

Planting Seeds; Growing Communities
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INTRODUCTION

The University of Missouri-St. Louis Public Policy Research Center (PPRC) conducted a study of the impact of community gardens on their surrounding neighborhoods for Gateway Greening, Inc. Gateway Greening incorporated in 1984 to promote community development through community gardening. This report documents that Gateway Greening is achieving its mission. There are measurable improvements in neighborhoods around community gardens, although not on all the dimensions examined in this study.

The analysis of Census data provides evidence that for the period 1990 to 2000 there were notable differences in indicators of housing and socioeconomic conditions between garden areas (a 3-block radius around the garden) and their larger surrounding neighborhood. Garden areas had greater increases in rents and mortgage expenditures, rates of home ownership, and particularly larger increases in household income. At the same time, the percentage of low-income households was more stable as was the overall population in garden areas.

In addition to reporting the findings, this paper describes the methodology used in the study. Gateway Greening, like many community garden support organizations, believed that it was having a positive impact on neighborhoods, but lacked the evidence to substantiate its intuition. The process applied in this study can not only be repeated at a future time for Gateway Greening, it is based on data and analysis that can be applied in other metropolitan areas to evaluate the impact of community gardens.

STUDY DESIGN

PPRC conducted the privately funded Whitmire Study from 2000 to 2003 in three phases that examined a number of variables. All three phases of the Study examined 54 gardens in four selected zipcodes in the City of St. Louis. The first phase involved two surveys, one of community gardeners and a second of residents living in impact areas around the community gardens. The second phase examined 1992 – 1998 crime data, comparing garden areas and nongarden areas in the City of St. Louis. The third phase compared 1990 and 2000 Census data for 16 variables examining changes in demographics, housing, and socioeconomic conditions in garden areas and their surrounding neighborhoods.

The telephone surveys of 97 active gardeners and 177 garden-area residents asked questions on three topics: 1) crime in the neighborhood, 2) community relations in the neighborhood, and 3) neighborhood appearance. The survey results documented a difference in perceptions of neighborhood conditions. Gardeners felt very strongly that neighborhood conditions greatly improved in recent years and would improve even more in the coming few years. While residents felt there had been improvements in neighborhood conditions, they did not feel there had been as much improvement in recent years as did gardeners. And residents were largely unaware of the garden in their neighborhood and many had no opinion on its impact.

Crime data for the 1990s did not show a significant difference between garden areas and comparable neighborhoods without a garden. The positive aspect of crime data was that the crime rate dropped considerably throughout the City of St. Louis during the 1990s. There was not, however, a measurably greater crime decline in garden areas.

This paper details the methodology and findings of the third phase of the Whitmire Study, the use of Census data to examine change in a number of variables that measure household and socioeconomic conditions in a neighborhood.

NEIGHBORHOOD INDICATOR DATA

The analysis of neighborhood indicator data focuses on 54 of the gardens sponsored by Gateway Greening. To examine the relationship between community gardens and their immediate neighborhood, Census data was extracted from 1990 and 2000 regarding occupancy rates, owner occupancy rates and rents as a percentage of income. While there were over 60 gardens in the study area, the number of gardens examined in this analysis was limited by the ability to reliably place the gardens using Geographic Information Systems (GIS) software and to reliably gather Census data for the surrounding area.

Determining Area of Impact

One challenge to evaluating community gardens is defining the area of their impact and then collecting data for that specific area. As such, one must examine data from a small area of geography. This can be difficult due to the definitions of geography created by the U.S. Census Bureau. The smallest geographic level for which sample Census data is released is the block group. Block group boundaries are small enough that while some gardens may be contained well within one, many gardens will impact more than one block group. The next highest level of data released is the census tract. Census tracts generally contain between 1,000 and 8,000 people with an optimum size of 4,000. Tracts are designed to be relatively homogeneous with respect to population characteris-

tics, economic status, and living conditions.¹ They are large enough, however, that one cannot reasonably expect a community garden to impact the entire tract.

To overcome these issues, GIS software was used to locate each garden on an electronic map and drew a .3-mile circle around the garden. Any 1990 block group that fell within that radius was then included as a part of the garden's expected area of impact. PPRC staff compiled data from the relevant block groups for each garden and combined it to measure changes in the impact area. The extracted block groups within .3 miles of a garden are referred to as garden areas. This is an imperfect solution given some block groups will be more affected by the gardens than others, but given the organization of Census data, it is by far the best measure available.

Given the strong identity that neighborhoods have in the City of Saint Louis, it would have preferable to compare the data for each garden area to the data for the neighborhood in which it resides. In a city undergoing dramatic demographic change positive increases in the rate of occupancy or home ownership may be desired, but unrealistic given regional demographic and population movement trends. In such cases, the data for a garden area would be best compared to the neighborhood area it resides rather than compared to citywide data.

The U.S. Census Bureau does not release data based on defined neighborhoods. City of Saint Louis officials had not yet to release their breakdown of 2000 Census data at the neighborhood level at the time this analysis was prepared. Census tracts are the next lowest geographic level of data released by the Census Bureau after the block groups. Census tracts do not correspond to the neighborhoods in the City of Saint Louis, but are generally compact and relatively consistent areas.

¹ U.S. Census Bureau, Decennial Management Division Glossary, <http://www.census.gov>

In some cases only one tract surrounded the relevant block groups, but in others, they extended into 2 or more census tracts. In those cases, one tract was selected to represent the larger geographic area. To do this, the tract with the largest portion of the block groups was chosen. In a few cases, the number of block groups was equally divided between the two tracts. In that event, the tract with the larger percentage of population was chosen. This was done in cases where gardens were located in areas with less immediate residential surroundings. Given the larger population area is likely to be the area of interest, this most closely followed the goals of the research.

Neighborhood Indicator Focus

A number of variables were selected to estimate the well-being of the neighborhoods in general and garden areas in particular. Recent work (as noted in Sawicki and Flynn 1996) has utilized indicators at the level of the neighborhood and below to more clearly identify and evaluate impacts of policies and projects that are geographically specific.²

Ideally, panel data would be available. Panel data would allow in-depth analysis of individuals in the neighborhoods. In this case the project was not conducive gathering panel data. First, Gateway Greening locates gardens according to neighborhood interest and commitment, which does not allow neighborhood information to be gathered prior to the siting of a new garden. Second, the Whitmire Study started after most Gateway Greening gardens were established and so pre-garden siting data would not be available except in Census or other routinely collected data.

²Sawicki, David S. and Patrice Flynn. 1996. "Neighborhood Indicators: A Review of the Literature and an Assessment of Conceptual and Methodological Issues." *Journal of the American Planning Association*. Spring 1996, vol. 62, num 2, Pg 165 (19).

Indicators were drawn from data common to the 1990 and 2000 Census. These indicators provide consistent measures for the neighborhood status of the areas and through correlation files generally consistent geography. Variables measuring housing costs, income, and overall population demographics were chosen as indicators of neighborhood vitality. The weakness of the strategy is that it cannot track individuals in the neighborhoods thus raising the question of whether the impact is due to residents who had already been living in the area or who had moved in over the decennial period. The great strength of the choice is that the process is easily replicable and works with data that is handled consistently by one data source, the U.S. Census Bureau.

Data Acquisition

The data was gathered from three sources. First, *Geolytics' Census CD of National Neighborhood Change Database 1970 – 2000 Tract Data* provided the 1990 census tract data and initial data from the 2000 census tracts. Additional 2000 tract data was downloaded from the Missouri Census Data Center and the U.S. Census Bureau's American Fact Finder web site. Data was downloaded in text file format and then imported into SPSS and Excel for analysis and data manipulation. Block group level data was downloaded from the Missouri Census Data Center and American Fact Finder as well; though some data had to be cut and pasted into Excel Spreadsheets after initial downloads were made.

The 1990 and 2000 Censuses were significantly different in how block group boundaries were drawn. To compensate for this, the Missouri Census Data Center provided us with a block group correlation file to most closely match block groups from the 1990 Census to the 2000 Census. This file was run and data from the correlated 2000

Census block groups extracted within Excel. From there, the finished product was reimported into SPSS for analysis.

Data Analysis

To analyze the change in garden areas versus surrounding Census tracts, the data was analyzed using differences-in-differences. This required first calculating the difference between 1990 garden areas and 2000 garden areas. Next the difference between the 1990 census tracts surrounding the garden areas and the 2000 census tracts that surround garden areas were determined. Then the difference of the two differences was taken to determine if there was a measurable change in the garden areas compared to the census tracts.

If the improvement in the garden areas was greater than the census tracts one can conclude that the garden areas are different in some manner not found in the larger census tract. While demonstrating a simple causal link to the presence of gardens is not possible under this sort of research design, it certainly allows one to determine if garden areas are doing better than their surroundings.

Causation is unlikely to be straightforward in such areas. Areas that support a garden make a commitment to doing so and so they are different from other areas that do not support a community garden. However, the existence of the garden is likely an important focal point for those investing time and energy in their neighborhood. Not only are gardens often focal points for neighborhoods, but they also provide an important venue for increasing a neighborhood's social capital. In terms of Robert Putnam's argument in *Bowling Alone*, people may be bowling alone, but in the case of the Gateway Greening community gardens, it is an empirical question of whether they are gardening

as a community.³ Neighborhood indicators do provide a manner of determining the status of the Garden areas without trying to establish a clear causal chain.

Differences-in-differences is problematic in this case due to the nature of the data and the difficulty of obtaining unbiased standard errors with serial correlation. Data collected over time is serially correlated meaning that observations are related to the previous observations and not independent as differences-in-differences test assume. Bertrand et al. address the problem of serial correlation in detail.⁴ By being serially correlated observations bias the standard error estimate. Biased standard error estimates potentially cause the rejection of the null hypothesis when there is no significant difference.

Making matters more complicated, the analysis in this case rests upon two time points and so asymptotic solutions are unlikely to solve the problem as Bertrand et al suggest in most cases. An additional problem exists in the nature of block groups and census tracts. Both geographic entities are heterogeneous in regards to size further creating the possibility of biased standard errors.

Given the difficulty of obtaining reliable estimates of standard errors, the statistics are reported with information about the range, thus enabling the results to be evaluated as essentially descriptive statistics. Analysis of such data requires detailed attention to outliers and other data problems that might skew basic descriptive statistics.

The data for nine variables is reported here. In analyzing variables from Census data to determine the impact of gardens, data for an addition seven variables was analyzed. These variables included data that measured housing values directly as well as the

³Putnam, Robert. 2000. *Bowling Alone: The Collapse and Revival of American Community*. Simon and Schuster. New York.

length in residence and the diversity of housing costs in a given area. Unfortunately those variables were not very useful for analysis due to the limitations of only being available over 10 years in between data points and unclear interpretation. Length in residence, for example, produced little in the way of clear information because it was unclear how to interpret the data. Was longer good if there area had a losing population? Or was shorter good if the population was increasing? Since the interpretation was unclear those results have been omitted. Fluctuating market values over ten years created problems with more direct measures of housing costs.

Owner Occupied Housing Units

An important indicator of the health of a neighborhood is the rate of home ownership. The Census measures home ownership through the number of households that are owner occupied as a proportion of total occupied housing units. It is in this category that the greatest difference is observed between the garden areas and the surrounding census tracts. Forty-four of the garden areas did better in the ten-year period, improving home ownership more than the surrounding census tracts. Eight did slightly worse, and two performed the same. Areas directly around the gardens saw higher increases in home ownership rates than did the census tracts as a whole. More importantly, only three areas directly surrounding a garden reduced the rate of home ownership between 1990 and 2000. This is in contrast to 10 census tracts in which the gardens reside where there was a reduction in the rate of home ownership.

Citywide the rate of owner occupancy increased by 1.8 percent. The 2000 Citywide rate of owner occupancy was 47 percent. Amongst the garden areas, Table 1 de-

⁴Bertrand, Marianne, Esther Duflo, and Sendhil Mullainathan. 2002. "How Much Should We Trust Differences-in-Differences Estimates?" National Bureau of Economic

monstrates the average rate of home ownership increased from 23 percent in 1990 to 36 percent in 2000. The median rate increased from 21 percent to 37 percent. In comparison, the census tracts in which the gardens reside had an average increased in owner occupancy from 34 percent owner occupied units to 35 percent. The median increase in the census tracts was 34 percent to 37 percent. By all measures, areas surrounding the gardens improved far more than the city as a whole or the census tracts in which they reside. While they are still behind the overall rate of owner occupancy for the city, the garden areas have dramatically improved the rate of owner occupancy in their immediate areas.

Table 1
Mean Owner Occupancy 1990 – 2000

	1990 Garden Areas	2000 Garden Areas	1990 Tracts	2000 Tracts	1990 City-wide	2000 City-wide
Mean Owner Occupancy	23 %	36 %	34 %	35 %	45 %	47 %
Range	0% -70%	3% - 76 %	1 % - 100 % ⁵	3% - 68 %	N/A	N/A

Garden areas experienced a slightly higher number of housing units being taken out of use during this period than the tracts as a whole, but the number of housing units taken out of the market should have produced a similar, if lower increase in owner occupancy at the tract level if this was the only factor driving the improvement. Ultimately, the areas directly surrounding the gardens increased the proportion individuals invested in the vitality of the neighborhood more than the surrounding tracts.

Research Working Papers. <http://www.nber.org/>. Cambridge, MA.

⁵ This is an artifact of the Tract and Block Group selection method. The next highest percent is 69 percent. The number has been included for accuracy, but given none of the other Tracts approached it, readers are cautioned to treat it as an outlier.

Mortgaged Owner Occupied Units

Whether an owner occupied unit is mortgaged is less clear of an indicator. If one expects that more people are investing in the neighborhood, one should expect that mortgaged units increase as a proportion of owner occupied units. Alternatively, one might expect that fewer units with mortgages is a good sign because it points to neighborhood stability amongst property owners. In this case, garden areas have decreased on average the number of units with mortgages between 1990 and 2000. The census tracts surrounding garden areas have increased however as shown in Table 2.

Table 2
Percent of Owner Occupied Units with a Mortgage

	1990 Garden Areas	2000 Garden Areas	1990 Tracts	2000 Tracts
Mean Mortgage Rate	50 %	42 %	35 %	45 %
Median Mortgage Rate	50 %	45%	34%	45 %

This data would indicate that areas surrounding gardens are more stable. As residents stay longer in an area and pay off their home loan, the number of mortgaged properties would decrease.

Another manner in which to approach the question is to consider whether the prices of homes are increasing in an area. The data as gathered by the Census is based on self-reporting and generally not that reliable and therefore not included. Other sources of data, such as the Home Mortgage Disclosure Act, only provide information at the tract level. Another problem crops up in areas where houses are being rehabbed. Home sales figures and valuations often do not take into account sweat equity for owners that an area

with an aging housing stock often requires. Sale prices do not necessarily reflect value at the geographic levels being examined.

Rental Units as Percentage of Household Income

Rent as a percentage of income measures how affordable housing is to occupants. Typically, housing is considered affordable if it consumes less than 30 percent of household income. Between 1990 and 2000 the percentage of households in the census tracts surrounding gardens that paid over 30 percent of household income to rent was constant, while the garden areas themselves significantly reduced the percentage of household paying over 30 percent of household income. This is indicative of increasing economic diversity amongst renters.

Table 3
Median Percentage of Renters Paying
A Specified Proportion of their Income as Rent

	1990 Garden Areas	2000 Garden Areas	1990 Tract	2000 Tracts
19% of Income or Less	26 %	58 %	38 %	32 %
20 – 24% of Income	13 %	5 %	9 %	11 %
25 – 29% of Income	9%	7 %	12 %	11 %
30 – 34% of Income	9%	5 %	9 %	7 %
35 % of Income or More	39%	23 %	38 %	40 %

This trend demonstrates an increasing diversity in the type of residents occupying garden areas. While it is important not to generalize too much, increasing diversity amongst renters is generally seen as a strength for a neighborhood. When a high proportion of renters are economically strapped, neighborhoods often are challenged with a

number of problems stemming from concentrated poverty. More economically integrated neighborhoods curtail those problems thus greater diversity is generally a positive development.

Median Gross Rent

In 51 of the 53 available cases for this indicator, rent in the garden area increased more than in the tracts as a whole. One of those was by less than a dollar and should be considered even with the larger tract. Two more garden areas had rent increases of less than \$10 per month and the other 48 cases increased by more than \$10 per month. This is the most dramatic change observed in the data evaluating the areas immediately surrounding the gardens.

Table 4
Median Gross Rent Change 1990 – 2000

	2000 Garden Areas	2000 Tracts	2000 City-wide
Mean Increase in Median Gross Rents	\$113	\$0	-\$4
Median Increase in Median Gross Rents	\$91	\$3	N/A
Range	-\$81 - \$531	-\$71 - \$103	N/A

In the City of Saint Louis, overall median gross rents fell \$4 between 1990 and 2000, and in the tracts surrounding the gardens there was no change in rents. The areas immediately surrounding the gardens saw a median increase of Median Gross Rents of \$91 and average increase of \$113. Rents charged in areas immediately around the gardens are significantly higher than the surrounding tracts and in the City as a whole. The areas directly around the gardens have increased what people are willing to pay at a greater amount than in the larger tracts and city as a whole.

Monthly Costs for Owner-Occupied Units with Mortgages

For owner-occupied property, the Census determines monthly housing costs by including mortgages, taxes and maintenance costs into one statistic. The results between the garden areas and the tracts indicate higher monthly housing cost increases on average in the garden areas compared to the surrounding tracts. In 30 of the garden areas owner costs increased indicating a rise in value for housing units in the garden areas. While there are a number of tracts that did better than the garden areas, overall both the median and mean of increases in owner costs in the garden areas was greater than in the tracts as shown in Table 5.

Table 5
Median Monthly Costs for Owner Occupied
Units with a Mortgage 1990 - 2000

	2000 Garden Areas	2000 Tracts
Mean Increase in Median Owner Costs with A Mortgage	\$314	\$198
Median Increase in Median Owner Costs with a Mortgage	\$295	\$207
Range	-\$410 - \$1119	-\$186 - \$608

Home values and costs increased in the immediate areas surrounding gardens more than in the tracts. Owners were willing to invest more in the homes in areas directly surrounding the gardens than were owners in the tracts surrounding the garden areas.

While the Census does collect information on home valuation, people tend to be more accurate in recalling their monthly costs than they are at providing an accurate value of their home. The one disadvantage, as indicated above, is that long-term residents often have paid off their mortgages.

Median Household Income

Median Household Income increased citywide by \$1,770. In the garden areas that increase was on average \$6,440 between 1990 and 2000 while the surrounding tracts recorded an increase in Median Household Income on average of \$2,588. Median increases of the Median Household Income reported demonstrate a similar pattern as shown in Table 6.

Table 6
Increase in Median Household Income from 1990 to 2000

	2000 Garden Areas	2000 Tracts	Citywide 2000
Mean Increase in the Median Household Income	\$6,440	\$2,588	\$1,770
Median Increase in the Median Household Income	\$6,712	\$1,730	N/A
Range	-\$16,550 - \$18,856	-\$5,025 - \$14,592	N/A

While gardens are unlikely to increase Household Income by themselves, clearly the areas directly surrounding the gardens attracted households with incomes increasing above the average for the City and the surrounding tracts.

Poverty Rate

The overall poverty rate in the City was constant between 1990 and 2000, while both the garden areas and the surrounding tracts experience a slight decrease in poverty, with the tracts surrounding garden areas actually having slightly more of a decrease in the median rate. Gardens are almost evenly split between doing better than surrounding tracts and doing less well.

Table 7
Median Poverty Rates 1990 – 2000

	1990 Garden Areas	2000 Garden Areas	1990 Tracts	2000 Tracts	Citywide 1990	Citywide 2000
Median Poverty Rate	32 %	29 %	34 %	27 %	25 %	25 %
Range	5 % - 75 %	4 % - 59 %	8 % - 73 %	5 % - 65 %	N/A	N/A

Gardens should not exhibit much of an influence on the poverty rates in a given area, but poverty rates do provide three important pieces of information. First, the gardens are located in diverse neighborhoods from low poverty areas to high poverty areas. Next, poverty rates provide a benchmark for the starting point of a neighborhood for one to judge the beginning social conditions before gardens are cultivated. Third, it provides a context describing changing neighborhood conditions. While the city as a whole had a constant poverty rate, there is a slight improvement in poverty rates in both the tracts and garden areas, even though both categories have a median poverty rate above the citywide poverty rate in 1990 and 2000.

It is important to note that the Census measure for unemployment is highly correlated to the poverty rate and presenting that figure would be repetitive. The Census measures unemployment differently than does the Bureau of Labor Statistics by using a broader definition of who fits in the unemployed category.

Population Change

In 37 of the 53 studied gardens the garden areas maintained a higher percentage of its 1990 population in 2000. The City of Saint Louis maintained 87 percent of the population in 2000 that it had in 1990. The median tract population percentage in 2000 compared to the 1990 population is 88 percent. This is compared to the areas nearest the gar-

dens that have a 2000 population that is 94 percent of the 1990 population. The population loss in the areas immediately surrounding the garden was less than in the city as a whole and less than their surrounding tracts.

Table 8
Median 2000 Population as a Percentage of 1990 Population

	2000 Garden Areas	2000 Tracts	Citywide 2000
Median 2000 Population as a Percentage of 1990 Population	94 %	88 %	87 %
Range	25 % - 310 %	59 % - 106 %	N/A

One should notice the median is used in this case so as not to weight outlying observations. The area that experienced a 310 percent increase in population is probably affected by changes in block group boundaries from 1990 to 2000. Given that Census boundaries at the block group level changed significantly between 1990 and 2000, reliably measuring population changes is difficult. Swings in that population are especially likely at the block group level and they are present as the range is shown in Table 8.

Population itself is not likely to be directly affected by the existence of a garden, but again, it gives a better understanding of the neighborhood's characteristics. One important element of understanding the effects of a garden is to understand what facilitates a garden. By looking at poverty and population changes, one is able to examine what underlying conditions are likely to be conducive to a garden being established.

Occupancy Rates

Comparing the results to the entire City, gardens areas and tracts tend to have slightly lower occupancy rates than the City as a whole. In 1990 the occupancy rate for

the City of Saint Louis was 84.6 percent, which fell to 83.4 percent in 2000. Given garden areas are slightly below the City average in occupancy, it normally would be

Table 9
Occupancy Rates in Garden Areas
and Surrounding Census Tracts 1990 - 2000

	1990 Garden Areas	2000 Garden Areas	1990 Tracts	2000 Tracts
Mean Occupancy	79 %	78 %	80 %	79 %
Range	60 – 96 %	54 – 94%	64 – 93 %	61 – 92 %

expected those same areas would be hit hardest by continuing demographic challenges. It appears that garden areas did slightly better than the City as a whole as well as the surrounding census tracts in the 10-year period.

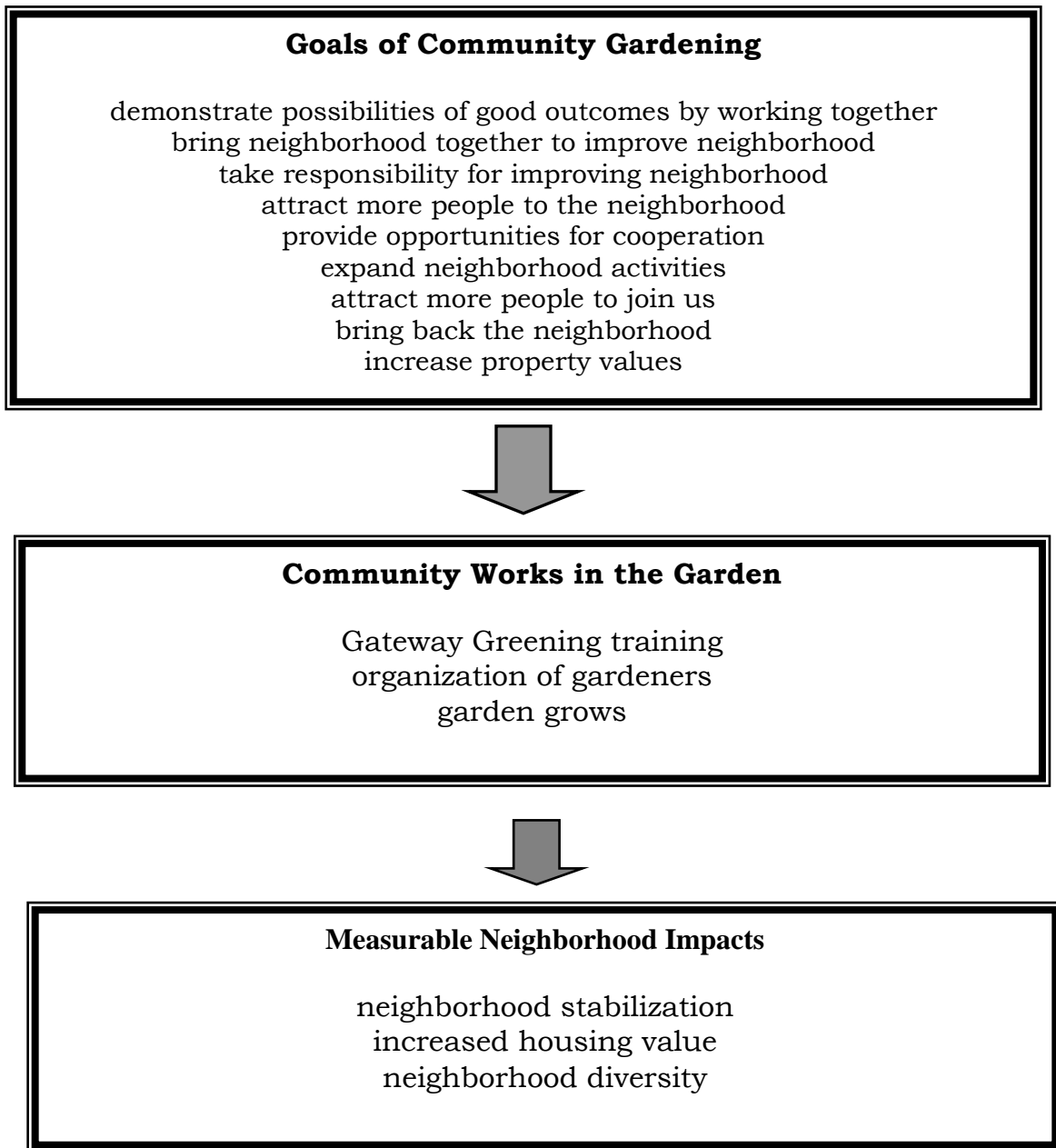
Summary of Indicator Data Analysis

The changes in garden areas between 1990 and 2000 indicate first of all that they became more stable neighborhoods. The garden areas retained a higher percentage of their 1990 population over the decade, increased the rate of homeownership on average by over 50 percent, and retained a high percentage of residents who lived in the area long enough to pay off their mortgage.

In addition to stability, the garden areas attracted a higher rate of investment in housing than their larger neighborhoods. They attracted residents with higher income levels, who paid higher rents and made higher mortgage payments. At the same time, the more affluent residents did not, at least over the last decade, displace the rather substantial population of low-income households in garden areas.

Overall, the indicators from analysis of Census data show that the garden areas are more sustainable than the surrounding areas where there was not an active community development process sponsored by Gateway Greening.

Figure 1
The Process of Community Garden Impact



Community gardens are established to accomplish many goals. A critical factor in this analysis is how that goal is established, and how it is realized. Gateway Greening's goal is to cultivate community development. It does this by working with community residents to establish their own goals for their community garden (Figure 1). Gateway Greening then provides training to the community gardeners who then work in their community. Trained gardeners and developed community gardens is the output of the process administered by Gateway Greening. The purpose of this study was to examine the impact of Gateway Greening's work. Looking particularly at demographic and housing indicators of neighborhood conditions, Gateway Greening has a measurable impact on the quality of life in the neighborhoods where it works.