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Sustainable Food Shed

Throughout my tenure in the Urban Studies Program at The University of Washington Tacoma, I have studied the many effects that have emanated from urbanization and urban sprawl. The world has been rapidly urbanizing over the last 100 years and we can see the impacts of this urbanization and sprawl on our society, the economy, and our environment. Although there are some very progressive results that arise from urbanization, there are just as many pitfalls if not more that, in my opinion, have to be addressed in order to continue to urbanize sustainably. Although one could talk forever about all of the negative externalities that ascend from urbanization and do little in the way of rectifying them, I see it fit, instead, to focus on one basic requirement that every human has that I believe is at risk of being destroyed or mishandled as the populations of our cities become larger and more dense as a result of this rapid urbanization.

This requirement that I am referring to is our food production. "The process of urbanization can be seen to have impacted substantially on world food production and distribution" (Smith 1998). It seems that the larger our populations grow and the denser cities become the further away our food sources are pushed to be. One statistic I read claims "The typical fruit or vegetable on an American's plate travels some 1,500 miles to get there, and is frequently better traveled and more worldly than its eater." (Pollan 2006). I do not feel that

this current practice is at all sustainable for the environment and ultimately it is not sustainable for our population as it Leads to “obesity and health risks” “environmental damage from industrial farming and genetic modification, fossil fuel based agriculture, the disconnect between producers and consumers, gendered and racialized and cultural meanings attached to food, the passivity associated with food choices, the rise of the fast food and continued reliance on eating out” (Berry 2007). Furthermore, as our populations grow, our land use is continually converting from agriculture to urban. “This happens when the present value of future net returns generated by land in urban uses rises above the present value of future net returns generated by the land remaining in non-urban uses” (Kline, Moses and Alig 2001). My goal for this project is to create a map that would paint a picture of and bring awareness to the Idea of a sustainable foodshed, or “a geographic area that supplies a population with food.” (Hayward 2010), that would serve our local populations as well as to provide a resource to consumers and producers of food products to join in and bring our food production closer to where we consume it. "It's very simple: I trust the Salatins (a local Food Producer) more than I trust Wal-Mart. And I like the idea of keeping my money right here in town." (Pollan 2006)

Originally, I had conceived an idea of a doomsday scenario where we, as a nation, had finally reached peak oil, or some sort of catastrophic, or even a cataclysmic event, man-made or triggered by nature, caused Western Washington to be cut off from the rest of the country or even the rest of the world for that matter, we would all suddenly be without the means of providing food for our large population that has gathered in the Puget sound region over the last 100 years. I was sold on the Idea of using GIS to determine if the population of western Washington had exceeded the capacity of the land to sustain itself in the event any of these

ends of the world scenarios. After some research I decided that a doomsday approach really wouldn't be useful to anyone and may even provoke an incredulous response to a cause that, I feel strongly, is worth mention. I also felt that I was going to spend the time and effort to create a project of this magnitude; I would want to be taken seriously. So then my project became more of a tangible product that any citizen could use to be informed and to begin to actually practice sustainable consumption habits and in turn cause a demand for sustainable food production in our local region. "As these costs (of non-sustainable agriculture)—especially those associated with food-borne illness and the profligate use of fossil fuel—have become increasingly apparent in the last few years, we have seen a spike in demand not only for organic food, but for local food as well. In fact, "locally grown" has begun to compete with "organically grown" as the label of choice among environmentally and socially conscious consumers, particularly now that so much organic food is grown in industrial-scaled monocultures far from the places it is consumed." (Kleiman 2009)

The methods of my project have changed a little since the original conception but most of the data and processing has remained the same. The only thing that has changed significantly since the shift in my focus is the final analysis whereas, instead of determining the carrying capacity of western Washington in the case of a catastrophe, I would now be determining the carrying capacity of local food sheds given the current agricultural land use.

The extent of my project includes the northernmost border of Washington and Canada to the southern border of Washington and Oregon and the Pacific Ocean that borders the western extent to the Cascades that borders the eastern extent. I decided I needed a dataset

for my project to include these extent data features such as western Washington boundaries and land features such as water boundaries, an arable land feature class that I could use to display possible sources of local food production, an urban cluster feature class that would show population densities, and a population feature class urban clusters that would define the area that needed to be serviced. With this data I could determine if the population of western Washington had exceeded its ability to feed itself given only the current available agricultural land within this extent. However, since my focus changed to a sustainable foodshed, I used this data to determine my service areas and my production areas.

To get my extent data and population data was pretty simple. I just had to download this data from the census bureau shapefiles and add them to Arcmap. I then had to clip these features to my western Washington shapefile and this was the beginning of my foodshed geodatabase. The arable land data, however, was not so simple. I decided that I would develop my own definition for arable land in this project. I determined that arable land was going to be of good soil, be of adequate elevation (less than 3,000 ft.), have no more slop that 10%, and not be obstructed by impervious surface. Since this arable land feature class did not already exist I had to compile this individual data and make my own arable land feature class. Once I had my food production sources I needed to process my urban cluster and population data. Since the extent of my project was so large, I had to narrow my major cities down to seven. I simply used the largest seven populations for this. I then joined the urban cluster data to my cities to determine my service points that I would need later for my final analysis.

Currently, the production and distribution of food costs about 7- 10 calories of fuel for every one calorie we consume. In order to be sustainable, I decided that we should get this ratio to one calorie of fuel for every one calorie we eat or even lower. With that said, a sustainable consumption practice, I believe, would be to consume food produced from within 170 miles. Since the extent of western Washington is almost completely within 170 miles, I decided to lower this number to fifty miles. This would mean that for every one calorie consumed, it would cost .29 calories of fuel and this ratio would be even more sustainable.

Once I had my food production sources population centers and a distance determined to be sustainable, I needed a road layer to perform a network analysis that would determine a sustainable foodshed for each of my seven selected major urban areas. I found this road layer as a tiger shapefile provided on the U.S. Census website. All I had to do is clip the data to the extent of Western Washington. After I had all my processed data, I could then run my final analysis. This consisted of a running the network analysis tool in ARCGIS that would utilize the road layer and determine a 50 mile service network for each of my major population centers. My research concluded that, on a 2000 calorie a day diet, one acre of land could sustain 8 people for one year. With these service areas determined, I could select all of the agricultural land that currently exist within each service area and determine if there was enough land to sustain the population.

The results of my project turned out to be what I expected. The current population of each of my determined foodsheds exceeds its carrying capacity of about 8 people per acre per year which means that most people are consuming food from outside of a sustainable distance.

The most sustainable foodshed had 123 people per acre and the least sustainable was over 100,000 per acre. This shows that the larger cities become the less agricultural land is maintained. I decided to use current agricultural land instead of the more comprehensive arable land feature class that I created due to some uncertainties I had while working through my network analysis. As time ran out I felt that it would be safer in order for me to complete my project on time. These results, however, open up questions for further analysis that could benefit from the arable land feature that I created. With more time, and with all have learned through this process, I could not only determine if the current land use meets the carrying capacity requirement but I could determine, if we expanded our agricultural land, would that be enough land to satisfy the requirement of 8 people per acre per year? In all, I believe that the result of my project is substantial enough to support my goal of bringing awareness of this issue and to provide a resource for average consumers who are aware of the issue and want to make a change but do not know where to start.

For my layout I wanted to keep my map clean and simple. It was a challenge to determine what data would be displayed and how to display it correctly to be accurate, true and to tell the story that I wanted to tell. As we learned in Monmonier's book "*How to Lie With Maps",* "A single set of numerical data, say, for the states of the united states, can yield markedly dissimilar maps." (Monmonier 2005). I decided to simply compare the ratio of population per every acre of agricultural land for every foodshed that I developed in my network analysis. What you see on the map is the urban centers, their respective foodsheds, and a legend explaining the analysis. From there the audience can determine what agricultural areas are located within their food shed as well as determine if their foodshed is sustainable

based on my criteria of 8 people per acre. For my western Washington extent, I used a beige color to represent background. Then I added the water body layer for reference and symbolized it as blue with no outline. My agricultural land was symbolized as green with no outline. I felt this would be a perfect backdrop to display my foodshed data layer. The colors used to display the foodsheds are completely arbitrary. They do not suggest anything but their boundaries and the land located within. I set the transparency of this layer to 50% as to not completely cover up the background so that you can see the agricultural land located within.

In my project, I set out to explain the idea of a sustainable foodshed that would meet the food production needs of our rapidly growing population due to Urbanization and urban sprawl. In conclusion, I think that my project overall is pretty good for my first map start to finish. I have learned in this process that any amount of book knowledge of GIS doesn't compare to actually running the program and working through the processes yourself. The labs are a great way to get your proverbial feet wet but it is repetition that will ultimately pay off in GIS. Looking back at my finished product, I feel my map doesn't reflect the tireless hours that I spent to create it. I do know that I could now accomplish the same project in less time and with less toil but it was the learning curve from doing this project that has led up to this confidence. In retrospect, after all of the reading about participatory GIS, if I had it to do all over I would like to add a participatory element to my project to add some qualitative data instead of relying on mostly quantitative data. After all, the community is the end user of my project so I think it would have been beneficial to utilize the perspective communities' feedback in my final analysis.

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