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A Location Analysis of Landscape Plant Retail Outlet Markets in Georgia

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Abstract: GIS is an emerging marketing tool. This study examines the Georgian landscape plant retail market using GIS in conjunction with other traditional market research tools. Spending and logistic regression propensity scores are analyzed for prevailing geographic patterns. This allows retailers to make store location decisions by identifying underserved markets.

In their efforts to become more competitive, retailers have turned to a number of marketing tools to enhance their market research. In the landscape plant retail markets, the stakes are particularly high. Landscape plant receipts have grown from approximately \$7.0 billion, or 11% of all cash crop receipts, in 1988 to \$14 billion in 2001. Techniques developed for this industry, such as tobit regressions, can go as far as identifying what type of person is most likely to purchase plants at a particular retail outlet (Turner, 1988).

Though much of marketing research focuses on the various demographic and socio-economic characteristics that influence buying decisions, until recently there has been very little consideration of the geographic influences on buying and spending patterns. With the advent of Geographic Information Systems (GIS), retailers have a powerful tool to analyze the role of geography in retail markets. In addition, retailers can use GIS in a variety of other ways, such as store location decisions (Vlachopoulou, 2001).

This study examines the geographic dispersion of spending patterns of Georgians on landscape plants. By studying these patterns, insights into plant buying behavior that are not normally captured in a purely quantitative model can be seen. Additionally, the use of GIS can identify areas that may be underserved by retailers and represent an opportunity for expansion.

Data for this study comes from the Georgia Poll, a yearly survey conducted by the Georgia Survey Research Center. Socio-economic and demographic variables, as well as the amount spent on landscape plants and the percentage spent on landscape plants at a particular retail type were collected over a period of fifteen years (1988-2002). Additionally, unique identifiers for each of Georgia's 159 counties, called FIPS codes, were collected for each respondent for the last seven years (1995-2002)

To determine what geographical characteristics influence plant expenditures, the mean amount of money spent on landscape plants for each county was plotted onto a county map of Georgia. Each observation's amount spent equals the midpoint of the category of which the respondent selected as the how much he/she spent on landscape plants. The mean amount spent for each county is the arithmetic mean of all the observations in the county over the period from 1995-2002.

Counties with fewer than 10 observations for the entire period were pooled with neighboring counties that also had fewer than 10 observations to form a contiguous region with a sufficient number of observations. Of Georgia's 159 counties, 85 had to be pooled in such a way.

The average amount spent at a particular retail type was investigated in the same manner. The amount spent for each observation was multiplied by the percentage of plants the observation bought at the retail type in question. The average spent was then calculated for each county and plotted onto a county map of Georgia

The above geographic analysis relied on the mean spent by all respondents to the survey, including non-buyers. The presence of these observations may not give the most accurate picture of landscape plant spending behavior. As the mean expenditure is

calculated, the non-buyer's zeroes lower the average. To examine the geographic dispersion of plant spending without these distortions, two different analyses were conducted.

The first analysis examines only the mean dollar amount spent by homeowners. Based on the logistic regression above, the largest predictive factor in the decision to buy landscape plants is home ownership. By limiting the examination of expenditures to just this demographic variable, any geographic effects that possibly dissuade buying, as well as those that encourage buying, are seen. Homeowners have a strong propensity to buy landscape plants. If homeowners in one area buy less, on average, than homeowners in another area, then the homeowners in the first area are being affected by some other, possibly geographic, variable.

The second analysis examines the mean expenditures of buyers of landscape plants. By eliminating all observations that did not buy landscape plants, this analysis is able to focus on the actual landscape plant market. Unlike the homeowner analysis, which relies on an observation's propensity to buy, this analysis captures all factors of the plant buying decision by using only the respondents that actually bought. This focuses the results of the analysis to all Georgians, providing a clearer picture of plant spending behavior.

Limiting the analysis in these two ways creates a problem. Once observations are omitted from the analysis, most counties do not have a sufficient number of observations to calculate a consistent mean. To remedy this problem, counties were grouped into several areas. Rural Georgia was divided into Northeast, Northwest, Southeast and Southwest areas. The cities of Albany, Athens, Augusta, Columbus, Macon, and

Savannah are their own areas. Finally, Atlanta and its surrounding counties were consolidated into one area. The mean dollar amount spent was calculated in the same way as the analysis covering all Georgians.

The third analysis of this study combines logistic regression and GIS. For the logit regression, the data is pooled from all fifteen years of the survey. Of the 7486 total observations, 2,156 were eliminated due to missing values and a total of 5,330 observations were used in the regression. The dependent variable in the regression is whether or not an observation bought landscape plants, while the independent variables are the demographic and socioeconomic variables outlined in the literature and data section. Thus the model could be written:

$$buyer_i = \beta_0 + \beta_1 age_i + \beta_2 agesq_i + \beta_3 HMV_i + \beta_4 INC_i + \beta_5 female_i + \beta_6 white_i + \beta_7 black_i + \beta_8 MAR_i + \beta_9 Single_i + \beta_{10} HIGH_i + \beta_{11} COL_i + \varepsilon_i$$

where *buyer* is a binary variable with a value of one if the respondent bought landscape plants and zero otherwise. *Age* and *agesq* are the age and squared age, respectively, of each respondent. *HMV* and *INC* are home market value and income levels, while *female* is a gender dummy equaling one for a female and zero otherwise. *White* and *black* are racial dummy variables equaling one if the observation is either white or black, *MAR* and *SINGLE* are marital status dummy variables, equaling one if the respondent is either married or single, and *HIGH* and *COL* are educational dummy variables, equaling one if the observation's highest level of education was either high school or college. β_i is the coefficient for each variable *i*, and ε_i is a randomly distributed error term.

From this regression, the predicted probabilities of purchase for each observation were then calculated. These values were pooled in the same method as the buyer and homeowner geographic analysis and mapped. Comparison of these mapped propensity scores with actual expenditures can reveal areas that may be underserved by retailers and markets that are saturated.

Based on the results of the logistic regression, some inferences about the geography of plant buying behavior can be made. The most significant variables from the regression, income and housing ownership, have a positive affect on the propensity to buy. Since these rates tend to be higher in suburban counties than in urban or rural counties, suburban counties are hypothesized to spend more on landscape plants than other counties.

The type of retailer where landscape plants are bought can also depend on geography. Turner, et al., found the mass merchant's target market is lower to middle income individuals. Home ownership is not an import factor in this target market. Mass merchants also need a critical population mass in order to operate. Both of these factors converge in urban areas.

The large retailer's target market is focused on upper income homeowners, which is the target market most likely to buy landscape plants. As mentioned above, homeownership and higher income levels are mostly focused in the suburbs. Therefore, large retailers are hypothesized to receive most of their revenue coming from suburban counties.

Though local garden centers are small enough to thrive anywhere by creating niche markets, greater revenues can be made if it does not have to compete with the other

types of retailers. Smaller towns and rural areas do not have the population size or the income and home ownership levels needed to sustain mass merchants and large garden centers. With no other retail types to compete for the market, local garden centers can garner all the expenditures on landscape plants in rural counties.

Map 1 shows the mean dollar amount spend by county. A clear pattern of landscape plant buying based on geography emerges from this map. Several counties around Atlanta and other urban areas spend more on average than other counties. However, neither Fulton nor Dekalb counties are in the upper categories of landscape plant spending and, with the exception of Augusta (Richmond county), no other urban center spends a large amounts on plants. The communities around the urban areas are the areas that spend the most on landscape plants. Although urban areas tend to have high-income levels, most housing in highly urban areas is in the form of apartments or condominiums, neither of which is conducive to landscaping. The bedroom communities and suburbs surrounding the urban areas also have high-income levels and are primarily developed with houses. This combination makes them more apt to buy more landscape plants. Rural areas primarily fall into the lower spending categories. Lower income and homeownership levels in rural counties could contribute to the difference between rural and urban plant buying.

It is also apparent that more is spent on landscape plants in North Georgia than in South Georgia. North Georgia not only has larger towns, which are conducive to landscape plant sales because of the greater number of home owners, but North Georgia also has higher per-capita income levels than South Georgia. In other words, South Georgia is much more rural than North Georgia.

A pattern similar to the total mean spent appears for the average spent at mass merchants. Map 2 shows several of the same suburban counties that were in the upper categories of total mean spent on landscape plants are also in the upper categories of mean spent at mass merchants. This seems counter-intuitive based on the above explanation of geographic dispersion of mass merchants and their target markets. However, mean spending at mass merchants is high in populous counties where there should be large enough markets to sustain mass merchants. Most of the counties in the higher categories of mean spending at mass merchants are concentrated in urban North Georgia areas. Rural South Georgia does not have the population size to sustain many mass merchants. Therefore, landscape plant buyers are more likely to make their purchases elsewhere.

Additionally, spending at mass merchants is high in the urban areas of Savannah, Augusta, and Macon. The other counties with high expenditures at mass merchants are clustered around the metro Atlanta counties of Fulton and Dekalb. Though suburbs of Atlanta, these counties closely resemble the demographic makeup of other metro areas due to urban sprawl.

Another factor in the similarity between the maps for total mean spent on landscape plants and mean spent at mass merchants is the large market share that mass merchants enjoy in the landscape plant market. With almost 70% of the market, mass merchant are almost guaranteed to see high revenues in counties in which landscape plant spending is high.

Counties with higher spending at large garden centers, which can be seen in Map 3, are primarily concentrated around Atlanta. This dispersion corresponds with the target

markets and the market sizes that make large garden centers viable. Almost all of the Atlanta area suburban counties exhibit the market characteristics that are attractive to large garden centers. However, only about half of these counties show expenditures in the upper categories for mean spent at large garden centers. This could be due to current store location for large garden centers.

Pike Family Nursery is the most prominent large garden center in the Atlanta area. Most of its stores are located in Atlanta's eastern suburbs and there seems to be a high correlation between store location and mean expenditure on landscape plants at large garden centers. The potential for large revenues in the western suburban Atlanta counties still exists. If Pike's expand into these areas with an effective marketing plan, the mean amount spent at large garden centers should rise to parity with the eastern counties.

Like both other retail types, local garden centers enjoy high revenues in the Atlanta area. Map 4 shows the mean spent at local garden centers. Unlike the other retail types, local garden centers do as well in rural counties as they do in the Atlanta area. A majority of the counties that fall in the upper categories of spending are outside of urban areas and some are located in South Georgia. Though a majority of rural residents appear to buy less landscape plants, those that do choose local garden centers for their purchases.

Local garden centers perform well in some of Atlanta's suburban counties, but struggle in other urban areas. No other urban area in the state ranks in the upper categories for mean spent at local garden centers. In urban areas, local garden centers must compete against both mass merchants and large garden centers and can not perform as well as local garden centers outside urban areas. Even if urban local garden centers fill a niche market, revenues might not be as great as rural local garden centers.

Map 5, the map of the mean spent by homeowners, shows a familiar picture. Homeowners spent more on landscape plants in urban areas than in rural areas. With the exception of Columbus and Macon, all of Georgia's cities fall into the upper categories of landscape plant buying. This is probably the effect of income levels on spending behavior. Urban area homeowners have higher income levels than rural area homeowners, and thus spend more on landscape plants.

Although slightly muted, the divide between North and South Georgia is apparent. The rural homeowners of North Georgia and Southwest Georgia fall into the same category, but rural Southeast Georgia homeowners lag behind in average spending. The difference between North and South Georgia is even more pronounced in Map 6, the map of the mean spent by buyers. It is clear that there is a fundamental difference between the landscape plant spending habits of North Georgians and South Georgians.

As with the difference between urban and rural areas, this could partially be the result of different income levels in the various regions. However, there could be several distinct geographic differences that account for some of the difference also. Any number of differences, from soil composition to climate, could affect ornamental plant cultivation, leading to the differences between North and South Georgia plant purchases.

Land use is another geographical consideration in examining landscape plant expenditures in Georgia. South Georgia is a primarily agricultural area, with only a few small communities scattered in between a large number of farms. Farmers dedicate as much land as possible to cultivate crops and forests. North Georgia generally has larger communities and denser populations than South Georgia and less row-crop agriculture. With less land dedicated to crops, more land is used for housing development and

associated landscaping. In other words, higher density areas are more likely to have higher landscape plant purchases and North Georgia is denser than South Georgia.

Further examination of Map 6 shows the same urban/rural split is present in analysis of mean spent by buyers as in the other analyses. This urban/rural difference could also go beyond the differences in income. As expounded above, denser areas buy more landscape plants. Urban areas also have more retailers in a given area, and, given the increase in competition and availability, landscape plant buying becomes easier for the consumer.

Map 7 shows that South Georgian have a higher propensity to buy landscape plants than North Georgians. However, this is not consistent with the spending patterns in which North Georgians spend more on landscape plants than South Georgians. One explanation for this apparent discrepancy is climatic in nature. During the study period, South Georgia suffered a drought, which could have significantly depressed spending on non-essential planting. The disparity could also indicate a lack of supply in South Georgia, and thus an undeveloped market in which retailers could expand and be successful.

Athens and Columbus offer similar opportunities to develop markets in landscape plants. Both cities show an above average propensity score, indicating that their populations are more likely than other Georgian's to purchase landscape plants. However, both rank fairly low in mean expenditures on plants, not only overall, but also at each retail type. Apparently, landscape plant retailers have not effectively marketed in these areas; otherwise the mean expenditure would be greater than most other counties.

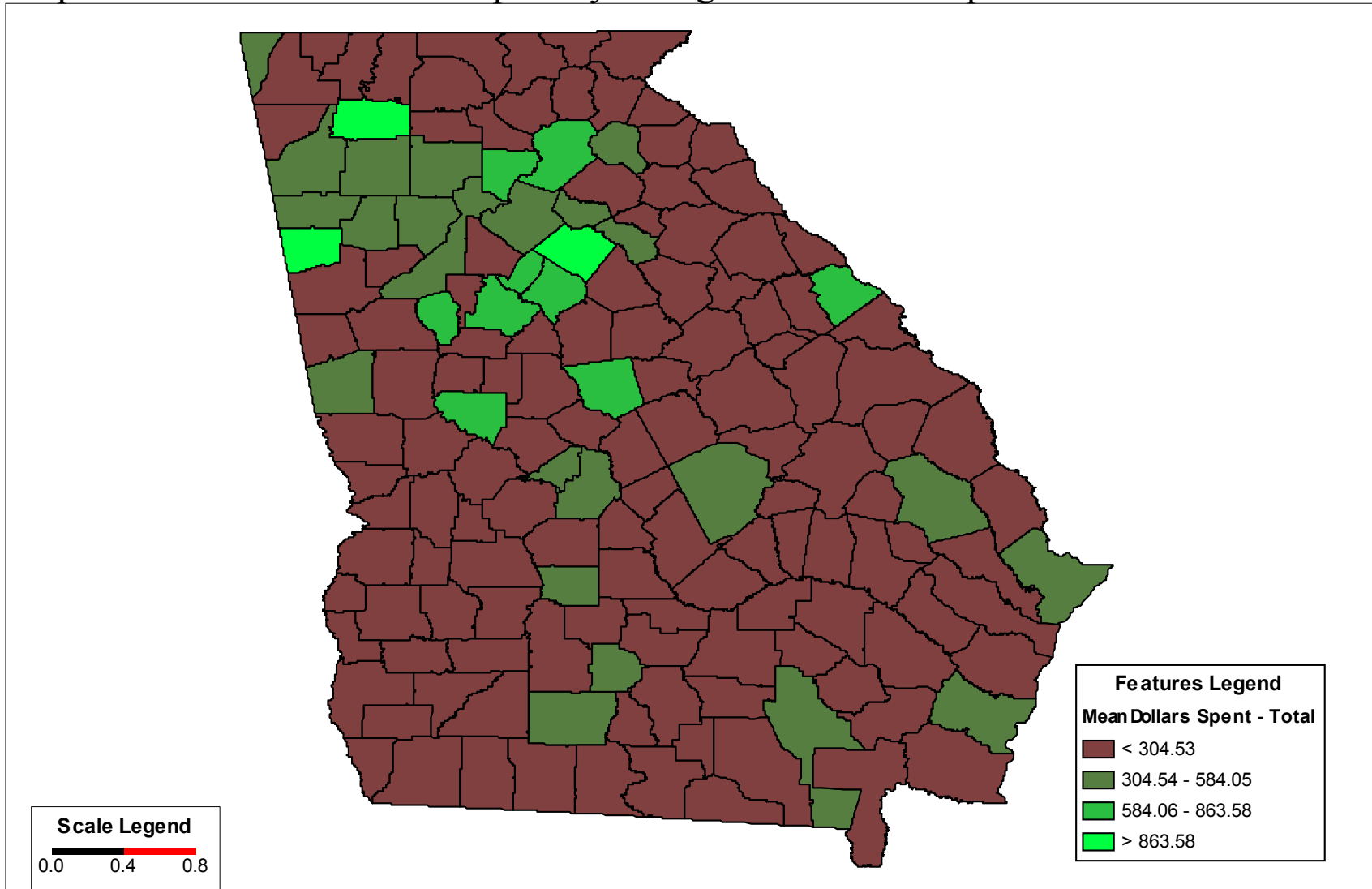
Thus, retailers have the opportunity to allocate more resources to marketing in these areas and expand sales.

Conversely, the Atlanta and Savannah areas show a lower propensity to buy landscape plants, but higher levels of expenditures. Retailers might be using too many of their resources to market in these areas, and would be better off shifting resources elsewhere.

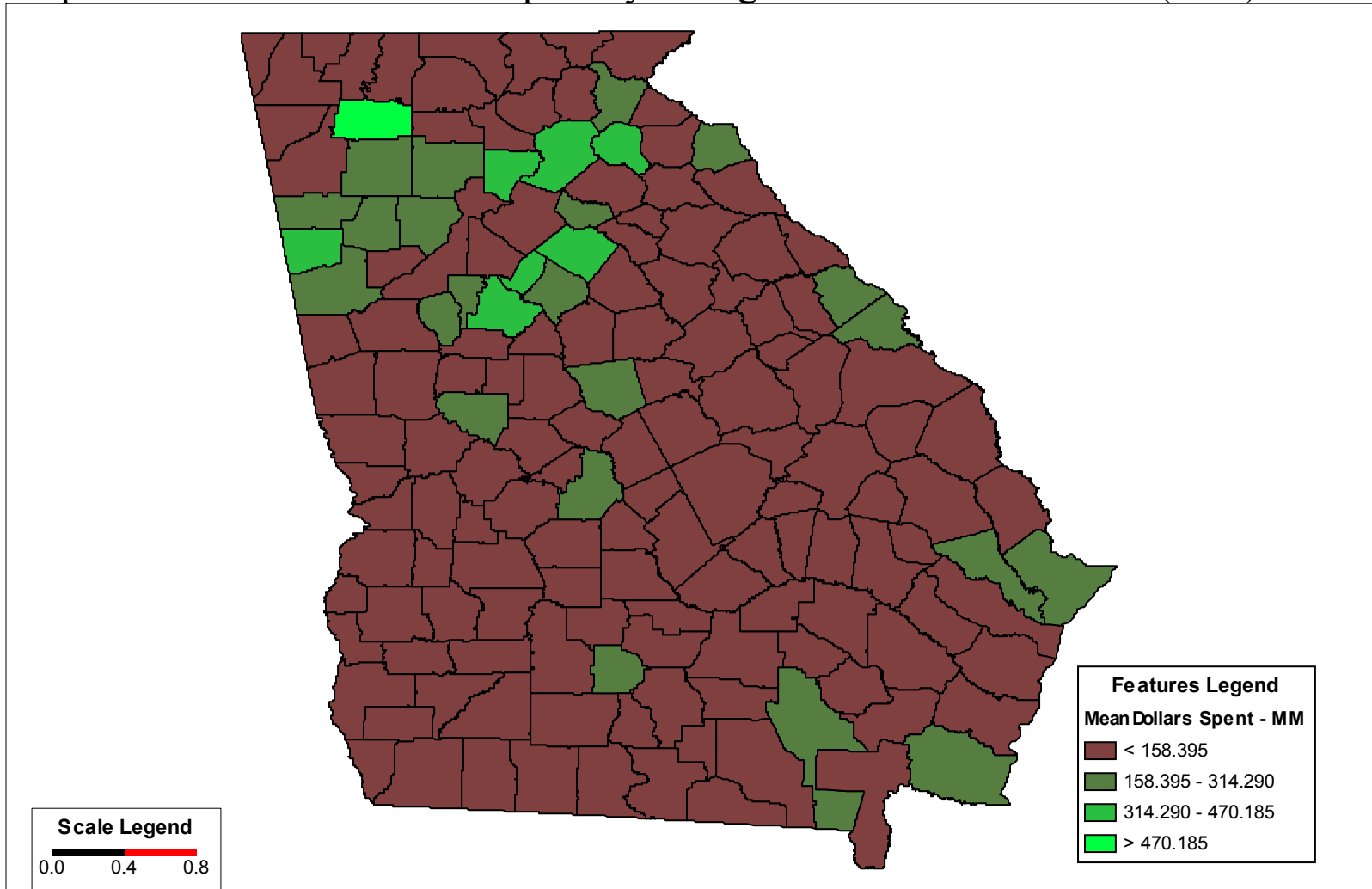
The application of GIS to landscape plant spending patterns in Georgia has shown several distinct patterns. North Georgia tends to spend more than South Georgia and suburban counties spend more than rural or urban counties. Retailers can use these patterns to make informed store location decisions. By avoiding areas that already spend a high amount on plants and focusing on areas where the demand for landscape plants has not been tapped, or in other words where spending is low, retailers can further maximize profits.

Taking this approach, retailers are faced with the problem of determining why spending is low in a particular area. Spending could be low in an area due to lack of supply or a lack of demand. If the supply is low, the retailer will do very well, however, if demand is low, then the retailer will most likely fail. By layering a traditional marketing tool, the logit analysis, with GIS analysis, retailers are able to make the distinction between low demand and low supply in low spending areas.

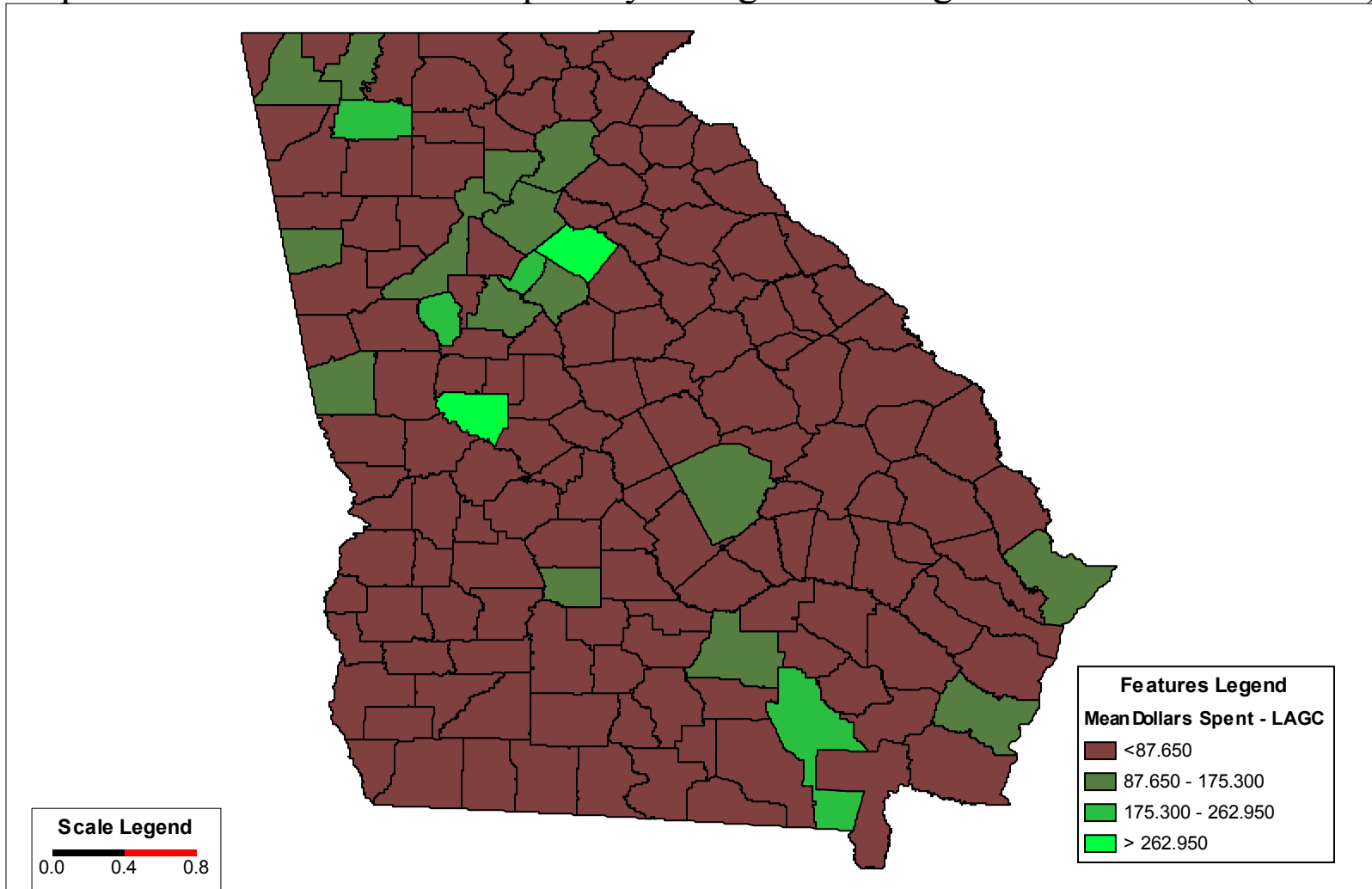
Map 1: Mean Dollar Amount Spent by Georgians on Landscape Plants



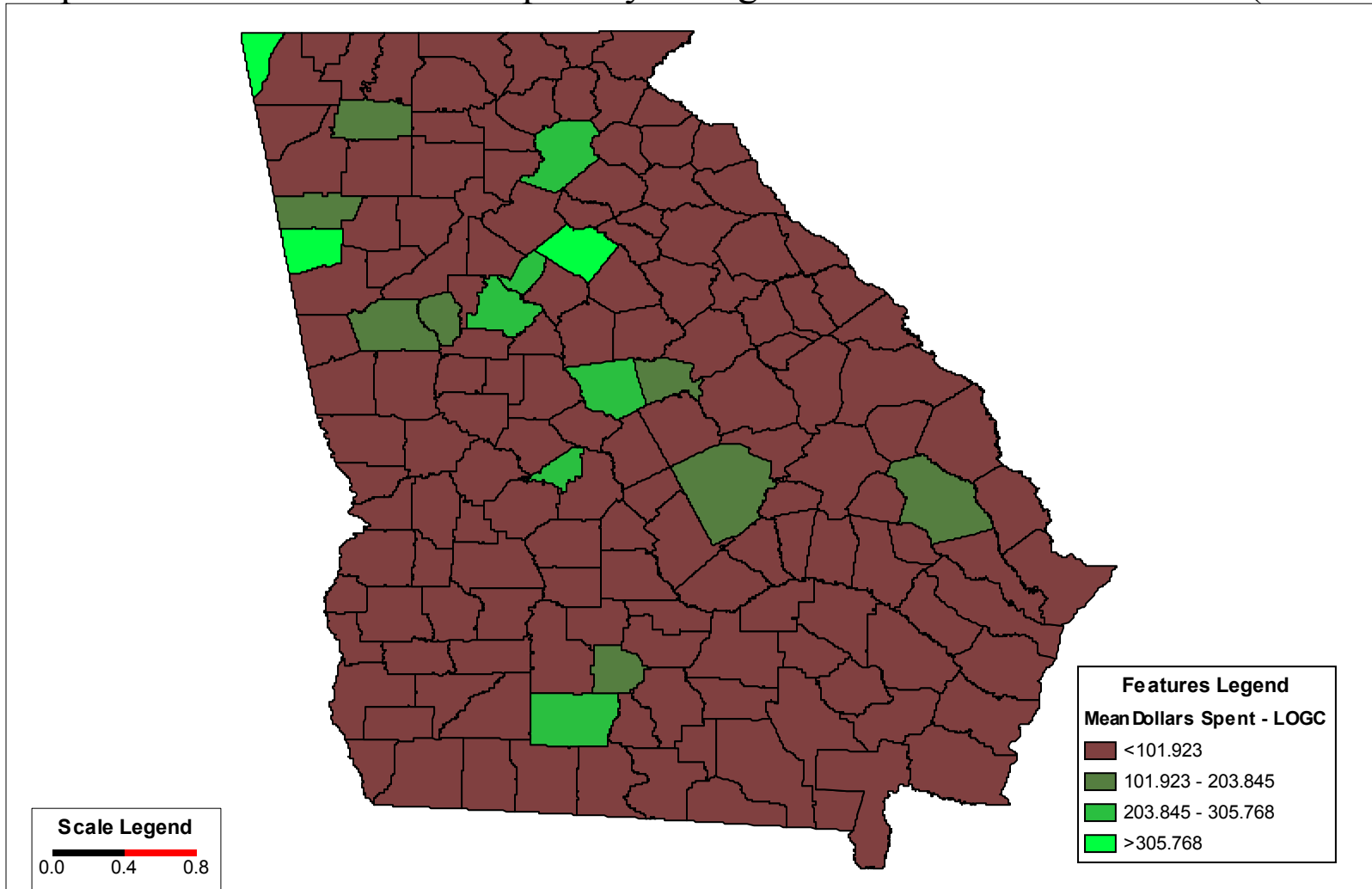
Map 2: Mean Dollar Amount Spent by Georgians at Mass Merchants (MM)



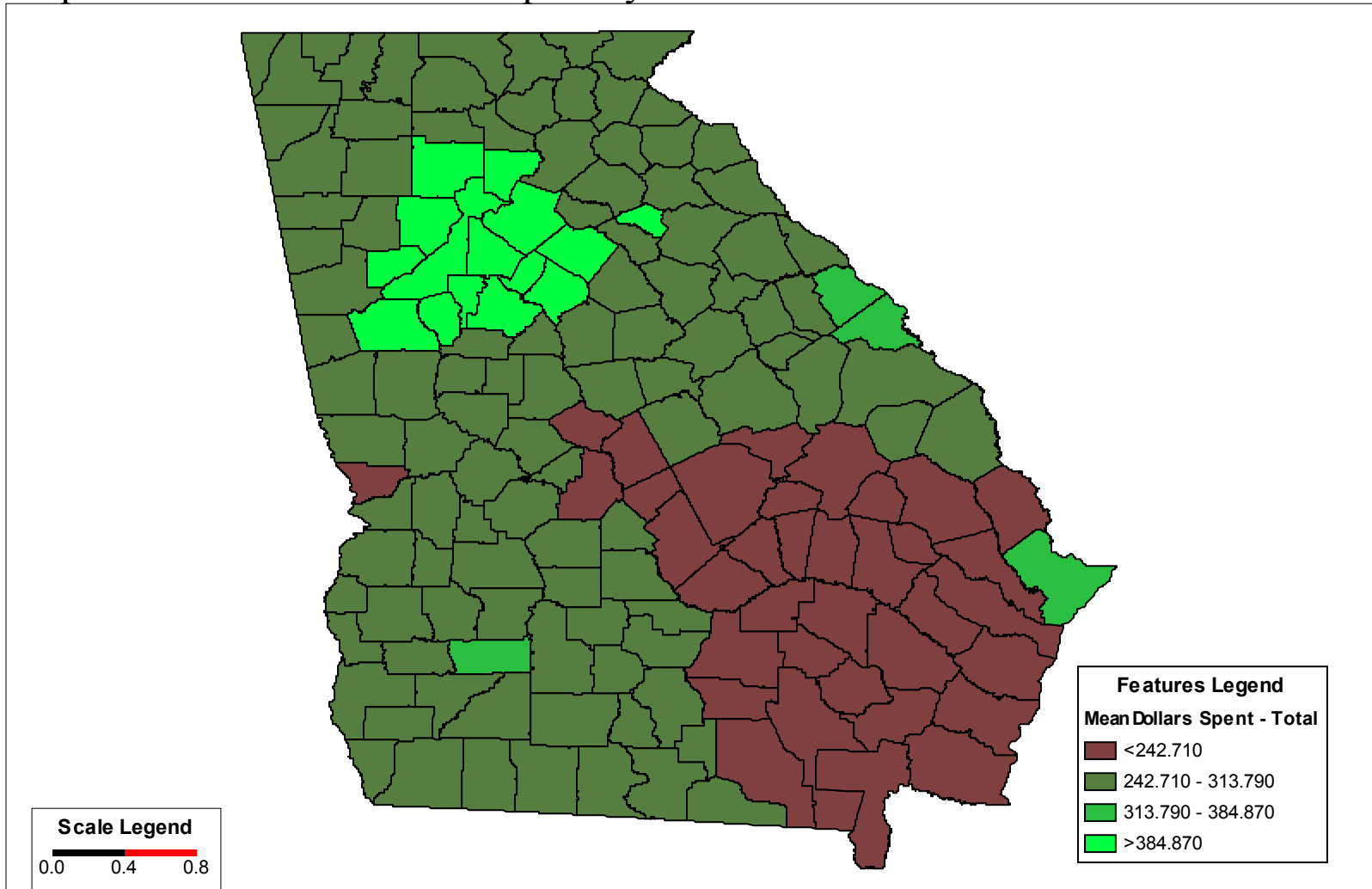
Map 3: Mean Dollar Amount Spent by Georgians at Large Garden Centers(LAGC)



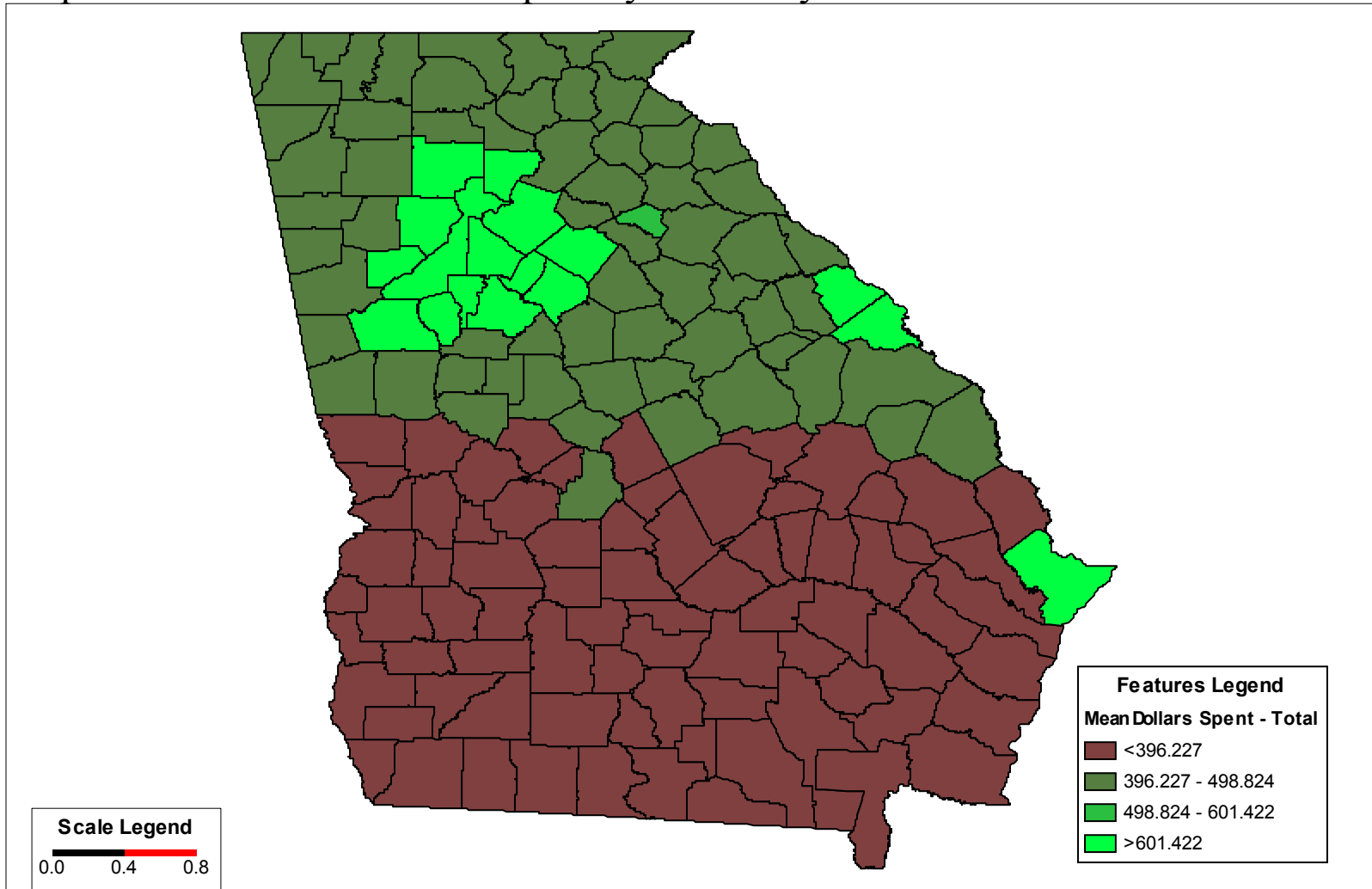
Map 4: Mean Dollar Amount Spent by Georgians at Local Garden Centers (LOGC)



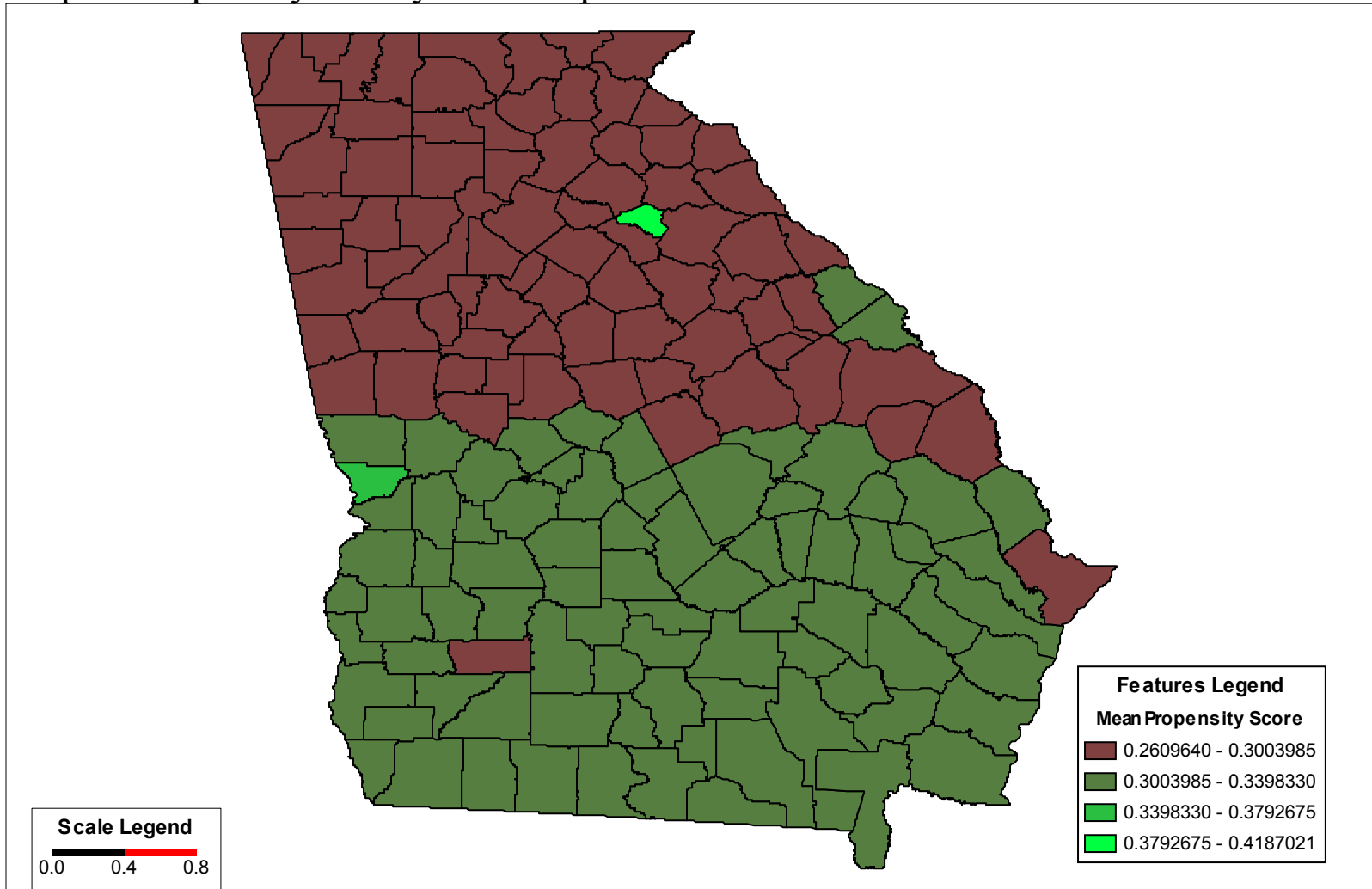
Map 5: Mean Dollar Amount Spent by Home Owners



Map 6: Mean Dollar Amount Spent by Plant Buyers



Map 7: Propensity to Buy Landscape Plant Score



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