Utilizing GIS-Based Site Selection Analysis for Potential Customer Segmentation and Location Suitability Modeling to Determine a Suitable Location to Establish a Dunn Bros Coffee Franchise in the Twin Cities Metro, Minnesota

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Abstract

Selecting a profitable location is the most important endeavor a business owner can invest in. Site selection suitability modeling determines the future of a business in vital areas of growth, expansion, and revenue. Entrepreneurs opt to analyze demographics and socioeconomic development of candidate locations to determine whether a proposed location will be a good choice or not. Businesses are continuing to become proactive in site selection analysis to eliminate or reduce long term losses. Business owners are targeting locations where potential customers are located by identifying those who will likely frequent a new business location. This project details necessary steps for conducting site selection analysis using Geographic Information Systems (GIS) to determine potential areas where one could establish a Dunn Bros Coffee house franchise. This analysis uses GIS for potential customer segmentation to identify a new Dunn Bros Coffee location in the Twin Cities Metro area. The project hypothesis is that successful client market area identification and segmentation have a significant positive impact on business growth, expansion, and revenue.

Introduction

Dunn Bros Coffee was established in 1987 when Ed Dunn opened the first coffee shop in St. Paul, Minnesota. The company purchases coffee beans from farmers around the world. It supports sustainability of farming partners and environmental practices where coffee is grown. Dunn Bros Coffee focuses on promoting community treasures like hanging local arts and playing local music where coffee shops are located. The company takes pride in roasting coffee daily to ensure each customer enjoys a fresh cup of coffee. There are coffee shops in nine states with most of the stores located in Minnesota. The stores are independently owned by franchisees. A Dunn Bros Coffee franchise opportunity can be attained by an individual with financial capital ranging from $125,000 - $160,000 (Dunn Bros Franchising Inc., n.d.a.). This provides opportunities for individuals with an entrepreneurial mind and a desire to establish a coffee house business.

Dunn Bros Coffee was selected for this research for the following reasons: (a) its focus on empowering communities where the shops are located by offering opportunity to individuals, (b) its support of fair trade to coffee farmers and, environmental sustainability where coffee is grown, and (c) its performance for being the highest-rated coffee franchise by Entrepreneur

Ringo, Linder G. 2009. Utilizing GIS-Based Site Selection Analysis for Potential Customer Segmentation and Location Suitability Modeling to Determine a Suitable Location to Establish a Dunn Bros Coffee Franchise in the Twin Cities Metro, Minnesota, Volume 11. Papers in Resource Analysis. 11 pp. Saint Mary's University of Minnesota University Central Services Press. Winona, MN. Retrieved (date) from http://www.gis.smumn.edu

Magazine's Franchise 500 (Entrepreneur, 2009). Dunn Bros Coffee provides support to qualified franchisees based on the company's franchise preset real estate criteria (Dunn Bros Coffee Franchising Inc., n.d.a.).

Background

Coffee is the second highest traded commodity and the largest valuable US food import (Global Exchange, n.d.). In recent years coffee drinking trends have saturated consumer markets and coffee drinking demand continues to grow in the United States and the world. According to a report presented by The National Coffee Association (2008), national coffee drinking trends showed a significant change on how society regards coffee drinking and its health benefits: (a) 17% of the adult population drinks coffee compared to 14% in 2007, (b) adults 25-59 in age represented 19% of the daily gourmet coffee drinkers. An increase in coffee consumption in 2008 was led by consumer beliefs that coffee is healthy and has a positive effect that increases mental focus and productivity. Young adults ages 18 -24 consumed an average of 3.2 cups per day. The survey results indicate and predict the future trends of coffee drinking to continue increasing (National Coffee Association, 2008).

According to MINTEL (2006), coffee markets experienced an increase of 157 % in 2000-2005. The report suggests by 2010 the coffee market will be up 125 %. The report also indicates that coffee shops in the United States has increased 70 % between 2000-2005, and included a statistics that, one coffee house exists per 14,000 Americans. In addition, MINTEL predicted the number will reach one coffee house per 10,000 Americans (MINTEL, 2006) soon. The report indicated a significant increase in coffee drinking and this in turn demonstrates opportunities for coffee house business expansion.

Business owners are using Geographic Information Systems (GIS) to identify customers and potential locations in order to establish new restaurant franchises. Many are using GIS technology to determine a suitable location by analyzing demographics, customer spending, and coffee drinking preferences.

According to Pittman (2006) "Site selection is both an art and a science, and location decisions are usually made only after a careful analysis of data sets and sophisticated financial and risk modeling". In a competitive business environment decisions for locating a new facility may come with repercussions. The repercussions can be avoided, reduced or eliminated by analyzing location costs, benefits, and return on investment (Pittman).

Project Background Information

For an entrepreneur to qualify for a Dunn Bros Coffee franchise opportunity, the company prefers a set of criteria to be considered. The Dunn Bros Coffee location criteria used in the project were obtained from the Dunn Bros Coffee web site under franchise information. The company suggests in order for a franchise to be profitable, the location must meet the following criteria (Dunn Bros Coffee Franchising Inc., n.d.a.):

- Located in Urban or Suburban area
- Have 1,600-2,000 square feet
- On the AM-drive side of the street
- Have strong visibility
- Ample parking with easy accessibility
- Minimum 20-foot frontage
- Mix of regional & national retail tenants (food and non-food)

- Average household income of $60,000+
- High daytime density/pedestrian traffic
- Outdoor seating a plus

For this project, the company's new franchise location criteria were categorized in two levels: macro and micro level. Macro level data included the following criteria: (a) the new location should be in an urban or suburban area; (b) in a retail area for food and non-food services; (c) in areas with average household income of at least $60,000.00.

Micro level data criteria included store square footage, availability of ample parking space, minimum of 20-foot frontage, and outdoor seating. In the planning process, micro level criteria are often analyzed and assessed later in the site selection process once a candidate location has been determined and selected through the macros analysis. With technology advancements, location analysis processes are easily completed with a GIS system. The results can be attained in a short time, and thereby, minimizing time, money, and resources.

This project was based on the macro level criteria. Current customer profile or market penetration data was not available for this study. The analysis was conducted using data available to the public. GIS technology was utilized to analyze data sets based on selected criteria to provide a visual map and results that could be used by a franchisee or business entrepreneur to make informed decisions about a suitable location to establish a Dunn Bros Coffee house franchise business.

Project Delimitations

Project data was publicly available from the internet. Limitations encountered through the analysis were the following: (a) availability of proprietary Dunn Bros Coffee store information due to confidentiality and disclosure procedures, (b) availability of US 2000 Census data for demographics and availability of social economic analysis data, (c) availability of customer spending data based on coffee option preferences, coffee drinking habits, and patterns, (d) and GIS data showing prime areas where coffee drinks sell better than others, (for example mocha vs. cappuccino or latte).

The analyses of this project were based on Dunn Bros Coffee's real estate franchising criteria. The data sets and variables used in the project were chosen to demonstrate the use of GIS technology and analysis tools in business site selection and to validate the site selection analysis based on Dunn Bros Coffee's macro real estate criteria.

Methods

Technology and Software Requirements

Computer based technology using GIS software was used to conduct the study. The following software and applications were used: ESRI's ArcGIS 9.3, Spatial Analysis tools, Microsoft Excel, and Notepad. These tools were used for data collection, transformation, manipulation, analysis, and presentation.

Data Collection

Data sets for this project were collected from a variety of data sources publicly available from the internet. Demographics and socioeconomic data were downloaded from the US Census Bureau. Dunn Bros Coffee store locations were obtained from the company website. The Twin Cities Metro shopping center locations, and Regional Planned Land Use - Twin Cities

Metropolitan Area data set were downloaded from the MetroGIS Data Finder website. Major roads data were obtained from the Minnesota Department of Natural Resources (MN DNR GIS Data Deli, 2009). Census block group level demographic data sets and selected variables were used in the site selection analysis to meet the macro level criteria.

Data Preparation

The project required a number of data sets to conduct the site selection analysis. The Dunn Bros Coffee store locations consisted of the stores in the seven counties metro area (Dunn Bros Coffee Franchising Inc., n.d.b.). The data set was used to determine whether some or all existing Dunn Bros Coffee locations meet the macro level site selection criteria.

The second data set was the Twin Cities Metro shopping center locations. Based on Dunn Bros Coffee franchise location criteria, the data set helped in the analysis process to (a) determine how many stores are currently located within or near shopping centers; and (b) that the data set meets the criterion that the Dunn Bros Coffee franchise location be in commercial or retail area or in an area of mixed businesses, food, and non-food services.

The third data set used was land use to determine the location vicinity. Dunn Bros requires the location to be in an urban or suburban area. The last data set used was US 2000 census data. This data was used for demographics and socioeconomic data derivation to determine where people with average incomes of $60,000.00 were located. This data set was used to assist client identification and segmentation of possible customers age 18 and above; the age segmentation was based on the 2008 coffee drinking trends report showing people from age 18 and older are coffee drinkers (National Coffee Association, 2008).

Data Analysis

The study area covers the Twin Cities Metro area (Figure 1). According to the Metropolitan Council (2009), the Twin Cities Metro area consists of seven counties that cover an area of 2,975 square miles (1,904,021 acres). Based on 2008 statistical estimates, the population count is 2, 870,250, number of households is 1,129,966, and the employed individuals count is 1,622,743 (Metropolitan Council).

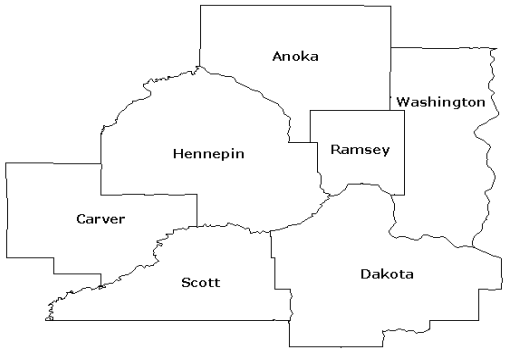

Figure 1. Study area consisting of the seven county Twin Cities Metro area.

Dunn Bros Coffee store locations within the Twin Cities Metro area are shown in (Figure 2).

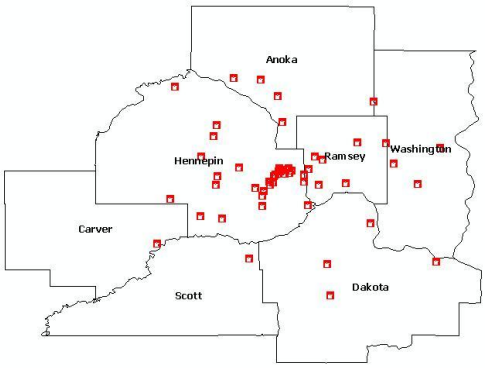

Figure 2. Seven counties metro study area and the 55 existing Dunn Bros store locations.

Data Analysis Processes

The project extent was a polygon layer representing the seven counties metro area. Data layers used in the analysis were queried and clipped to the project extent. Some of the data layers were clipped then spatially re-projected to the appropriate geographic coordinates to match the project polygon extent layer. The metro block group census data layer's spatial reference was set to Geographic Coordinate System: GCS_WGS_1984. Datum: D_WGS_1984. This coordinate system was used as spatial reference to best serve online programs such as Google Maps. Other layers were re-projected from the Projected Coordinate System: NAD_1983_ UTM_ Zone_15N. Projection: Transverse Mercator. Layers projected in UTM NAD83 were projected on the fly to match the project extent layer coordinate system.

Spatial reference manipulation was needed for several data layers. The following steps were performed: (a) ArcCatalog was used to set a spatial reference and geographic coordinates on the project data layers, and (b) data sets that were in a text (.txt) or comma separated value (.csv) file format were converted to shapefiles in order to be viewed and analyzed in ArcMap.

Geocoding and projection processes were conducted for the Dunn Bros locations. First, existing Minnesota Dunn Bros locations were downloaded from the company website. The store locations records were edited and imported into Microsoft Excel where latitude and longitude fields were added. Google Earth was used to extract latitude and longitude information for each location (there were 74 Minnesota locations). In the geocoding process the physical address and telephone of each store was used to validate the location information to ensure it matched both the text file and Google Earth. The store location information extracted from Google Earth was identified in Degree Minutes Seconds (DMS). A web tool from the Federal Communications Commission (FCC) website was used to convert the data into Decimal Degrees (DD) (Table 1).

Table 1. Sample Dunn Bros locations represented in latitude and longitude coordinates.

STORE_NAME	Latitude_DMS	Longitude_DMS	LATITUDE_DD	LONGITUDE_DD
Airport - Humphrey	44°53'15.94"N	93°11'43.95"W	44.887761	-93.195542
Airport - Main Terminal	44°53'15.94"N	93°11'43.95"W	44.887761	-93.195542
Albertville	45°14'40.95"N	93°39'47.46"W	45.244708	-93.663183
Alexandria	45°50'44.41"N	95°22'58.99"W	45.845669	-95.383053
Andover	45°13'10.23"N	93°19'19.22"W	45.219508	-93.322006
Anoka	45°13'23.30"N	93°23'45.51"W	45.223139	-93.395975
Bemidji	47°27'58.44"N	94°52'36.44"W	47.466233	-94.876789
Bryant & Lake	44°56'53.28"N	93°17'25.61"W	44.948133	-93.290447
Buffalo	45°11'7.79"N	93°52'29.99"W	45.185497	-93.874997

The excel file with updated latitude and longitude coordinates was saved as a text file and then was added to ArcMap using the Add XY Data tool. The locational attributes were then added as events. The events file lacked an Object-ID. To alleviate the problem, the location data set was exported to a shapefile to create an Object_ID for each record. This was useful for attribute selection when querying data. ArcCatalog was used to update the existing Dunn Bros locations shapefile spatial reference to match the reference system for the project extent layer Geographic Coordinates System.

Second, the census data block group shapefile was added to ArcMap. The metro block group boundary shapefile was used as a base map for the project. Finally, shopping centers, land use, and highways were added to the project.

Existing Store Location Analysis

There were 74 existing Dunn Bros Coffee stores. A few of these stores were located

out of the metro area. To resolve this problem, the stores locations were clipped to the project study area (Figure 1). This resulted in 55 store locations within the study area (Figure 2). Model Builder was used to run an overlay analysis to find existing locations that intersected with shopping centers. In the process, both files were represented as point shapefiles. In order to obtain accurate intersect results, an XY tolerance of .98375 miles was used in the analysis (Figure 3). This distance was obtained from an average sample of 8 shopping centers and 2 existing Dunn Bros locations. 51 locations resulted within this tolerance. Table 2 represents a small set of existing locations that are near or within the shopping centers location criteria. The travel distance and time was obtained using a Google Earth tool.

Table 2. Sample showing travel distance and time taken from two Dunn Bros Coffee locations to Shopping Centers within the area.

FROM	TO	DISTANCE (Miles)	TIME
1301 2nd Ave S	City Center	0.8	4min
	Crystal Court (IDS)	0.9	4min
	Gaviidae Common I	0.8	4min
	Midwest Plaza	0.9	4min
12601 Ridgedale Dr	Ridge Square South	0.5	2min
	Ridgedale	3.17	5min
	Ridge Square North	0.4	1min
	Bonaventure Mall	0.4	1min

The existing stores and shopping center intersection results suggest that Dunn Bros Coffee locations are visible to the public and are located high traffic areas. Consumers would likely patron a coffee shop while in or near shopping centers and in turn provide revenue for each store.

The next intersection analysis was conducted to identify metro block group areas containing both high income and existing Dunn Bros Coffee locations (Figure 4). Of the 55 existing stores (Figure 2) 33 of these store locations within the high income areas and met macro level criteria. Hence, the analysis provided a positive

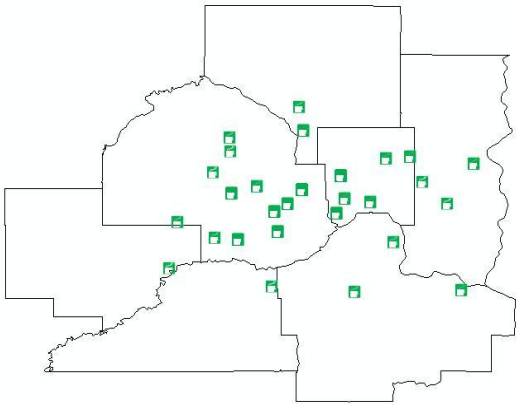

Figure 3. 51 Dunn Bros Coffee locations shown within approximately 1 mile of shopping centers.

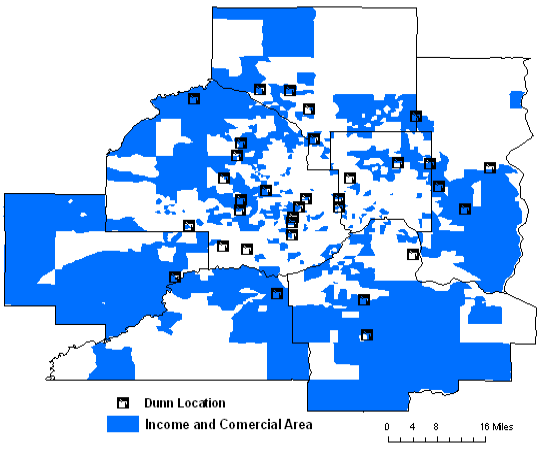

Figure 4. 33 Dunn Bros Coffee store locations that are located within high income (> $60,000.00) metro block group areas.

indication that these locations may have higher revenues compared to the other 22 stores that did not meet the macro level "siting" criteria. The analysis demonstrated Dunn Bros existing locations that met the macro level criteria were in urban areas, near or within shopping centers, and high income areas (Figure 5).

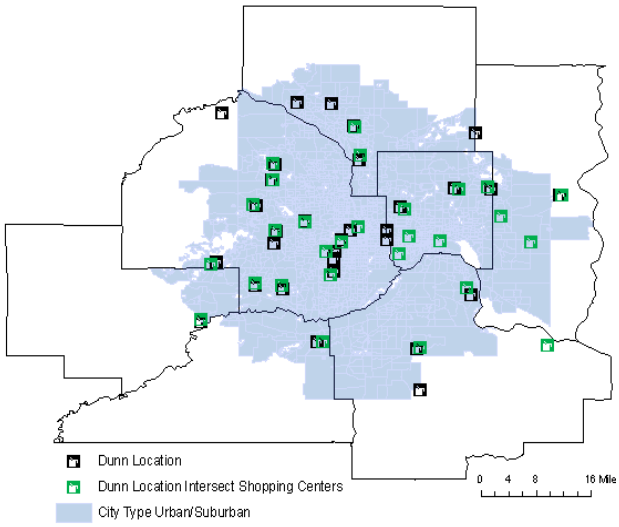

Figure 5. Dunn Bros Coffee locations within urban areas, shopping centers, and high income block group areas.

Figure 5 shows the Dunn Bros Coffee stores meeting some or all macro level criteria. The income criteria posed a strong argument that people with high income do not necessarily live in urban areas but rather commute to urban areas. A selection by location query was conducted on six closed or relocated stores. It was determined even the closed or relocated stores met the macro level analysis criteria.

This analysis indicates that for some, a store's success depends on factors other than location. Hence, multiple variables should be used to identify a suitable location. Factors that could be analyzed further could be the competitors' sales performance, customer spending, and consumer coffee drinking preferences. Thorough research would need to be conducted to evaluate and implement competitive strategies could be devised to attract and retain customers by offering incentives. Location visibility and accessibility, availability of amenities such as Wi-Fi, drive thru, and outdoor seating are some options.

Possible New Location Analysis

Building off existing locations that met macro level criteria, a new location(s) could be established in the vicinity. Two income data layers were combined to provide one income data layer to be used in the new store location analysis. The variables used to create the income layer were:

1. Average household income
2. Household Income 50K-75K
3. Household Income 75K-100K
4. Household Income 100K-150K
5. Household Income 150K+

The Regional Planned Land Use - Twin Cities Metropolitan Area data layer was used to find places that occurred within areas designated for retail or commercial purposes. This category of land use (commercial) is primarily engaged in the provision of goods or services for an unspecified market area. In ArcMap, a select query was used to subset commercial land from the land use layer. Second, a select by location query was used to select features from the income data layer that intersected with the land use layer with areas for commercial/retail goods and services (Figure 4). Third, Model Builder (Figure 6) was used to execute a select query on the population age 18-55 or higher and who were located in urban and suburban areas.

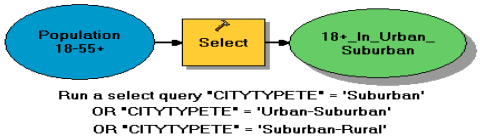

Figure 6. Model Builder select query sample to identify population ages 18-55 in urban and suburban areas.

Raster analysis was conducted on daytime populations (a concept referred by US Census Bureau as the number of people

who are present in an area during business hours including workers). The daytime population analysis results were reclassified to identify areas with low to high population age 18 and above. A semi-transparent urban/suburban layer was then added to the ArcMap session to further help understand the spatial consistencies with the urban daytime population layer (Figure 7). The light green shade of color in Figure 7 represents a lower daytime population, and the solid green color represents areas with high daytime population concentrations:

- Low value 0 – 2,122
- Medium value 2,122 -7,821
- High value 7,821 – 51,905

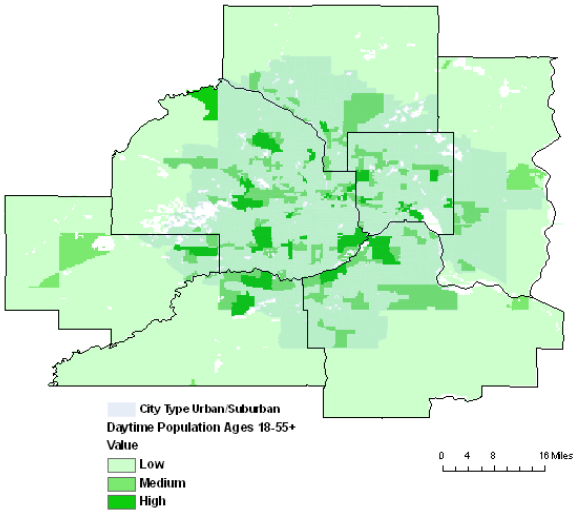

Figure 7. Daytime population ages 18 – 55+ showing where low to high numbers of population are located in urban and suburban areas.

Raster analysis and reclassification was conducted on the following data layers: (a) daytime population, (b) income and commercial area, and (c) income. These data layers were combined and major roads were added to display possible areas where one could establish a Dunn Bros Coffee franchise according to the macro level analysis criteria of daytime population, high income, and land use. These data layers were converted into raster layers with the use of Model Builder (Figure 8). Next, each raster layer was reclassified to represent both suitable and not suitable areas.

Finally, the raster calculator (Figure 9) was used to determine suitable locations for a Dunn Bros Coffee franchise by adding the three reclassified raster layers to obtain

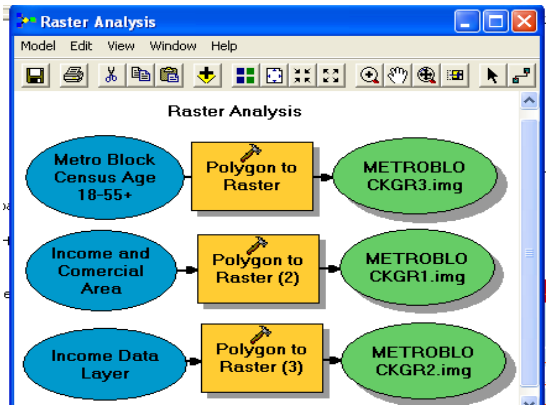

Figure 8. Raster analysis using Model Builder.

final map output (Figure 10). This output raster layer shows 13 metro block groups as suitable locations (represented on a map with solid red color) where one could consider establishing a Dunn Bros Coffee franchise.

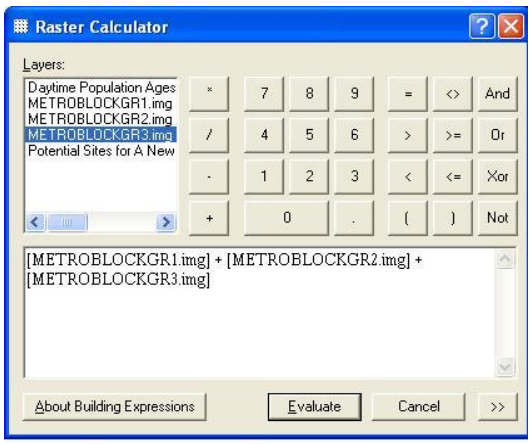

Figure 9. Raster Calculator showing the 3 reclassified raster data layers that were added.

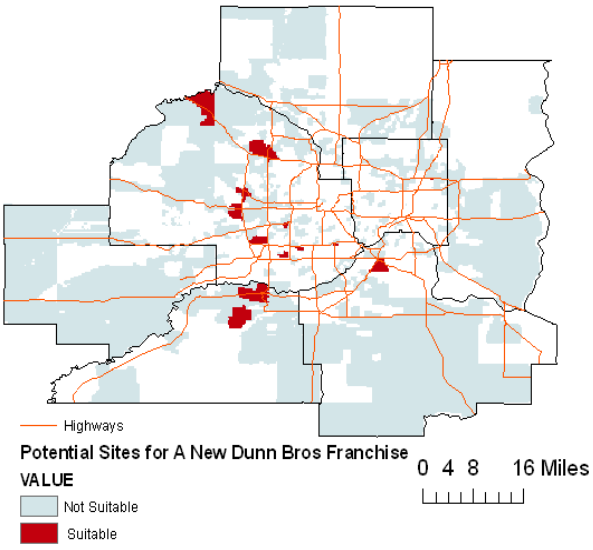

Figure 10. Suitable locations (red color) to establish a Dunn Bros Coffee franchise. White areas did not fit in the analysis based on the criteria used to conduct this study.

Results

The study indentified the following:

1. Over 50% of Dunn Bros Coffee existing stores met the macro level criteria.
2. Six closed or relocated stores met the macro level criteria; this means other factors may have caused the owners to relocate or close the store. One of reasons could be store's accessibility, visibility or drive thru the services.
3. Figure 10 represents a Twin Cities metro map showing areas where a Dunn Bros Coffee franchise could be established according to the analysis criteria. The areas highlighted in red are the most suitable and areas in light blue are less suitable (not suitable). The white areas on the map are not considered as suitable or less suitable based on macro level analysis criteria used in the study.
4. Income variables can change the outcome as demographics indicated people with high income were located in the outer part of the metro.
5. The suitable locations identified from the study are located near highways; this indicates the new location could be easily accessed from the highways.

Conclusions

The project was designed to assess Dunn Bros Coffee franchise site locations in reference to Dunn Bros 'siting' selection criteria based on macro level criteria. The results from the study can be useful to the public, Dunn Bros Coffee's real estate team, and business entrepreneurs in the area.

The analysis also demonstrated how GIS can be used to provide a spatial depiction of suitable location(s) where an entrepreneur could establish a Dunn Bros Coffee house franchise. Finally, it demonstrates that GIS technology and applications analysis of this project can assist entrepreneurs in making informed decisions before venturing into a franchising opportunity.

Closed or relocated locations were few compared to the total number of existing stores. Most were relocated to the same area but at a different address. The reasons might have been based on micro level criteria to ensure the site is visible and provides amenities to the public such as drive thru service, outdoor seating, and/or ample parking for customers who patron the store.

Using GIS site selection analysis can eliminate guess work and provide insight about a business location and its future. The results from the study provide economic insights and opportunities for growth to the community where a potential franchise could be located. In the long run the franchise could create jobs, revenue, taxes,

and all these in turn would improve community's socioeconomic status and individuals well being.

The suitable locations identified in the study indicate a new Dunn Bros Coffee could be established in any of the 13 metro block group areas. ESRI tapestry information (ESRI, n.d.) on the zip code on or around the identified metro block groups suggest the following cities are suitable locations: Rogers, Minnetonka, Plymouth, Hopkins, Minneapolis, Prior Lake, Savage, Shakopee, and Saint Paul. These communities possess and consist of a higher number of the following characteristics (ESRI, n.d.):

- Located in suburban areas
- Consist of affluent family markets
- Educated working professionals
- Families live a busy upscale lifestyle
- Median household income ranges from $69,166 - $113,231

The aforementioned characteristics fit the macro level criteria. The suitable locations identified from the study could now be evaluated for micro level analysis. An entrepreneur would have to visit the sites for physical location analysis and infrastructure evaluation to ensure that a candidate location meets the micro level criteria. This analysis can lower the number of potential locations to those identified as best candidates. Even though the suitable locations met the macro level criteria, some locations may or may not meet the micro level criteria. The entrepreneur would need to make informed decisions based on business plans, goals, and objectives. Conducting strategic marketing that is customized to the clientele in the area will increase the chances that a new Dunn Bros Coffee franchise will thrive.

For future analysis, the suitable locations could be analyzed and compared to other coffee house business competitors in the area. The analysis could be conducted on some of the following sample characteristics: customer spending, customer specialty coffee preferences, coffee markets in the area, coffee house business growth and failures, community developments, and business operation challenges in the area.

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