Jeanette Shutay

Decision Support with GIS

Lesson 1

August 10, 2020

City Selection for "Jen and Barry's Ice Cream" Shop Conducted by Jeanette Shutay

Jen and Barry are embarking on a new opportunity that consists of starting up a new ice cream shop and they have hired Jeanette Shutay to conduct a GIS analysis to identify optimal city locations for their new shop. As part of the project, business and quality of life criteria were documented and included in the analysis. This report contains four sections, which include (1) project objective, (2) initial city selection criteria and results, (3) refined city selection criteria and results, and (4) conclusions and recommendations.

Project Objective

The objective for this city selection project was to find a suitable location for Jen and Barry's Ice Cream shop in the state of Washington that meets the business and quality of life requirements outlined by the clients. This analysis consisted of two phases. The first phase leveraged four datasets, including cities, counties, interstates, and parks data. The second phase incorporated two additional datasets, which consisted of national park and forests data and hydrology data within the state of Washington. All analyses were conducted in ArcGIS Pro.

Initial City Selection Criteria and Results

The initial criteria for the site selection project focused on three business and four quality of life factors, which are listed in Table 1. These criteria were used to query the data to create subsets that match the project requirements. The analysis included several steps consisting of attribute and location queries. Each query was contingent on the prior query. For example, selecting a major interstate located within 10 miles of the city was conducted on the subset of data derived from the prior queries.

Table 1

Ice Cream Initial City Selection Criteria

Criterion	Description
Business	Many dairy farms for milk production
Business	A labor pool of at least 20,000 individuals between the ages of 18 and 64 years
Business	A major interstate within 10 miles
Quality of life	A low crime rate (less than or equal to 50)
Quality of life	At least one state or local park within 10 miles
Quality of life	A population of less than 200 individuals per square mile
Quality of life	Located near an airport

Prior to conducting the site selection analysis, the NAD 1983 HARN State Plan Washington South FIPS 4602 (US Feet) projected coordinate system was selected to help provide a more accurate depiction of the locations on the map. The analysis included several steps consisting of attribute and location queries. Each new query was based on the output from the prior query.

The first set of queries pertained to selecting locations that met attribute requirements for dairy counts (greater than or equal to 15), population per square mile (less than 200), and population of individuals between 18 and 64 years of age (greater than or equal to 20,000). The second step was to select data based on location. These queries focused on selecting cities that were completely within the counties that matched the attribute selection criteria from the prior set of queries. For these location queries, crime rate, distance to an airport, distance to interstates, and distance from a state or local park were considered. The initial set of criteria resulted in five cities in which to consider as depicted in Figure 1.

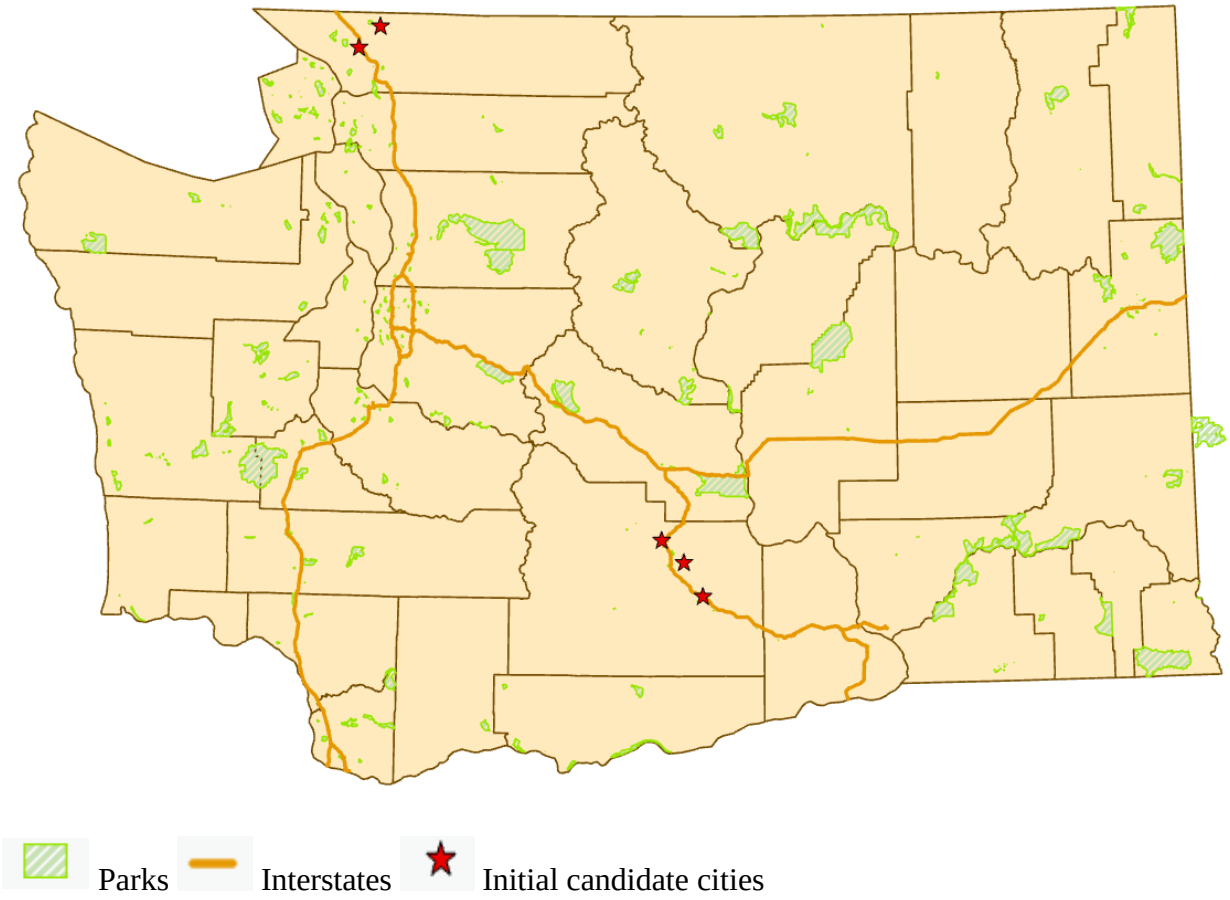

Figure 1. *Cities selected based on initial criteria (n = 5).*

Final City Selection Criteria and Results

After further consideration, Jen and Barry decided that they wanted to refine the analysis further by including two additional requirements. The two new criterion included distance to lakes and distance to national parks or forests. These requirements were added to the prior analysis and therefore this analysis began with the subset of five potential cities generated previously. Before querying based on location, the hydrology dataset needed to be queried based on hydrology attributes to refine the dataset to include lake attributes only. Once that data was selected, the location queries were conducted to ensure that the final selection included only cities that were within 10 miles of a lake and within 20 miles of a national park service unit or a US forest service area.

The final analysis resulted in only one city (Selah) that matched the site selection requirements, which is illustrated in Figure 2. It is interesting to note that Selah is the only city of the initial five candidates that has a lake within 10 miles or a national forest or park within 20 miles. Therefore, restricting to only one of these two criteria would still result in only one candidate city.

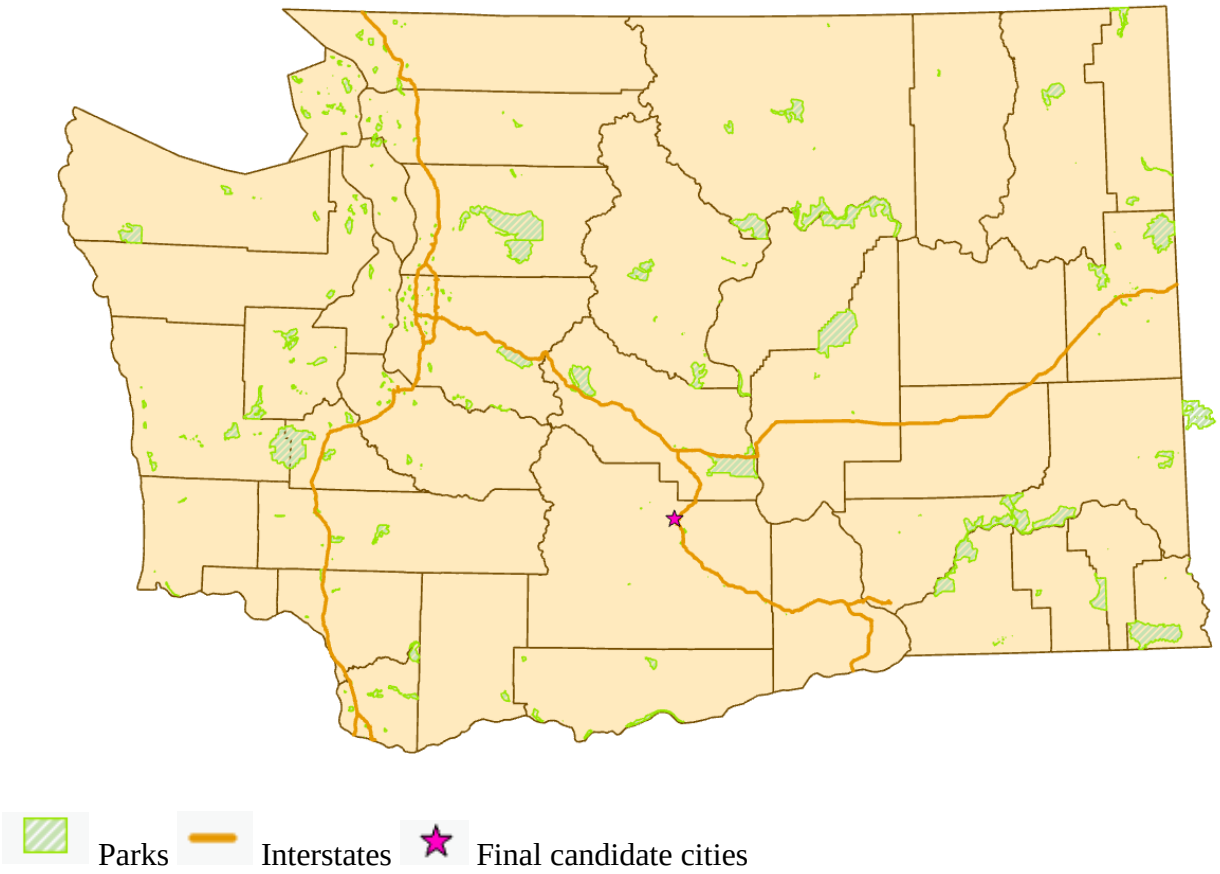

Figure 2. *City selected based on final criteria (n = 1). Hydrology and national parks and forests are not featured in this map to allow for a clear indication of the selected city. Refer to Appendix for map with hydrology and national parks and forests.*

Conclusions and Recommendations

The purpose of this analysis was to identify optimal cities for Jen and Barry's new ice cream shop in the state of Washington. As part of this analysis, several project requirements

were considered. In addition to being in the state of Washington, there were several business and quality of life criteria that were considered. The initial set of criteria resulted in the identification of five potential cities. After further consideration, the clients decided that they wanted to refine the analysis further by adding two new criteria. The final analysis resulted in only one city that matched all requirements.

Based on this analysis, three specific recommendations come to mind. First, it is recommended that Jen and Barry consider their business model and how refining their requirements will impact their desired economics. It may be beneficial to relax the constraints of the analysis to allow for more options. Any parameters that are modified should be modified based on assumptions of criteria priority. As such, each criterion should be prioritized and weighted based on their assumed relevance to the desired business outcomes.

Second, Jen and Barry should consider potential environmental protections as part of their site selection to ensure that they are acquiring land that will be properly zoned for their intended commercial use. Specific attention should be paid to protected habitats, and avoidance of human-wildlife conflict.

Finally, it might be beneficial to incorporate a data science model as part of the analysis, such as segmenting the city population based on demographic characteristics to determine which cities best match the target population based on their business model. For example, if middle class families with small children are believed to be the optimal target customer, those types of attributes should be taken into consideration as well.

Appendix

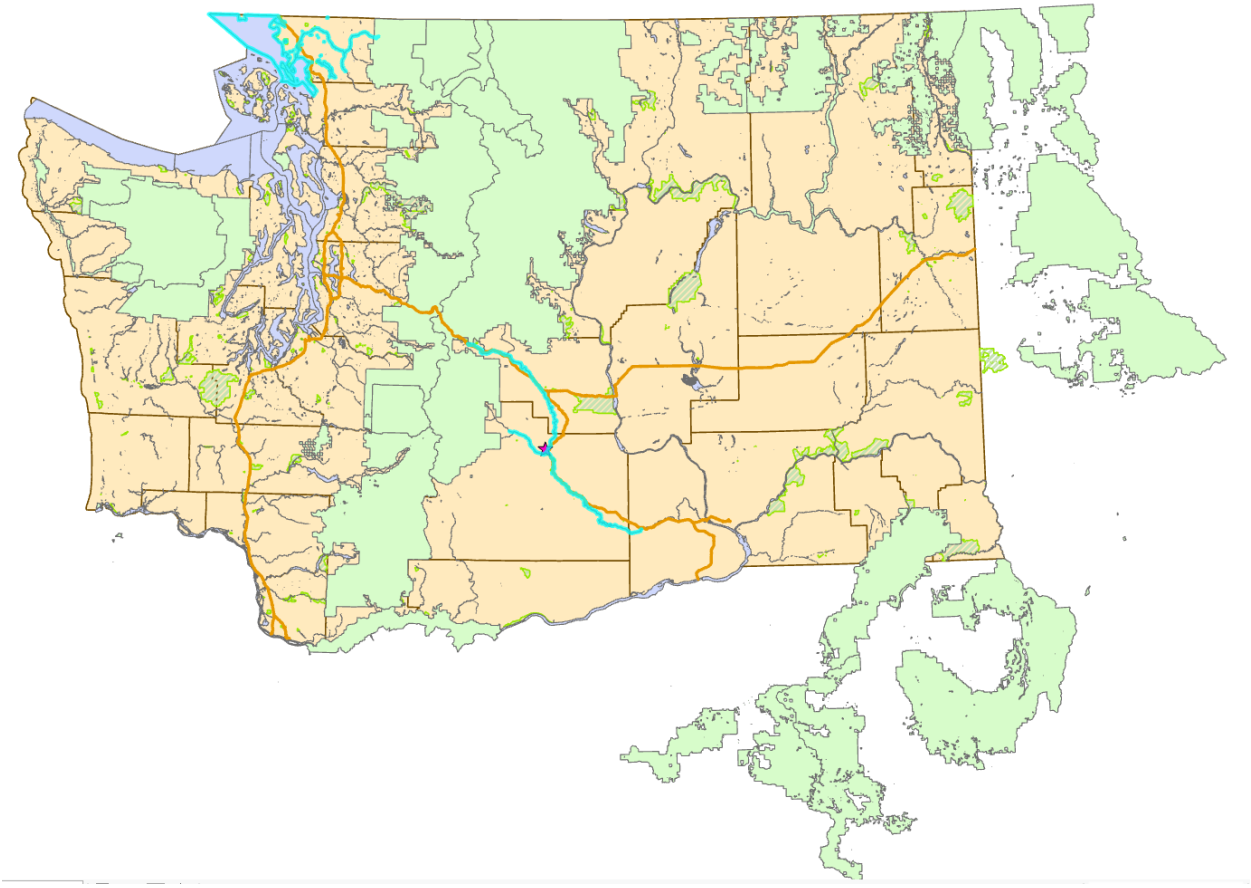

Figure 3. *Final map featuring hydrology and national parks and forests.*