

# Farmers' Market Mapping Final Report

## Geographical and Sustainability Sciences



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Course: Health and Environment: GIS Applications

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# **Mapped Sources of Sioux City Farmers' Market 2015 Products; Analysis of Individual Health Outcomes and Accessibility to Healthy Food Choices**

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## **Abstract**

In this project, geocoding and network analysis are used in order to calculate estimations of travel times and distances for Sioux City Farmers' Market vendors. Vendor addresses, provided by the Iowa Initiative for Sustainable Communities, and the Sioux City Farmers' Market address are batch geocoded and displayed on a map of states with participants. In particular, closest facility analysis was performed on these geocoded locations using ESRI's street network data, in order to determine the distance and time it takes for each vendor to reach the Farmers' Market. In addition, potential carpool routes were also determined using the results of the closest facility analysis.

## **Introduction**

Every year from May through October, the Sioux City Farmers' Market brings together members of surrounding communities and provides them with the opportunity to exchange goods and build relationships in order to both support and grow the local community. The Iowa Initiative for Sustainable Communities (IISC) requested students in the Geographical and Sustainability Sciences department to use GIS to map the sources of the Farmers' Market to provide a visual understanding of where market products come from, as well as how far they travel before they reach the market site. Students have also been requested to research areas of opportunity in which Farmers' Market staff may recruit vendors for future events. This project attempts to fulfill these requests so event coordinators and visitors alike can understand where the market's products are sourced. The Farmers' Market recruits vendors from three states over an area that spans an approximately 100 mile radius around the market site. Geocoding vendor location data provided by the IISC and from online resources helps us identify where market products arrive from and how far products/vendors need to travel before they reach the market site. We used network shapefiles in conjunction with geocoded location data to calculate the distance that each vendor travels.

The questions we will try to answer in our study are:

- 1) Where are the sources of the Farmers' Market products located?
- 2) How can new vendors be recruited in the future?
- 3) What are potential carpool routes for Farmers' Market vendors?

**Data**

- Sioux City's Farmers' Market address was obtained from the Farmers' Market website

- Addresses of the 55 vendors participating in the 2015 Farmers' Market were provided by the IISC
- Road networks shapefile was obtained from the University of Iowa GIS Instructional Lab database

## **Methods**

ArcMap was used to process the data used in this project. Before data was displayed, we chose to represent the data using the Geographic Coordinate System North American Datum (NAD) 1983, and the Projected Coordinate System NAD 1983 UTM Zone 15N. Zone 15N was chosen because most of the spatial data featured in this project is located within the tri-state area.

The first of several methods used in this project is geocoding. Geocoding is the process of determining addresses' geographic locations, such as latitude and longitude coordinates, or the census tract, block group or ZIP code in which it is located. Since our project will map the source locations of Farmers' Market products, we used an online batch geocoder tool (<http://www.findlatitudeandlongitude.com/batch-geocode/>) to geocode the data we received from the IISC group to determine the geographic areas these products come from. This batch geocoder output a table with each location's address and coordinate data, which was used as input in ArcMap's "Display XY Data" tool to display the locations in a project file. This geocoder was also utilized in order to geocode locations for healthy and unhealthy food outlets.

Following the geocoding process, we used a closest facility analysis with a street network to determine possible shortest-distance routes between the Farmers' Market and its vendors. Each vendor's geographic location was used as an input for the network analysis, with the Farmers' Market as the target facility to find shortest routes to.

Using the network analysis results, we were able identify one potential carpool route. The carpool route was determined by first creating a buffer around the Sioux City Farmers' Market.

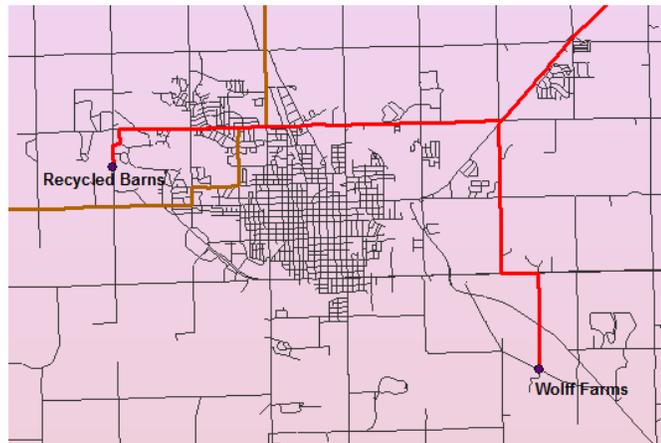
A buffer zone was needed because the network analysis results all congregate at the Farmers' Market; using a buffer would separate the data into individual routes to analyze. After these separate routes were created, we assessed the distance relationships between vendors with nearby vendors. All but one pair of vendors appeared to have inefficient carpool potential: the vendors Wolff Farms and Recycled Barns. These two vendors are located roughly 7 miles away from each other, and would need to travel about 25 minutes to reach the other vendor's location.

## **Results**

Through network analysis, we determined routes for Farmers' Market vendors to the Farmers' Market. Using these routes distances between vendors and the Farmers' Market itself were calculated. Through this analysis, we determined one potential carpool route for Farmers' Market vendors. These two vendors are Wolff Farms and Recycled Barns, who are approximately 7 miles apart from each other. Figure 1 shows the proximity of Wolff Farms and

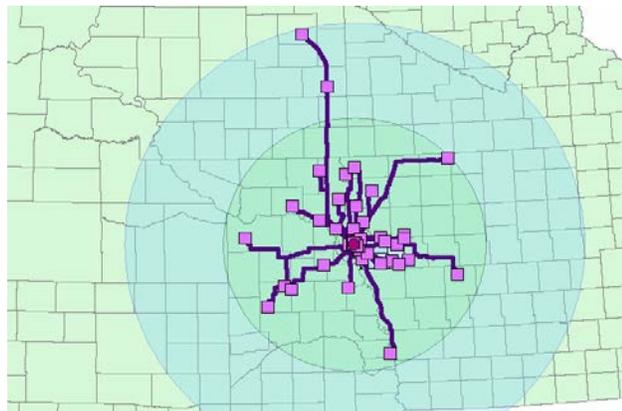
Recycled Barns. Next, we determined both the maximum and minimum distance traveled to reach the Sioux City Farmers' Market.

The maximum distance traveled was about 185 miles from Watertown, South Dakota and the minimum distance traveled was about 0.17 miles from Sioux City, Iowa. Figure 2 shows the entire network analysis road network for the Farmers' Market and the vendors.



## Discussion

In the first stage of our project, we were able to create visual representations of where Sioux City Farmers' Market vendors are located, estimations on how far they need to travel, and potential carpool routes. The geocoded vendor locations are useful in determining which counties have the highest participation rates. Understanding this knowledge can help Siouxland figure out which counties could be targeted for event promotion in the future.



After some consideration, we were unable to effectively determine how to recruit new vendors to the Farmers' Market with the data that was available. During our data collection

phase, we reached out to some faculty of the Omaha Farmer's Market in order to determine whether there were vendors who operated within 100 miles of Sioux City's Farmers' Market; we figured that perhaps these vendors would be interested in supplying products to the Sioux City Farmers' Market as well. Unfortunately, such vendor data was not available to us, so this approach wasn't utilized.

For future vendor recruitment efforts, we recommend surveying the vendors at next year's event to find demographic data about vendors' production facilities. For example, if the average size of the vendors' facilities can be determined, Siouxland could perhaps reach out to local producers with facility sizes similar to the average in order to find potential vendors.

## **Conclusion**

The analyses performed in this project provided numerous results regarding Farmers Market travel metrics. Vendors selling products in the Sioux City Farmers Market travel long distances from the four states that participate in the Farmers' Market. Through our network analysis results, we determined one potential carpool route for Wolff Farms and Recycled Barns, who are two vendors located southwest of the market. Although we were unable to find a method of recruiting new vendors to sell at the Sioux City Farmers Market with our given data, we offer several suggestions on how Siouxland may identify vendors of interest to recruit for future events. Examining both the results and the vendors from the Omaha Farmers' Market could provide insight into how producers could be recruited for future events. The visualizations of

vendor locations, distances traveled, carpool routes, and the results of the network analysis ideally provide Siouxland with an idea of how to recruit new vendors by illustrating the different routes vendors travel to reach the Sioux City Farmers' Market. Because the two marketplaces are geographically proximal to one another, it stands to reason that some vendors may be asked to supply their products for the Sioux City Farmers' Market. If current Sioux City Farmers' Market vendors are willing to travel up to 185 miles to reach the marketplace, vendors between the two marketplaces may be interested in doing the same.