

Figure 1: Food Desert Location Density

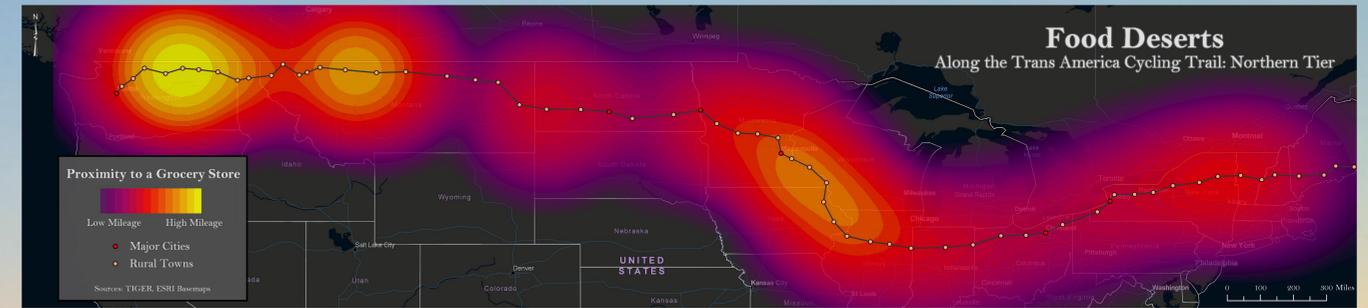


Figure 2 – Food Deserts by Proximity to Grocery Stores

**Abstract:** This project maps the location of food deserts along the Northern Tier of the Transamerica Cycling Route using GIS, personal interviews, and field observations. We explore the link between food deserts and socioeconomically disadvantaged areas while cycling across the Northern Tier route. The study tracks proximity to the nearest supermarket/supercenter because of their tendency to offer a wider variety of more nutritious and affordable foods (Walker et al, 2010). The definition of a ‘food desert’ is multifaceted and using proximity to these stores alone does not provide a complete picture; we incorporate personal interviews with residents for a clearer perspective of the area (after Bitler and Haider, 2010). We take the approach to identifying food deserts from Lois Morton and Troy Blanchard (2007) who defined a food desert as a location ten or more miles from a supermarket/supercenter.



**1. Study Site:**  
Our study sites consist of 63 different locations along the Northern Tier of the Transamerica Cycling route. The route is around 4,200 miles spanning across 13 states in the Northern U.S. The true Transamerica Northern Tier route ends in Anacortes, Washington; due to group planning constraints the end point of this trip was chosen to end in Seattle, Washington. We diverged from the true route in Rockport, WA where we headed to Darrington, WA, Snohomish, WA, and finally Seattle, WA.

**2. Research Objectives:**  
Our project consists of three main research objectives:  
» To provide the general public and government agencies with a better understanding of where food deserts are located  
» To argue for the existence of food deserts in the northern United States from a spatial perspective  
» To provide data spanning the width of the northern US, as data is currently scarce in this region



**3. Methods:**  
» Conducted 27 personal interviews at overnight stops  
The questions were as follows:  
» 1. Are your food prices higher, lower, or average compared to surrounding areas?  
» 2. Are you able to obtain food close to your work, home, or any location you attend regularly? (Bitler and Haider, 2010)  
» 3. Do you have several nutritious options available in your area?  
» 4. Do you have any thoughts or observations you would like to add based on living in this area?  
» Grocery stores were chosen using methods from Leete et al. 2012, which included ReferenceUSA.com  
» We set a radius of 10 miles for urban locations and 1 mile for major cities after Morton and Blanchard, 2007  
» Each grocery store was researched to determine if it was a branch which ensures a homogeneous line of products stemming from the existence of a parent company  
» Grocery stores in the finalized list were cross-referenced with Google Maps and field records for accuracy  
» Used American Fact Finder to collect the percentage of people below the poverty line  
» Using ArcGIS Pro, we designed maps to depict two spatial perspectives of food deserts along the same route  
» Figure 1 shows the density of food deserts across the Northern US, was symbolized using equal interval, and data was placed into 15 classes  
» Figure 2 depicts proximity to grocery stores (as a function of travel distance) and was symbolized using geometric interval with 32 classes  
» We conducted the analysis using Kernel Density with an output cell size of .005 and a search radius of 3



**4. Results and Discussion:**  
» Major hotspots for food deserts are in Minnesota, Montana, Washington, Iowa, North Dakota, and New York (Figure 1)  
» In places like Minnesota and Iowa there are several farmer's markets available to residents that can counter the effect of food deserts. Minnesota, having an abundance of farmland, gives residents greater access to local goods. Our research did not include farmers markets, so this could explain the major hotspot. As one resident from Dalbo, MN stated, “I’m amazed that up here in Minnesota the amount of fresh produce we get here year long.” Even with local options, however, residents may still struggle without nearby access to supermarkets or grocery stores. “This year we won’t have farmers markets because of the rain and the state has set down on many farmers markets and it’s gotten to the point where they can’t afford to do it anymore,” an Oxford Junction, IA resident said. Farmers markets may inhibit the growth of grocery stores, but may not always provide a secure means to food access with variable weather conditions.  
» The existence of food deserts differs when observed through different spatial lenses  
» Figure 1 shows fewer hot spots for food deserts, but Figure 2 indicates where there is a true lack of access to grocery stores  
» There is no all-encompassing definition of a food desert, but observing where the furthest drives are to grocery stores can open doors for research into why those areas have decreased access  
» P=0.5301 after running an unpaired T-test between food deserts and poverty rates. No statistical significance of a correlation

**5. Conclusions:**  
» The Northeast, Midwest, and Northwest show the highest density of food deserts, however, eastern Washington, Montana, and the western side of the Great Lakes proved to have greater travel distances to grocery stores  
» Food deserts exist from a spatial perspective, but the definition of what constitutes as a food desert varies based on many geographic variables  
» Future research should focus on those areas where residents have a longer travel distance and reasons creating the lack of access. Farmers markets should be included to gain a more complete perspective of food availability in an area.

**References**

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