# Site Selection with Enterprise Sales Data

## Using customer data to select new sites

*—by Fred L. Miller*

## Introduction

### Problem

Two years ago, Janice Brown and Steven Bent opened the first *Living in the Green Lane* store in the Minneapolis-St. Paul area.[1] Their concept, a home center for environmentally concerned consumers, has been very successful. Their core customers have been "green" consumers who are motivated either by environmental concerns or the economic savings available from green technologies (Schaefer 2007). These consumers tend to have higher levels of income, education, and home value than the general population of the United States (Kannan 2007).

In the past two years, the store has surpassed projected sales, established a solid base of customers (especially with its Living Green loyalty club, with almost 600 members), and achieved a reputation in the Minneapolis-St. Paul area as an innovative advocate of green building products and techniques.

To build on this success, *Living in the Green Lane*'s owners plan to grow their business in two ways: by (1) increasing sales to current customers with the green lifestyle concept and (2) opening new stores to increase sales from new customers in the market area.

This *SpatiaLAB* focuses on the second of these growth strategies. Your challenge is to use enterprise sales data from Living Green loyalty club members to analyze sales patterns for the firm's first store, evaluate potential sites for two new stores, and recommend the best locations for those stores.

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[1] The organizations and people in this SpatiaLAB are fictional. Any resemblance to actual individuals or organizations is coincidental.

## Location

Minneapolis-St. Paul core-based statistical area

## Time to complete the lab

Four to six hours

## Prerequisites

An understanding of the importance of using customer profile data in the site selection process for an existing retail enterprise

Access to Esri Business Analyst™ Desktop Premium 10

## Data used in this lab

- Demographic and consumer spending data at various levels of geography
- Market Potential Index values from GfK Mediamark Research & Intelligence, LLC (GfK MRI), a leading market research group
- Business listings for home center and shopping center data

# Student activity

To identify the best sites for new *Living in the Green Lane* green living centers, you will perform two tasks in this SpatiaLAB, each composed of several steps. Your first task is to assess the potential growth within *Living in the Green Lane*'s current market area by analyzing the distribution of sales data, market penetration rates, and distance decay models. These tools will help you understand the spatial distribution of the firm's sales more fully and determine the remaining potential market within this area. You will perform this task in three steps.

First, you will create market area polygons around *Living in the Green Lane*'s store based on sales volume to determine the spatial distribution of the firm's customers and sales volume.

Second, you will perform penetration analysis to evaluate the remaining sales potential within these areas. If sufficient sales potential remains, the prospects for sales growth from the new product and service lines are brighter, and the benefit of using this store's market area as a model for evaluating expansion opportunities increases as well.

Third, you will develop distance decay maps and reports to assess the attractiveness of *Living in the Green Lane*'s store relative to distance. This will help you determine whether the three- and six-minute drive-time polygons you used to select this store match the firm's actual sales pattern. If they do, it is appropriate to use them as the market area definition for evaluating locations for potential expansion.

You will then evaluate the attractiveness of the available properties in the Minneapolis-St. Paul area as potential locations for *Living in the Green Lane*'s second and third stores. You will begin your analysis with *principal component analysis*, a statistical technique that ranks available sites on their similarity to a model site, in this case *Living in the Green Lane*'s store. You will use this tool to identify the most attractive potential sites.

Your next step will be to estimate the sales potential of the most attractive potential site with the *Advanced Huff Model*. This tool will help you estimate potential sales at the new site by evaluating that site's competitiveness relative to nearby home centers based on factors such as distance, size, and environmental orientation. This screening process produces a short list of potential sites from which you would select the locations for the second and third stores.

At the conclusion of this lab, you may be required to submit written answers to the questions in this exercise or prepare a written project that covers the site selection decision process you perform here.


## Conventions used in the data

**CBSA** Core-based statistical area

**CY** Current-year data

**FY** Future-year projections, which are five years beyond the current year

**HH** Household

**MPI** Market Potential Index, consumer survey data covering hundreds of values, behaviors, shopping patterns, and media exposure, provided by GfK MRI


## Prepare your workspace

This lab uses Business Analyst™ Desktop Premium 10 to perform the analysis. To prepare for it, you should confirm that this software is available on your workstation.

The nearly 600 members of the Living Green loyalty club are *Living in the Green Lane*'s best customers. They shop at the store more frequently and purchase in higher volumes than do the rest of the customer base. For that reason, you will use sales data from this group to perform sales-based trade area analysis of that store.

**1**    If you have not already done so, copy the *LITGL Minneapolis St Paul* project folder to the *C:\My Output Data\Projects\* folder on your hard drive.

**2**    Click *Start » Programs » ArcGIS » Business Analyst » BusinessAnalyst.mxd* to run ArcMap™, load *Business Analyst Extension*, and then load *Business Analyst Message Center*.

**3**    Click *LITGL Minneapolis St Paul* under *Recent Projects* to select this project and load the business GIS default map.

**4**    Click *File* and click *Open*. Navigate to *C:\My Output Data\Projects\LITGL Minneapolis St Paul\CustomData\ChapterFiles\Chapter7\LITGLExpansion.mxd*. Click the map file to open it.
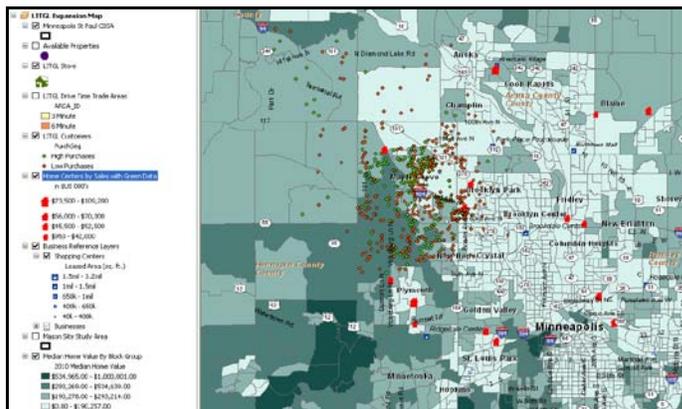


This is similar to the map you designed at the end of SpatiaLAB 6. It contains a layer for the *Living in the Green Lane* store, a layer displaying available expansion sites (which is turned off), an *LITGL Customers* layer displaying Living Green Club members, a layer displaying competing home centers, a drive-time trade area layer (which is turned off), and a thematic layer depicting *Median Home Value* based on a dataset customized for this firm. There is also a study area layer, *Mason* site, that you will turn on and use later in this lab. You will use these resources to continue your analysis and select a site for the second and third *Living in the Green Lane* stores.

**5**    Click the drop-down arrow on the toolbar and click *Trade Area*. Select *Create New Trade Area* and click *Next*.

**6**    Select *Customer Derived Areas* and click *Next*. Select *LITGL Store* as the store layer and *ID* as the ID field. Select the *All stores* option and click *Next*.

**7**   In the resultant window, select *LITGL Customers* as the *Customer* layer and *StoreID* as the *Store assignment* field and then click *Next*. In the resultant window, select the *By a weighted value* option and designate *LYPurchase* as the weighted field.

The window should resemble this:
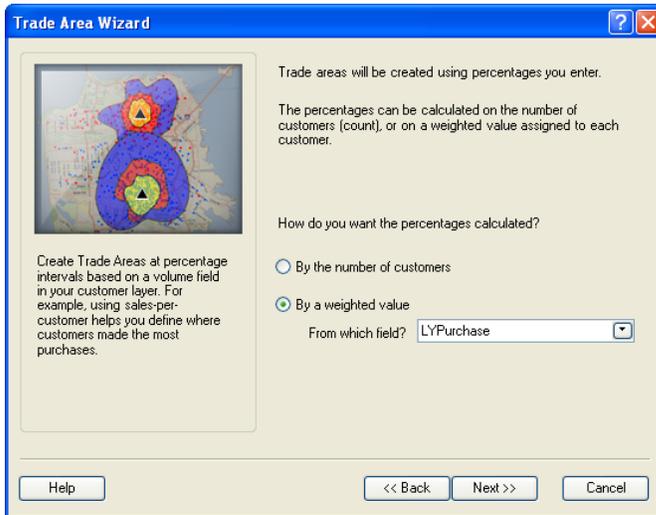


These are important settings in designing customer-derived trade areas. The first option, *By the number of customers*, would create polygons encompassing designated percentages of total customers. In contrast, the second option, *By a weighted value*, employs a user-designated attribute to seek concentrations based on some other value. In this case, that value is sales, which means that the trade areas you create will encompass designated percentages of total sales, thus assigning more weight to customers with high purchase levels than to those with lower levels. This is consistent with the customer profiling task you just performed, which concentrated on profiling customers with high levels of purchases.

**8**   When your window matches the image above, click *Next*. In the resultant window, select *2* as the number of trade areas to create and enter **50** and **80** as the percentage of sales to include in the inner and outer trade area polygons, respectively.

The window should resemble the one below. When it does, click *Next*.
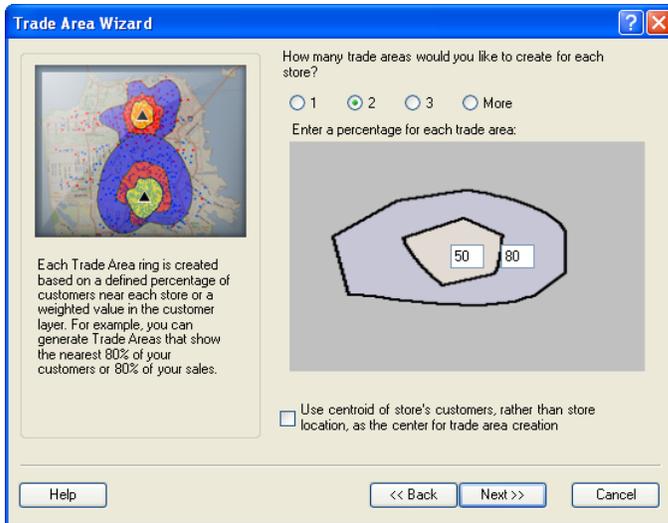
**9**  In the resultant window, select each of the available options and read its description below the sample map. Select the *Detailed With Smoothing* option and then click *Next*. In the resultant window, enter **Percent of Sales Trade Areas** as the name of the trade areas, select the *Create Reports* option and then click *Next*. In the resultant window, select the *For Individual Features* option, and then click *Next*.

**10**  The resultant *Report Templates* window lists the available report templates in the box on the left. To select a report, simply move it from the box on the left to the box on the right with the arrow keys between the two boxes.

**11**  Click the *Market Profile* and *Tapestry Segmentation Area Profile* reports to select them, and then click the right arrow between the boxes to move them to the box on the right and order these reports. Click *Next*.

**12**  In the final window, select the *View reports on screen* and *Create single report file* options. (You can export a report to a data file in several formats after your initial reading.) Click *Finish*.

The software creates the trade areas, adds them to the map as a layer, and produces the reports you ordered. The reports will open in the center of your screen, obscuring the map layer. Review them to determine how well the households in this trade area match the green customer profile.

**Question 1:**  *How do the characteristics of these trade areas compare with the green customer profile? What does this mean for the prospect of successful penetration strategies in these trade areas?*

**13**  Close the report to view the trade areas displayed on the map, which should resemble the one on page 7. Toggle the display of *Percent of Sales Trade Areas* and *LITGL Drive Time Trade Areas* that was used to determine the site of the first store.

If *LITGL Drive Time Trade Areas* is the larger of the two, you have overestimated the attractiveness of *Living in the Green Lane*'s store. If *Percent of Sales Trade Areas* is larger, you

have underestimated the attractiveness. That is, in the latter situation, you are drawing customers from a larger geographic area than you anticipated, indicating a more attractive retail concept. This, in turn, means that you can use a more extensive trade area definition to search for sites for the second and subsequent stores.
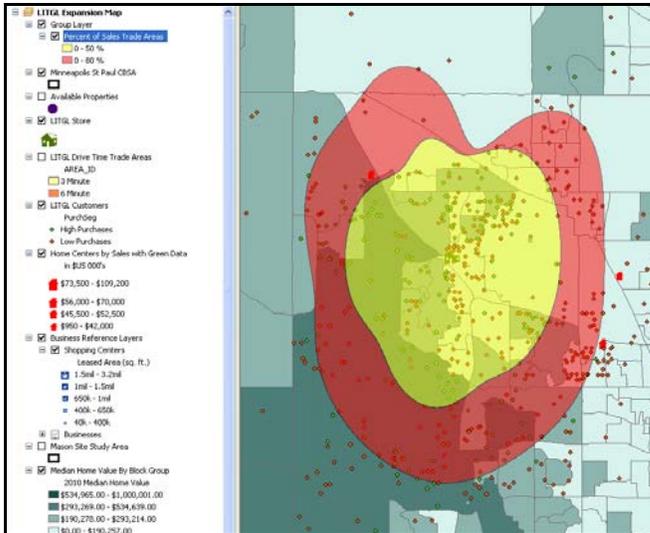


**Question 2:** *Is Percent of Sales Trade Areas larger or smaller than LITGL Drive Time Trade Areas? What is the implication of this conclusion for using the Drive Time Trade Areas approach in future site selection decisions?*

## CREATE TRADE AREA PENETRATION MAP AND REPORT

Trade area penetration analysis determines the level to which a firm has achieved market penetration in terms of either a percentage of potential customers or a percentage of potential sales. You will use this tool to determine the exact levels of customer and sales penetration you have achieved in *Percent of Sales Trade Areas*.

1    Turn off the *Drive Time Trade Areas* layer. Click the drop-down arrow on the toolbar and click *Trade Area*. Select *Trade Area Tools* and click *Next*. Select *Determine Trade Area Penetration* and click *Next*.

2    In the *Customer Layer* drop-down box, select *LITGL Customers* as the customer layer, confirm that the *Use a weight in the customer layer* option is *not* selected, and click *Next*. Select *StoreID* in the *Select Store ID* field in the *Customer layer* box and click *Next*.

3    In the resultant window, select *Percent of Sales Trade Areas* as the trade area layer. Select *AREA_ID* and *AREA_DESC* for the *trade area ID* and *Name* fields, respectively.

When the window resembles the one below, click *Next*.

4    In the resultant window, select *StoreID* in the *Select Store ID* field in the *Customer layer* box and *ID* in the *Select ID* field in the *Trade Area layer* box. Click *Next*.

5    In the resultant window, select the *Calculate using local Business Analyst data* option, and then select *Standard Business Analyst Data* as the data layer and *CY Total Households* as the data field.

6    When your screen resembles the one below, click *Next*.
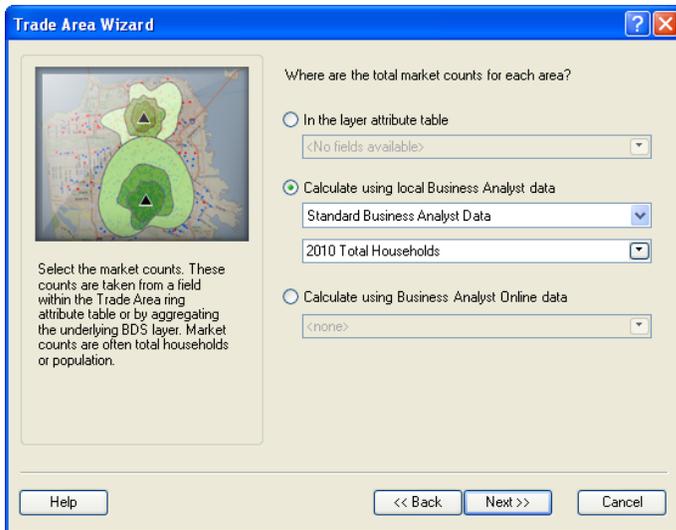


You have specified, with these settings, the customer and trade area layers you wish to study. In addition, you have specified that you wish to view penetration values for *Living in the Green Lane*'s customers as a percentage of households in the trade area. This will indicate how fully you have penetrated the potential customer base of the market area.

7    In the resultant window, enter **Trade Area Penetration** as the *Trade Area* name, select the *Create Reports* option, and click *Next*.

**8**     Enter ***Trade Area Penetration Report*** as the *Report* name and title. Click *Finish*.

The software determines the trade areas and displays them on the map. This layer is identical to *Percent of Sales Trade Areas* in shape but displays the penetration values of each polygon in the legend. In this case, penetration is defined as the number of *Living in the Green Lane* customers divided by total households in the trade area.

The system also displays the *Trade Area Penetration Report*, which reports penetration rates in a table as well as a graph. These penetration rates are based on the number of customer households relative to total households. You also wish to compare penetration rates measured in terms of purchases, so you will revise the *Trade Area Penetration* Wizard to include slightly different settings.
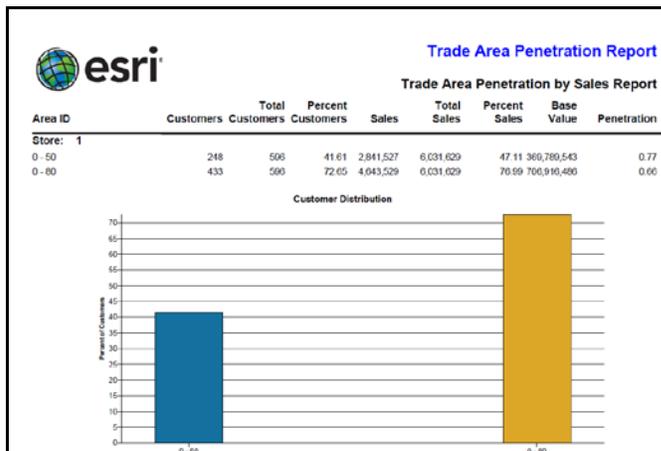


**9**     Click the drop-down arrow on the toolbar and then click *Trade Area*. Select *Manage Existing Trade Area(s)* and click *Next*. In the resultant window, select *Trade Area Penetration* and then select the *Modify Trade Area* option. Select *Customer Data Required*. Click *Next*.

**10**   Choose *Trade Area Penetration*. Click *Next* to revise *Trade Area Penetration Wizard* by repeating the steps you performed earlier but with different settings.

**11**   In the *Customer layer designation* window, retain *LITGL Customers* as the customer layer. Select the *Use a weight in the customer layer* option, designate *LYPurchase* as the weighted field, and choose *StoreID* in the *Select Store ID* field in the *Customer layer* box. Click *Next*.

**12**   Select *Percent of Sales Trade Areas*, *AREA_ID*, and *AREA_DESC* as the settings and then click *Next*. In the next window, retain the *StoreID* and *ID* settings and click *Next*. In the next window, retain *Standard Business Analyst Data* as the data source and select *Shelter: Tot* as the data field. Click *Next*.

**13** In the next step, enter ***Trade Area Penetration by Sales*** as the layer name, select *Create Reports*, and click *Next.* Enter ***Trade Area Penetration by Sales Report*** as the *Report* name and title and select *View Report*.

**14** Click *Finish* to run the analysis.

With these new settings, you have specified that you wish to view penetration values for a weighted field, *LYPurchase* (purchases in the past year), as a percentage of total consumer expenditures on shelter. This is consistent with the pattern of concentration on sales levels from the profiling task as well as the *Percent of Sales Trade Areas* approach. The software revises the map layer to reflect these settings and calculates a new report.

Review the report, which resembles the one below. Like the initial one, it displays the number of customers and percentage of total customers in each of the defined trade areas. It also displays total purchases and percentage of total purchases for each of the trade areas. In this report, however, the penetration rate is calculated using total customer purchases as a percentage of total shelter expenditures in the trade areas. High numbers indicate a strong sales presence by *Living in the Green Lane*, while lower numbers indicate that greater market penetration is possible if the profile of the market area matches that of high-volume customers. Recall that *Shelter: Tot* is the broadest category of housing-related expenditures and includes categories *Living in the Green Lane* does not offer. As a result, the company's market penetration will be understated.



**Trade Area Penetration Report**

**Trade Area Penetration by Sales Report**

| Area ID | Customers | Total Customers | Percent Customers | Sales | Total Sales | Percent Sales | Base Value | Penetration |
|---------|-----------|-----------------|-------------------|-------|-------------|---------------|------------|-------------|
| Store: 1 | | | | | | | | |
| 0 - 50 | 248 | 596 | 41.61 | 2,841,527 | 6,031,629 | 47.11 | 369,789,543 | 0.77 |
| 0 - 80 | 433 | 596 | 72.65 | 4,643,529 | 6,031,029 | 76.99 | 700,916,486 | 0.66 |

*Customer Distribution*

**Question 3:** *How do the penetration rates differ between the two levels of this trade area? Based on these values, is there opportunity for future sales growth in these areas?*

## CREATE DISTANCE DECAY MAP AND REPORT

Distance decay trade areas report penetration rates based on numbers of customers and/or customer purchases for trade areas defined by distance. Thus, they are similar to the original trade area model you used to select the site for *Living in the Green Lane*'s store. You will use this model to evaluate market penetration relative to drive-time distance from that store.

**1**    Turn off the *Trade Area Penetration* layer.

**2**    Click the drop-down arrow on the toolbar and click *Analysis*. Select *Create New Analysis* and click *Next*. Select *Site Analysis* and then click *Next*. Select *Measure Distance Decay* and click *Next*. Select *LITGL Store* as the store layer and *ID* as the ID field. Select the *All stores* option.

**3**    Your screen should resemble the one below. When it does, click *Next*.
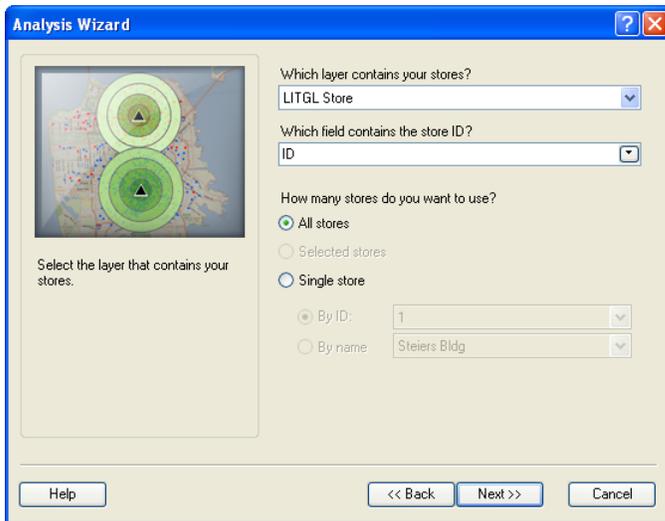


**4**    In the resultant window, select the *Drive Time* option, enter **3** as the number of rings you wish to create, and enter **3 minutes** as the size of each ring. Click *Next*.

**5**    In the resultant window, select *LITGL Customers* as the customer layer, but do not select the weight field option. Select *StoreID* as the *Store ID* field in the *Customer layer* box, and then click *Next*.

**6**    In the resultant window, select the *Calculate using local Business Analyst data* option and select *Standard Business Analyst Data* as the data source and *CY Total Households* as the data field. Click *Next*.

**7**    In the resultant window, enter **LITGL Distance Decay** as the *Analysis* name. Select the *Create Reports* option and then click *Next*. Select the *Generate Report* and *View Report* options.

**8**    Enter **LITGL Distance Decay Report** as the *Report* name and title, confirm that the *View Report* option is selected, and then click *Finish*.

The system creates *Distance Decay Trade Areas* based on drive times and adds them as a layer to the map. Note that these trade areas are comparable in size to *Percent of Sales Trade Areas*, indicating that *Distance Decay Trade Areas* encompass roughly 80 percent of *Living in the Green Lane*'s annual sales, which is significant coverage of the company's sales base.
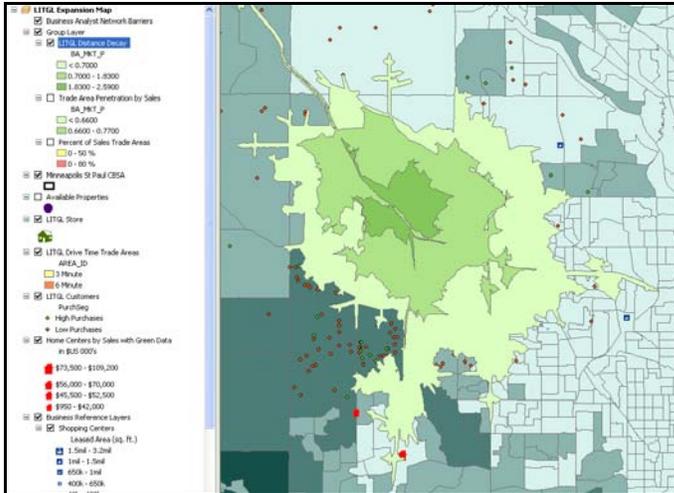
The software also generates a *Distance Decay Areas Report*, which reports the distribution of customers and penetration rates based on number of customers for the three drive-time trade areas. Note in the report that as distance from the store increases, the penetration rates of the drive-time trade areas decrease, confirming the central assumption of the distance decay concept.

## GENERATE REPORT

You will revise the analysis to determine whether this is true for the concentration of purchases across the drive-time areas as well.

1   Click the drop-down arrow on the toolbar and click *Analysis*. Select *Manage Existing Analyses* and then click *Next*.

2   In the resultant window, select *LITGL Distance Decay* analysis, select the *Modify Analysis* option, and click *Next* to revise *Distance Decay Analysis Wizard* by repeating the steps above.

3   Select *Site Analysis* and then click *Next*. Select *Measure Distance Decay* and click *Next*. Select *LITGL Store* as the store layer and *ID* as the ID field. Select the *All stores* option.

4   In the resultant window, select the *Drive Time* option, enter **3** as the number of rings you wish to create, and enter **3 minutes** as the size of each ring. Click *Next*.

5   In the resultant window, select *LITGL Customers* as the customer layer. Select the *Use a weight in the customer layer* option and designate *LYPurchase* as the weighted field.

6   Select *StoreID* in the *Select Store ID* field in the *Customer layer* box and then click *Next*. Select *Standard Business Analyst Data* as the data layer and *Shelter: Tot* as the data field, and then click *Next*.

**7**    In the next window, name the analysis *LITGL Distance Decay by Sales*, select the *Create Reports* option, and then click *Next*.

**8**    Enter *LITGL Distance Decay by Sales Report* as the *Name* and *Title* of the report, select the *View Report* option, and then click *Finish* to run the analysis.

The software revises the map layer to reflect these settings and creates a new report. That report resembles the one below. Note that penetration rates measured in terms of sales follow the same pattern as the rates based on number of customers.
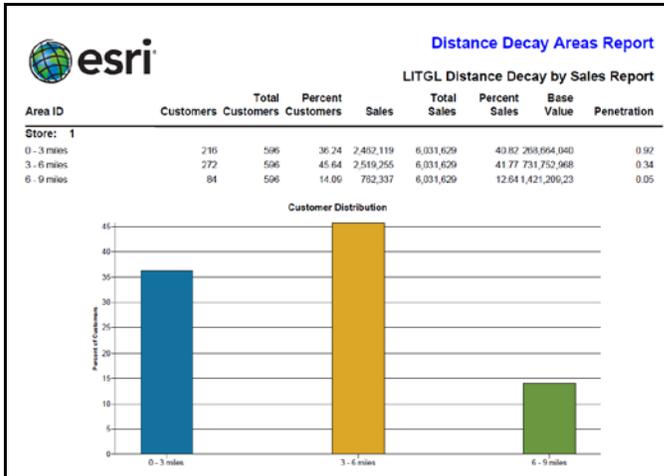


**Question 4:**   *How do sales levels compare in the three areas of the distance decay chart? Penetration rates? What conclusions do these values support relative to the size of the trade area for Living in the Green Lane's store?*

## FIND SIMILAR SITES WITH PRINCIPAL COMPONENT ANALYSIS

The *Find Similar* analytic tool evaluates a set of potential sites to determine which ones best match a site designated as the model store. It uses two approaches: the conventional *Find Similar* method and a statistical technique known as *principal component analysis*. In both, you define attributes to be used as a basis for comparison and use them to rate alternative new sites. As the *principal component analysis* option produces a ranking of all available sites, you will use this approach.

Based on the success of the current store and the attractive characteristics of the market area it serves, you will use the current *Living in the Green Lane* store as the model against which other potential sites will be compared.

**1**    Turn off the *LITGL Customers* layer and all trade area layers in the map and turn on the *Available Properties* layer in the *table of contents*. Right-click this layer and then click *Zoom to Layer* to view all the sites in the layer.

Note that it displays several potential expansion sites around the Minneapolis-St. Paul area as well as *Living in the Green Lane*'s store. Janice and Steven's revision of the site criteria they are seeking, as well as their willingness to build new facilities if necessary, serves to increase the range of sites suitable for new *Living in the Green Lane* stores. In addition, based on the size of the *Percent of Sales Trade Areas* layer, you will use a three-mile-ring buffer to evaluate these available sites.

**2**  Click the drop-down arrow on the toolbar and then click *Analysis*. Select *Create New Analysis* and click *Next*. Select *Site Analysis* and then click *Next*. Select *Rank Similar Sites (Find Similar)* and click *Next*.

**3**  In the resultant window, select *Available Properties* as the trade area layer, define a **3**-mile buffer around each site, and select *11:11* as the master site and *Standard Business Analyst Data* as the summarization level.

**4**  The window should resemble the one below. When it does, click *Next*.
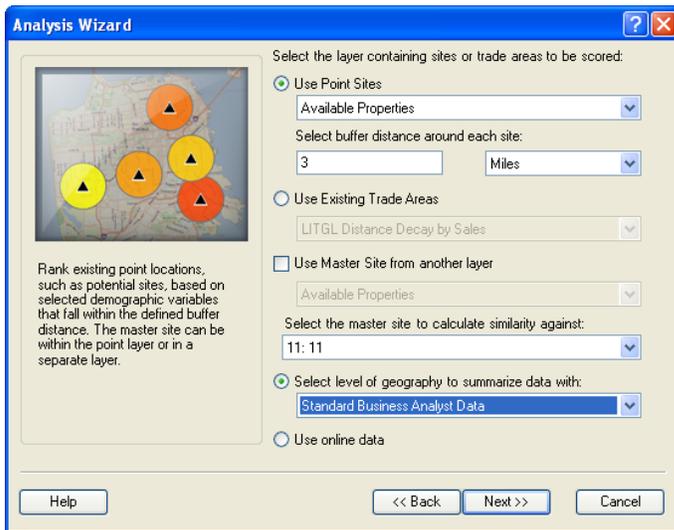


**5**  In the resultant window, select *Principal Components Analysis* as the method to use and enter **6** as the number of sites to rank. Click *Next*.

**6**   In the resultant window, select the attributes below from the list of available fields and click the single right arrow to move them to the box on the right. The window should resemble the one below. When it does, click *Next*.

- ▪   *CY Owner Occupied HU*
- ▪   *CY Median HH Income*
- ▪   *CY Median Value: Owner HU*
- ▪   *Shelter: Tot*
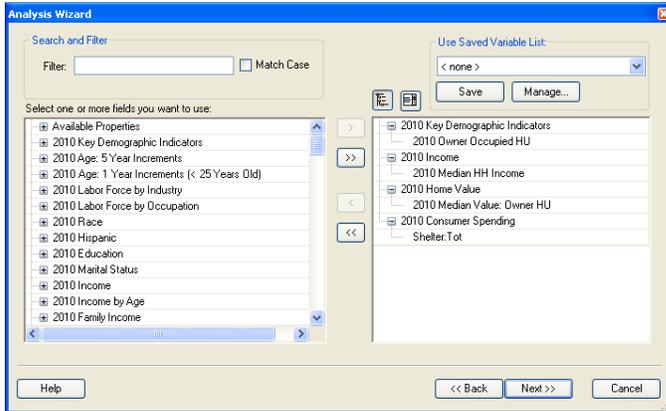


**7**   In the resultant window, enter **PCA Site Ranking** as the *Analysis* name and then click *Finish*.

The software performs the principal component analysis you specified, creates a three-mile buffer for each site, evaluates each using the attributes you specified, ranks the sites, creates a layer that displays the number of ranked sites you specified, and displays them on the map. Your map should resemble the one below:
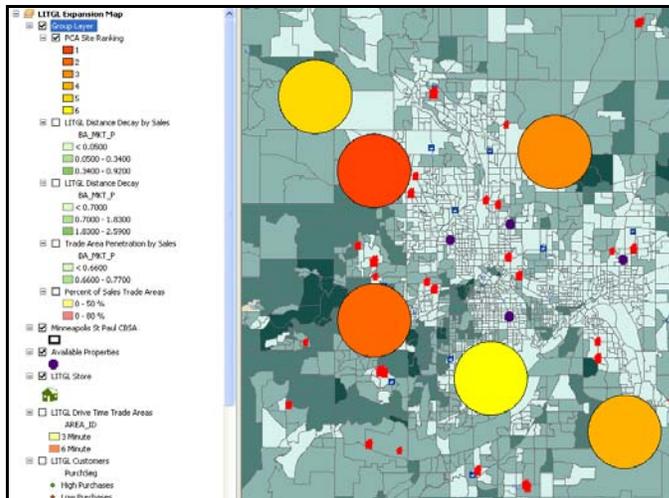


Not surprisingly, the highest ranked site is the model site, *Living in the Green Lane*'s existing store. All the other sites are those that most closely match this model store. These are the most attractive sites for new *Living in the Green Lane* stores.

To view the sites and their rankings, open the attribute table for the new layer. Select the features in the table one by one to view the site on the map and review the values of the site for the attributes used in the selection process. In the table below, the three most highly ranked sites are selected. These sites are those displayed as selected in the map on page 15.



**Question 5:** *Which sites have the highest principal component analysis ranking relative to Living in the Green Lane's existing store?*

## EVALUATE SITE COMPETITIVENESS WITH ADVANCED HUFF MODEL

These sites have now been ranked on market attractiveness relative to key attributes of *Living in the Green Lane*'s high-value customer profile. You must also evaluate the competitive environment of the most attractive sites to recommend the best location. You will use the *Advanced Huff Model* to do so.

The *Advanced Huff Model* allows you to assess the strength of a potential location relative to existing competitors in a general market area by taking into account a variety of factors that affect competitiveness. For example, the attractiveness of a store to a potential customer generally decreases as distance from the store increases. Similarly, attractiveness generally increases as the size of the store increases and, thus, its ability to offer a wider product line. While these two factors influence *Living in the Green Lane*'s competitive environment, two others are, in Janice and Steven's view, also relevant: the commitment of the store to green lifestyle products, as measured by the percentage of its products that are environmentally friendly, and the breadth of its mix of green products and services. The latter factor is measured as a rating from 1 to 10, with 10 representing a very wide range of green products and 1 a very narrow range.

The *Advanced Huff Model* allows you to incorporate these factors into your competitive analysis. You will use it to assess the competitive strength of a highly ranked site, a process you would repeat for the other potential sites before making a final selection.

1   Check the box to the left of the *Mason Site* layer to turn it on. Right-click this layer and click *Zoom to Layer* to zoom and center the display. Then turn off the *PCA Site Ranking* layer to get a clear view of the map.

Your map should resemble the one below:
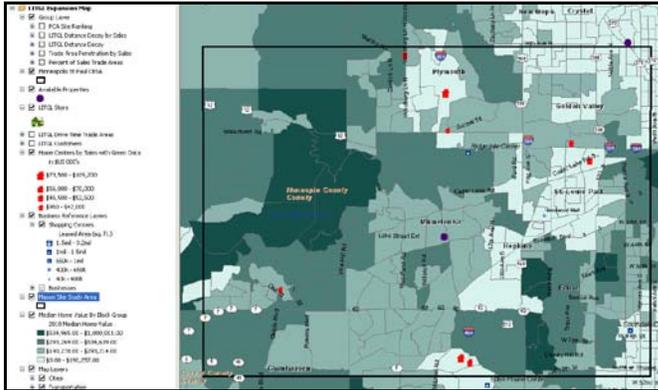


**2**     If necessary, turn on the *Home Centers by Sales in 000's* and *Available Properties* layers, open their attribute tables, and review the data they include.

Note that both tables include three attributes with data on the relevant store characteristics discussed by Janice and Steven: store size, percentage of green products in the product mix, and breadth of green products. Features differ in size in the *Available Properties* layer but have the same values for the green product attributes. These values reflect *Living in the Green Lane*'s marketing strategy and would be the same for a store at any of the available sites. This is the data you will include in the *Advanced Huff Model*.

**3**     Click the drop-down arrow on the toolbar and then click *Sales Potential Modeling*. Select *Create New Modeling Analysis* and click *Next*. Select *Advanced Huff Model with Statistical Calibration* and then click *Next*.

**4**     In the resultant window, select *Block Groups* as the *Sales Potential* layer, *ID* as the ID field, and *Home Imp Material-Own & Rent: Tot* as the *Sales Potential* field. (This attribute reports total expenditures on home improvement materials.)

**5**    The window should resemble the one below. When it does, click *Next*.
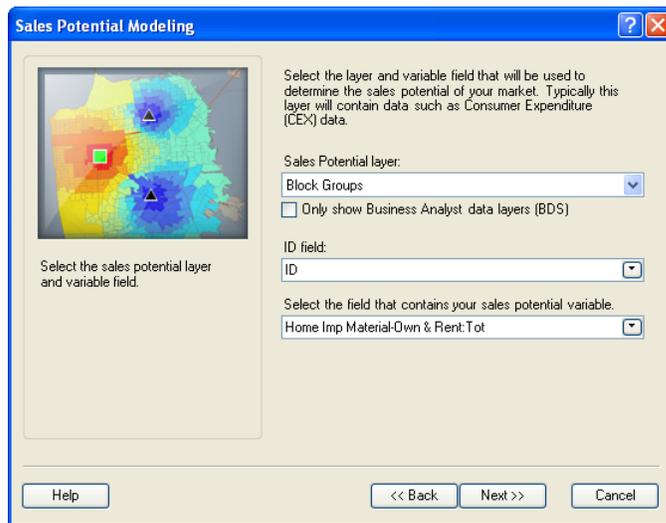


**6**    In the resultant window, select *Home Centers by Sales with Green Data* as the *Competitive Stores* layer and *ID* as the *Store ID* field, and then click *Next*.

**7**    In the resultant window, select the *By selecting a point feature from layer* option and click *Next*.

**8**    In the resultant window, select *Available Properties* as the potential site layer and *8: Mason* as the feature, and then click *Next*.

**9**    In the resultant window, select the *Enter parameters manually* option and then click *Next*.

**10**   In the resultant window, select the *Use Drive Time* option. Add *SizeSqrFt*, *PctGreen*, and *BrdthGreen* to the list of predictor variables using the plus sign (*+*) button.

**11**   Assign *Coefficients* of *1*, *0.8*, and *1.2* to them, respectively. The window should resemble the one below. When it does, click *Next*.
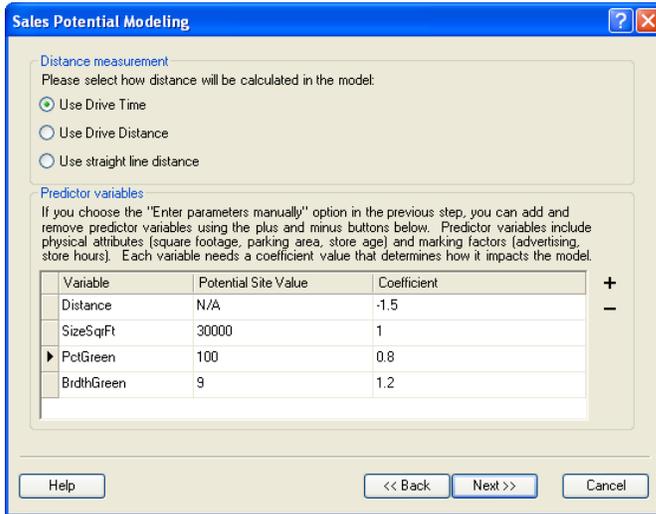


These values reflect Janice and Steven's judgment about the competitiveness factors in this market and their importance. They believe that the percentage of green product offerings is a bit more important to consumers than store size, while the breadth of green products and services in a store is slightly less important. Taken together, however, these factors are twice as important as store size and will be major factors in consumer decisions about shopping at a *Living in the Green Lane* store. The positive values for the three attributes you added indicate a direct relationship, while the negative value for distance indicates an inverse relationship. This is consistent with the judgments discussed above.

**12**   In the resultant window, enter ***Advanced Huff Model for Mason Site*** as the trade area name and then click *Finish*.

In a process that might take several minutes, the system runs the model and displays a box indicating the value of predicted sales in the trade area.

**13**   Click *OK* in the box to display the full analysis on the map, which resembles the one below, though it might differ depending on the extent of the original map screen.

The map displays the block groups in the market area with a legend that reflects total projected sales in each based on the balance of attractiveness between this site and competing stores relative to the three factors.
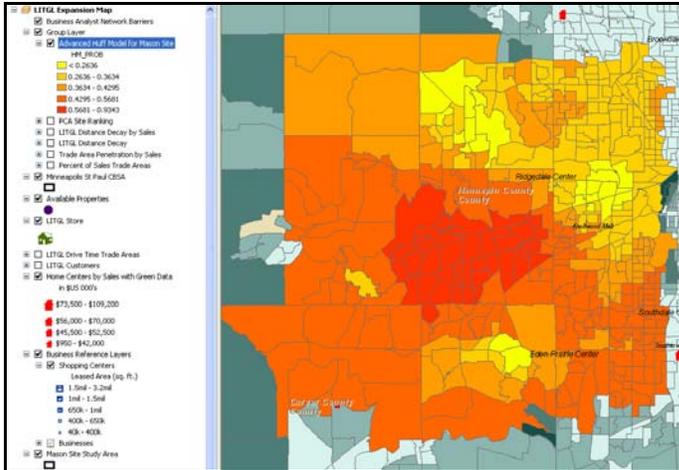
**14**  Open the attribute table for this layer and review it. The *HM_PROB* field reports the estimated probability that residents of a block group will shop at *Living in the Green Lane*, a value that may also be understood as the company's projected market share in the block group.

The *HM_TOTAL* attribute reports projected sales in the block group for *Living in the Green Lane*.

**15**  Select the *HM_Total* attribute and calculate statistics for it.

The *Table* and *Statistics* should resemble the ones below, though the exact numbers might vary based on your map extent. The *Sum* figure reports the total projected sales for a *Living in the Green Lane* store at this site given the competitive environment.
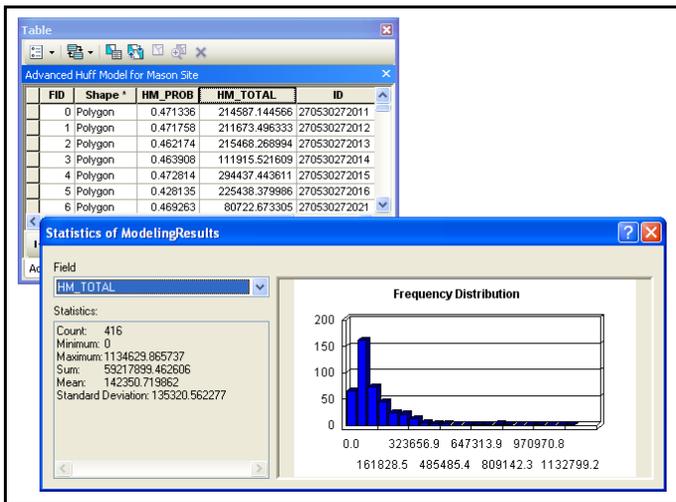


**16**  Save this map document in the chapter 7 folder to allow you to return to this analysis.

**Question 6:**  *Do the map and table indicate that this site would generate a sufficiently large market area and sufficiently high volume of sales to be acceptable for a new Living in the Green Lane store?*

Repeating this procedure for the other highly rated locations would produce comparative sales projections for them. This procedures allows you to select the two most favorable sites for the second and third *Living in the Green Lane* stores.

Upon completion of that process, you recommend to Janice and Steven that the *Mason* and *Longwell* sites be selected for those stores. They accept your recommendation and select those sites for the company's expansion plans. Coupled with an enhanced merchandising strategy, this expansion allows the company to implement its comprehensive growth strategy and complete its transition from a single green home center to a chain of neighborhood green lifestyle centers.

# Submit your work

Submit answers to the following questions in a Microsoft Word document:

**Question 1:**  *How do the characteristics of these trade areas compare with the green customer profile? What does this mean for the prospect of successful penetration strategies in these trade areas?*

**Question 2:**  *Is Percent of Sales Trade Areas larger or smaller than LITGL Drive Time Trade Areas? What is the implication of this conclusion for using the Drive Time Trade Area approach in future site selection decisions?*

**Question 3:**  *How do the penetration rates differ between the two levels of this trade area? Based on these values, is there opportunity for future sales growth in these areas?*

**Question 4:**  *How do sales levels compare in the three areas of the distance decay chart? Penetration rates? What conclusions do these values support relative to the size of the trade area for* Living in the Green Lane*'s store?*

**Question 5:**  *Which sites have the highest principal component analysis ranking relative to* Living in the Green Lane*'s existing store?*

**Question 6:**  *Do the map and table indicate that this site would generate a sufficiently large market area and sufficiently high volume of sales to be acceptable for a new* Living in the Green Lane *store?*

# Credits

## Data

Data displayed in screen captures of Business Analyst is courtesy of Esri; the US Census Bureau; Infogroup; the Bureau of Labor Statistics; Applied Geographic Solutions, Inc.; Directory of Major Malls, Inc.; GfK Mediamark Research & Intelligence, LLC (GfK MRI); and Market Planning Solutions, Inc.

# Instructor resources

## Contextual information

This SpatiaLAB is written for business students in an integrated business GIS course at the undergraduate or graduate level. It may be used to replace the exercises in chapter 7 of *Getting to Know ESRI Business Analyst* in labs with Business Analyst Desktop Premium 10 installed. The emphasis is on using spatial analysis in the site selection process for an established retail firm wishing to expand to other locations in a market area. Thus, this lab could also be used as a stand-alone exercise in retailing or retail management courses or in conjunction with the *Customer Profiling with Enterprise Sales Data* SpatiaLAB for a more comprehensive site selection project based on existing customer, sales, and store data.

This lab demonstrates how to perform sales-based trade area, penetration, and distance decay analysis as well as how to use these tools in decision making. It also demonstrates the implementation and application of *principal component analysis* and the *Advanced Huff Model.* The maps and reports in this lab also support the site selection process for an established retailer.

Upon completion of the lab, students may be required to submit answers to several questions based on their observation of the maps and reports they have created. Alternatively, students may be required to submit a project report covering their work in this lab.

## Analysis and visualization tools

Business Analyst Desktop Premium 10 and the *LITGL Minneapolis St Paul* project file are required to complete this exercise.

# Data information

All the data for this exercise is provided by Business Analyst Desktop.

## Data sources
Esri® Business Analyst data

## Answer key

**Question 1:**  *How do the characteristics of these trade areas compare with the green customer profile? What does this mean for the prospect of successful penetration strategies in these trade areas?*

*The demographic characteristics in the Market Profile Report match the characteristics of the target green customers. They also match the Living in the Green Lane customer profile from the* Customer Profiling with Enterprise Sales Data *SpatiaLAB. In addition, the Tapestry™ Segmentation Report indicates a similar match between the firm's best customers and trade area characteristics. This means that prospects for additional sales to new customers within the trade area are bright.*

**Question 2:**  *Is Percent of Sales Trade Areas larger or smaller than LITGLDrive Time Trade Areas? What is the implication of this conclusion for using the Drive Time Trade Area approach in future site selection decisions?*

*Percent of Sales Trade Areas is larger than LITGL Drive Time Trade Areas. This indicates that the store is drawing customers and sales from a larger area than that covered by Drive Time Trade Areas. This, in turn, supports the conclusion that the three- and six-minute Drive Time Trade Area definition is a relatively accurate estimation of Living in the Green Lane's retail attractiveness. It is appropriate to use it in future site expansion decisions.*

**Question 3:**  *How do the penetration rates differ between the two levels of this trade area? Based on these values, is there opportunity for future sales growth in these areas?*

*As measured by sales volume, the penetration rates are below 1 percent in both polygons of the trade area. However, the values are surprisingly similar, indicating similar levels of penetration in the two areas, a favorable result in assessing store attractiveness. This also means that there are significant growth opportunities for increased sales to potential customers within these market areas.*

**Question 4:**  *How do sales levels compare in the three areas of the distance decay chart? Penetration rates? What conclusions do these values support relative to the size of the trade area for Living in the Green Lane's store?*

*Both total sales and number of customers are relatively similar in the inner two areas, though the penetration rate decreases substantially. All three measures are significantly lower in the outer six- to nine-minute area than in either of the inner two. This is a further indication that the three- and six-minute drive times used in the original site selection decision are relatively accurate definitions of the store's market area and are appropriate for future site location decisions.*

**Question 5:** *Which sites have the highest principal component analysis ranking relative to Living in the Green Lane's existing store?*

*The Mason and Longwell sites are the most highly ranked of the available sites.*

**Question 6:** *Do the map and table indicate that this site would generate a sufficiently large market area and sufficiently high volume of sales to be acceptable for a new Living in the Green Lane store?*

*Yes, the map indicates substantial projected sales in the immediate vicinity of the store and residual sales potential across the extent of the analysis. The specific projection of over $59 million might vary among students if they use different map extents but should always result in values sufficiently high to make this area attractive.*

## Additional notes

1. Though both this lab and the *Customer Profiling with Enterprise Sales Data* SpatiaLAB rely on the same customer sales data, the focus is different. That lab focuses on market penetration, this one on market expansion. For that reason, these labs may be combined as a single project or separated as two projects, each with a different growth objective. Thus, you have the reporting options of requiring students to (1) submit answers to lab questions, (2) submit separate project reports for these two labs, or (3) submit a single report covering both labs.

2. Students may use either number of customers or sales volume to produce customer-derived trade areas but are instructed to use the latter in this exercise. Invite them to question this setting. What are the benefits of using each measure? When might one be more appropriate than the other? Similarly, you might wish to discuss the decision not to use the donut option in creating the polygons. This makes it difficult to discern profile differences between the inner and outer polygons. When might that be a disadvantage?

3. If your students completed the *Customer Profiling with Enterprise Sales Data* SpatiaLAB, invite them to compare the characteristics of the *High Purchases* segment you profiled in that lab with those of *Percent of Sales Trade Areas*. If the demographic characteristics and *Tapestry Segmentation* composition are similar, there are likely significant opportunities to enhance sales by increasing market penetration within the trade areas. If these characteristics differ, the stronger growth opportunity is to seek market areas with higher concentrations of households with characteristics that match the customer profile.

4. The *Trade Area Penetration* map and reports and the *Distance Decay* map and reports provide useful information on the spatial distribution of the firm's customers and their purchases as well as the impact of distance on store appeal to customers. Does this information confirm the *Huff Model*'s assumption of an inverse relationship between distance and attractiveness? Invite students to consider alternative interpretations of penetration numbers. Is a low penetration value reflective of low competitiveness or a measure of high remaining potential? It is treated as the latter in this exercise, with the expanded product and service lines in the *Customer Profiling with Enterprise Sales Data* SpatiaLAB viewed as the key to increased penetration of current markets. Do students agree with this approach?

5. *Principal component analysis* is an effective tool for ranking potential locations relative to the site of a model store. It simplifies and quantifies much of the comparative task. However, it also depends on a good choice for the model store as well as appropriate selection of the core market area attributes to be used for comparison. In this case, *Living in the Green Lane* has only one store. That store has demonstrated solid sales and has significant penetration opportunities and concrete plans to exploit them. Invite students to consider how the model store might be determined among several existing outlets in a larger retail operation. Encourage them to question the selection of comparative attributes and to run the model with different ones to review the results. This will help them understand how important the appropriate selection of a store model and relevant attributes are to the successful implementation of this tool.

6. This is the second use of the *Huff Model* in the Business Analyst SpatiaLAB Series. Notice that in this instance, factors related to competitive strategy are included in the analysis. This allows *Living in the Green Lane* to include its competitive advantage—its commitment to green products and services—as an attractive factor in the sales potential calculations. Encourage students to question this assumption and run the model without these factors or with different weights for them and observe the impact on the resultant map and projections.

   *Note: Review the* **Huff and McCallum** *(2008) white paper in the references for a discussion of how the* **Huff Model** *can be calibrated with results from consumer surveys as well.*

7. Instead of a project report consisting of answers to lab questions, you may wish to have students complete a more comprehensive report covering this lab or, if you wish, both this lab and the *Customer Profiling with Enterprise Sales Data* SpatiaLAB. If so, you may wish to use the following structure and guidelines for that report. Feel free to adjust this format to your preferences or class requirements.

<div align="center">

**Report format**

</div>

Each of your reports should be about six to eight pages in length and should follow this format:

I.      **Introduction—**A summary of the circumstances addressed by the research project
II.     **Problem statement—**A statement of the problem addressed by the project
III.    **Data information—**A statement of the sources and dates of all data used in the analysis
IV.     **Analytical methods—**A description of the analytic procedures used and how they will help solve the problem
V.      **Research results** (the largest section of the project)—To include
   A. Presentation of the results of the analysis
   B. Exhibits such as the required maps, charts, and tables and any others you wish to include to clarify your report
VI.     **Conclusions and recommendations—**Recommended response to the problem based on the results of the analysis

## Business GIS references

Business Analyst Resource Center.
**http://resources.esri.com/businessAnalyst/**

*BusinessGeoInfo* newsletter.
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