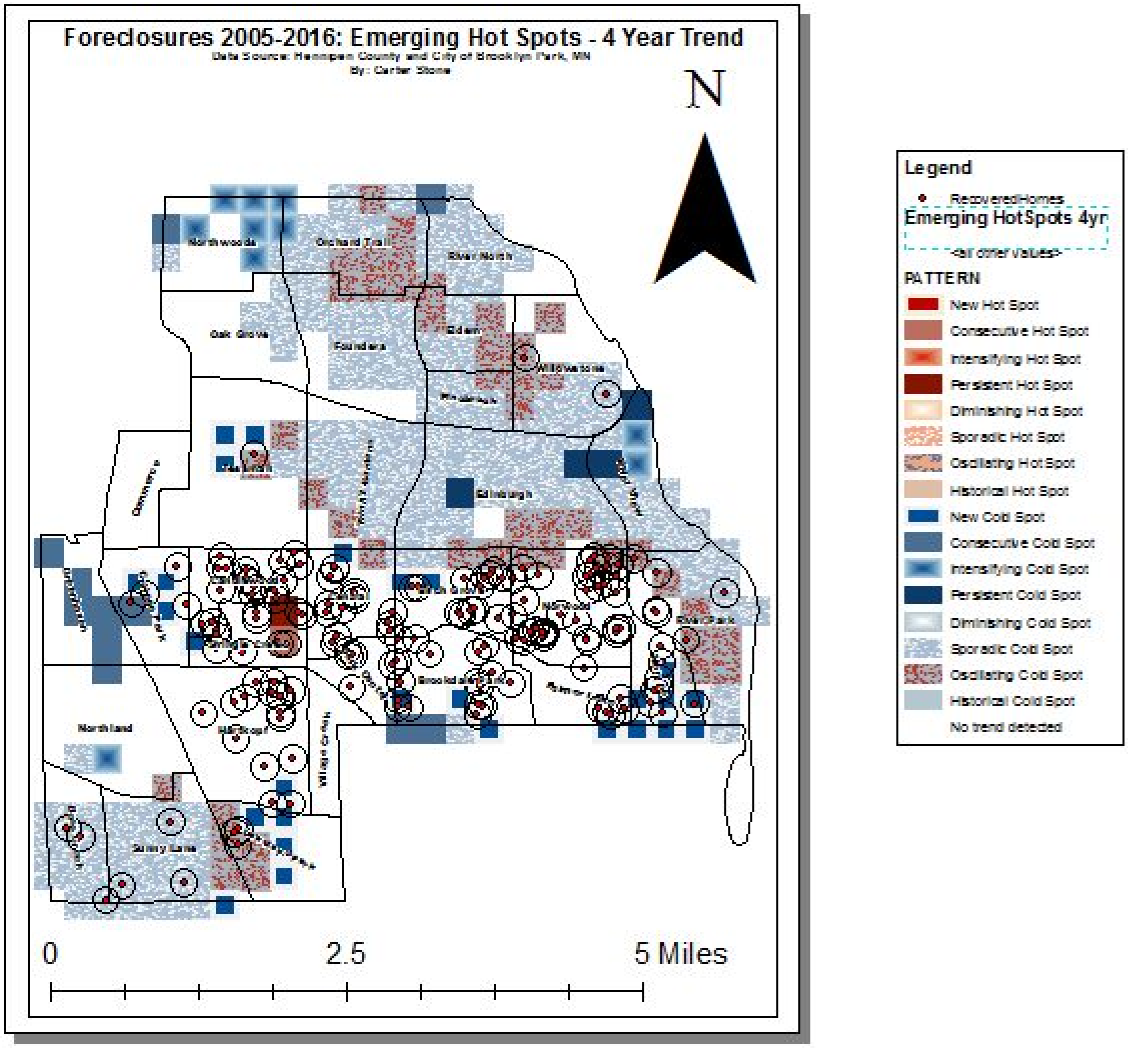
Emerging Hot Spots:

In order to further analyze possible spatial-temporal trends in clusterings of foreclosures, we used Emerging Hot Spot Analysis for foreclosures in the 2006-2015 period. We made maps for the entire time step, and then maps for specific time steps. Each of these allow for slightly different (but overall similar) conclusions to be made about *where* foreclosures happened and *when* they happened the most. These maps can be seen below. The Emerging Hot Spot Analysis tool works similar to the Hot Spot Analysis tool in ArcMap, evaluating spaces in the layer with p and z statistics for clusters of high and low values. Lower p-values would indicate that these trends are not due to chance. The Emerging Hot Spot Analysis tool does work slightly different in that does not provide different confidence intervals for each output feature and in that it is able to consider time variables alongside spatial clustering patterns. As such, the tool is useful in drawing conclusions about the ripple impact of revitalized homes over both space and time, as the tool considers time variables in spatial clustering by using the Mann-Kendall trend test, which groups incident points together over space and time and then evaluates trends in these groupings. The Mann-Kendall statistic allows the output of the tool to produce somewhat more descriptive results in trends in the data. For example, in the case of measuring a reduction in hot-spot clusters of foreclosures after the implementation of the revitalization of homes, an output of a New Cold Spot would indicate a new trend in clustering of low values of foreclosures over space and time, potentially pointing at areas in the city where the revitalization of homes may have succeeded. A New Hot Spot as an output, would indicate the opposite. We excluded all foreclosure points from neighborhoods “3” and “1” before running the Emerging Hot-Spots tool, which would inevitably skew the data and results.

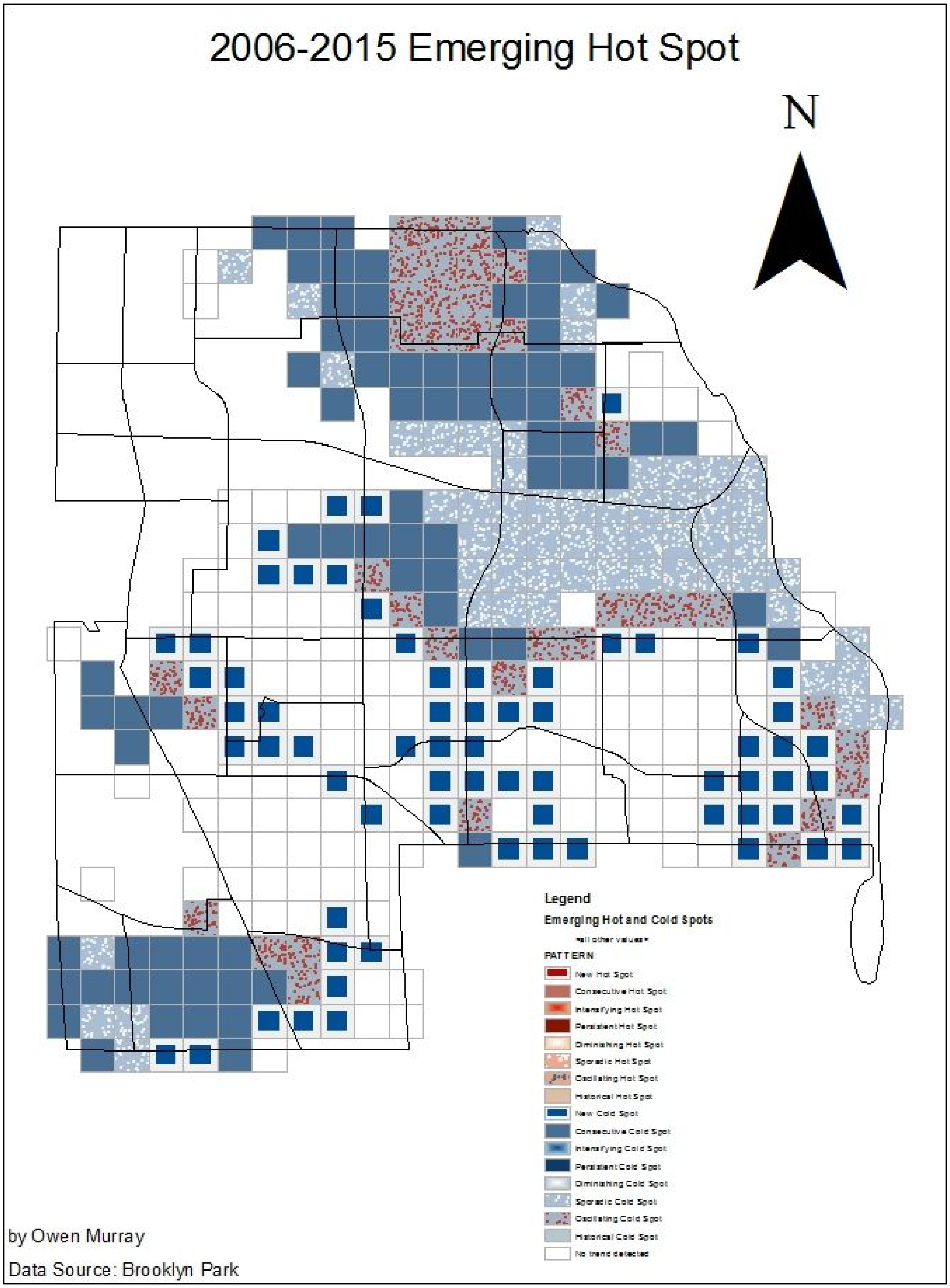
One conclusion that is most obvious to draw about the Emerging Hot Spot Analysis is that most of the new cold spots appear below the 85th Avenue North line, an area where foreclosure density was high, and an area which concentrated the neighborhoods with the highest rates of foreclosures. Similarly, only 3 of the recovered homes are located above the 85th Avenue North boundary. Furthermore, the majority of the output data from the Emerging Hot Spot Analysis that appear below the 85th Avenue North line are new cold spots. Additionally, a of the few new cold spots that do appear in neighborhoods above this avenue seem to coincide with areas where the three revitalized homes are located.

A more detailed analysis of the maps show that south of 85th Avenue North - Brookdale Park, the neighborhood tied for having the second largest number of revitalized homes also seems to show a high number of new cold spots. However, for almost the entire neighborhood with the highest number of revitalized homes, Norwood, the Emerging Hot Spot analysis produced no data values. Thus, when drawing conclusions about this map and what it tells us about a ripple impact of decreased foreclosures around revitalized homes, it is important to remember that this type of an analysis can not necessarily quantify the impact of initiatives like the revitalization of homes. In addition, it should also be noted that the emerging hot spot analysis must take as an input at least a 10-year period of data, meaning that it considers these the yearly trend according to the data for ten years. If the tool allowed, better results might be obtained by looking at trends for, say, the 2007-2011 period, looking at two years of data before and after revitalized homes began to be occupied.


Foreclosures 2005-2016: Emerging Hot Spots - 1 Year Trend
Data Source: Hennepin County and City of Brooklyn Park, MN
By: Carter Stone
N
Northwoods
Orchard Trail
River North
Oak Grove
Founders
Edinburgh
Northland
0
2.5
5 Miles
Legend
RecoveredHomes
Emerging HotSpots 1yr
<all other values>
PATTERN
New Hot Spot
Consecutive Hot Spot
Intensifying Hot Spot
Persistent Hot Spot
Diminishing Hot Spot
Sporadic Hot Spot
Oscillating Hot Spot
Historical Hot Spot
New Cold Spot
Consecutive Cold Spot
Intensifying Cold Spot
Persistent Cold Spot
Diminishing Cold Spot
Sporadic Cold Spot
Oscillating Cold Spot
Historical Cold Spot
No trend detected



With these two maps, Arc is comparing each bin of 1312 feet and 1 year time step intervals with a neighborhood time step of 1 and 4 respectively. This gives us the two resulting emerging hot-spot maps, which show hot spot emergence trends among periods of 2 years (for 6 total "steps", 1 year plus the year before is used for analysis) and 8 years (for 3 total "steps", 4 years plus the previous 4). The recovered homes are overlain over the emerging hot-spot analysis. What it shows is that many of the recovered homes exist in areas that are cold spots. This tells us that in general, the clustering trend for the block containing the recovered homes are generally *decreasing*. We can make this assumption because of the


2006-2015 Emerging Hot Spot
N
Legend
Emerging Hot and Cold Spots
PATTERN
New Hot Spot
Consecutive Hot Spot
Intensifying Hot Spot
Persistent Hot Spot
Diminishing Hot Spot
Sporadic Hot Spot
Oscillating Hot Spot
Historical Hot Spot
New Cold Spot
Consecutive Cold Spot
Intensifying Cold Spot
Persistent Cold Spot
Diminishing Cold Spot
Sporadic Cold Spot
Oscillating Cold Spot
Historical Cold Spot
No trend detected
by Owen Murray
Data Source: Brooklyn Park

Conclusion:

There are a few conclusions that can be drawn from our analysis, specifically as it pertains to our objective of assessing overall spatio-temporal trends in the city of Brooklyn Park, assessing a ripple effect of foreclosed homes or revitalized homes, and analyzing seasonal trends in the data.

To begin, kernel density analyses established that overall trends in foreclosures show intensified density in many areas leading up to and after the year 2008, and an overall decrease in foreclosure density after this year until 2016. Density in foreclosures is more common in neighborhoods south of 85th North Avenue. We can also conclude that while densities in foreclosure do somewhat reflect the overall density in units throughout the city, maps showing foreclosure rates by neighborhood (number of foreclosure per number of housing units by neighborhood) suggest that the neighborhoods south of 85th North Avenue exhibit higher foreclosure rates for the 2005-2016 period. In addition, density maps of homes that foreclosed more than once show also strong density below the 85th avenue north line, with density almost exclusively appearing in this part of the city. There is an overall decrease in foreclosures per year after 2009, with an average of 510.5 per year in the 2005-2008 period and an average of 423 foreclosures per year in the 2009-2016 period

In terms of analyzing the ripple impact of foreclosed homes or revitalized homes, no strong conclusions can be made from the hot-spot analyses analyzing the impact of revitalized homes in decreasing foreclosures. There does seem to be a decrease in overall hot spots after 2009, and in the Willowstone and Palmer Lake neighborhoods where no hot spots were present before 2009 they are present after 2009. These patterns are interesting, as we might expect the trend to go in the opposite direction, with hot spots present before 2009 and these hot spots reduced after 2009.

However, some correlations are observed between the recovered homes and the cold-spots on the 1-year trend map. It is clear when looking at the recovered homes, they exist in mostly “Oscillating” and “New” cold spots. What this means is that these areas with the recovered homes *are* trending in the right direction, that is, cold rather than hot.

While there are no quantifiable conclusions that can be drawn from hot-spot analyses, neighborhoods where nearly half of total revitalized homes are located do correspond to areas with an area of many emerging cold spots in the Foreclosures 2005-2016: Emerging Hot Spots - 1 Year Trends map.

In terms of foreclosures following seasonal trends, the data does suggest higher numbers of foreclosures in the months of May, June and July, with a peak in foreclosures in May. Our analysis of seasonal trends in foreclosures would suggest quantifiable results in more foreclosures occurring over the summer months.

While many of the results of our study were not quantifiable, our study provides some insight into overall trends in foreclosures in the 2005-2016 period, and the ripple impact of foreclosures or the revitalization of homes. Most of our analysis of foreclosure trends and the ripple impact of foreclosures or revitalized homes focused on kernel density, hot spot, and emerging hot spot analyses, all of which use statistics to make calculations. While statistical calculations in the hot spot and emerging hot spot tools can provide various levels of confidence and statistical viability for clustering patterns of values, and even clustering patterns of values related to time, as far as our data allows and the tools that were available to us for this study, there seems to be no statistically viable way of measuring the ripple impact of revitalized homes and their impact over space and time in relationship to foreclosures.

To better study the ripple impact of revitalized homes on decreased foreclosures, a future project might consider looking at the trends in foreclosure clusters specifically for years in which revitalized homes were resold. A comparison of clustering in foreclosures for each year and differences in the amount of homes revitalized might show trends of revitalized homes.

A future study might also incorporate trends in property values, normalizing for natural fluctuations in the real-estate market, and perhaps buffering a distance around revitalized homes and observing potential increases in property values in these areas, which could be attributed to re-occupied revitalized homes.

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