

# **GEOSPATIAL INFORMATION SYSTEMS**

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## **PORTFOLIO**

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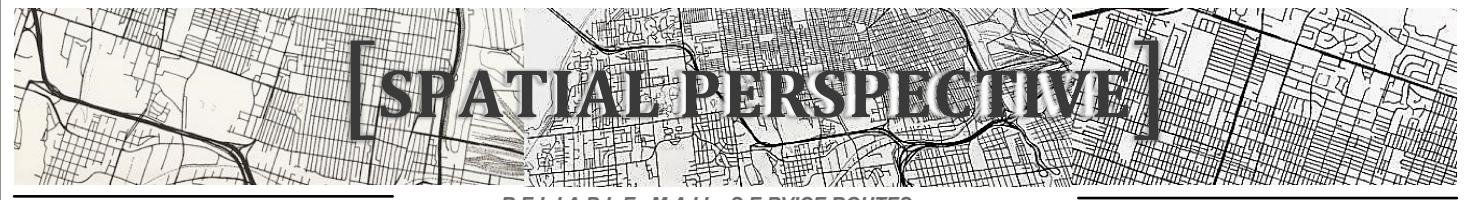


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# GEOSPATIAL INFORMATION SYSTEM: PORTFOLIO



## RELIABLE MAIL SERVICE ROUTES

### INTRODUCTION

Our nation is heavily dependent on our delivery platform today. The United States Postal Service was the first parcel business that helped improved the unreliable services that was called, "private package delivery." They were the first to invent the "overnight delivery" option and the expedited parcels of our mail throughout the world today. For a long time, the U.S Postal Service within Tacoma, Washington was struggling with the process of delivery. Especially having only one notorious highway, I-5, and traffic being incredibly slow. In the city of Tacoma, a place where the education is essentially falling below the states level, our libraries are heavily dependent upon. USPS delivers hundreds of books every single day to the local and public libraries throughout town. Since the majority of the libraries are essentially scattered around the entire city, it is a challenge for USPS drivers to reach from one portion of the city to another in a timely manner. This presentation breaks down what our USPS could use through ArcGIS to better enhance cost efficiency, time, and distance.

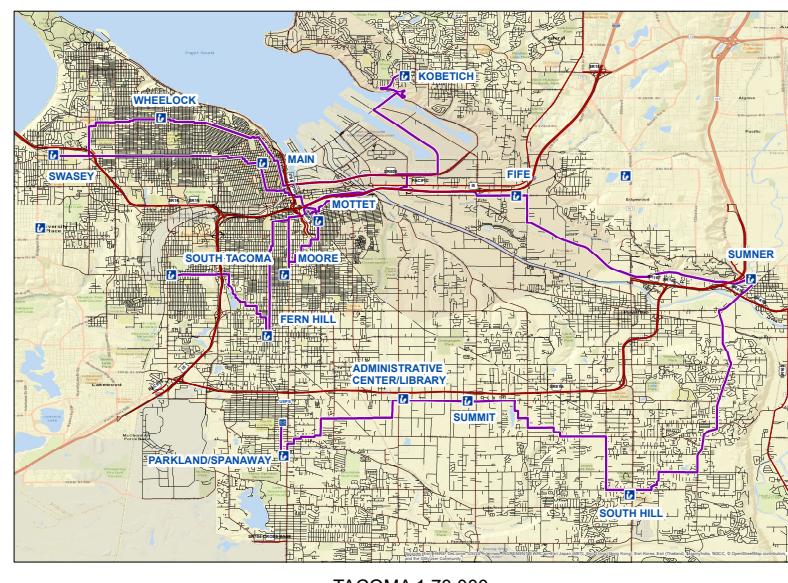
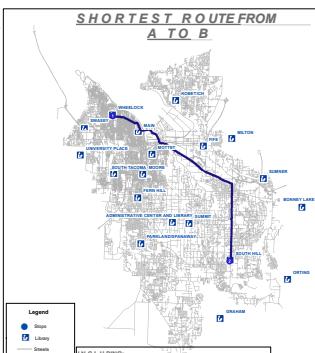
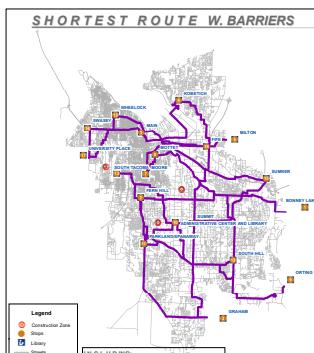
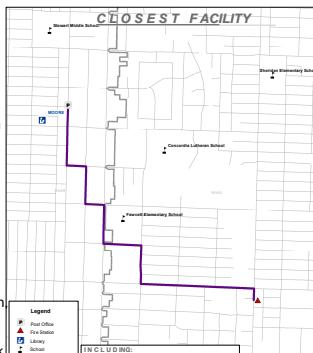


## WASHINGTON



### METHODOLOGY

To create faster services for USPS, the essential plan for a faster and cost efficient network route is to be created. With the ArcGIS Network Analysis toolset, the user is able to build a network dataset and perform analysis on a single or multiple network. From what we are all aware of, the longer it takes to hit from point A to point B will use allot more fuel and waste even more time. With an area that is so very clogged up due to a population of over 1 million citizens, you'd expect trafficability to be pretty tight. Network analysis allows the user to input real world problems that could hinder maneuverability that would include traffic, accidents, construction, etc. ArcGIS Network Analysis will benefit USPS through running processes of route creation from a specified place to another. Closest Facility is used in Network Analysis by finding the closest specified facility from a place. The user is allotted to change the amount of finds or if they want to drive towards or away from it. USPS is suppose to deliver a certain amount of mail during their duty day, but due to natural incidents like traffic, this is utilized by determining the route away from an accident to the next facility of delivery. Routes with barriers are implemented to drive around construction traffic, or one-way routes. This toolset allows USPS to add in any barriers in real time for accurate rerouting processes. Accessibility is measured in terms of travel, distance, and any other impediments within a route network. This is why barriers are a true avoidance, and can help the driver easily access a direct route. Best Route according to a specified impedance will help USPS with travel throughout the city to each designated library as the "traveling salesman problem". Network Analysis allows the user to determine the impedance of either creating the quickest path in time or the shortest path in between the two stops. The best route is essentially many meanings depending on the driver. This could mean cost efficiency or even just shortest distance. Network analysis could determine the best route by what the user is looking for.



### CONCLUSION

USPS has spent millions of dollars in investment to better improve their organization as a whole. For a long time, Libraries within the Tacoma area were struggling with the lack of updated material that needs to be delivered in a timely manner. These algorithms can be installed in USPS vehicles for better enhancement and cost efficient routes for their drivers. Implementing GIS data for USPS has saved the company over 100 million miles per year and a reduction of 10 million gallons of fuel consumed. This also helps our atmosphere with the reduction of carbon dioxide emissions by about 100,000 metric tons. The real problem is the reliability of these programs. In 2008, USPS adapted the ORION program to run these backgrounds in a matter of seconds for drivers. Today, many USPS drivers that were interviewed (who wished to remain anonymous) were lacking the reliability of the devices. Problems such as route development and speed of the system was simply too slow or "not working" the majority of the time. The odd find was that 2 in every 7 interviewed drivers were not utilizing these systems. ArcGIS is great for a homebase workshop, therefore, creating your route prior to your delivery venture could solve this problem. If you'd wish to utilize real world barriers by your delivery routing problem with time windows to honor these real world constraints. This would abide by vehicle capacities, USPS My Choice Services, and even driver specialties. In conclusion, Network Analysis is a reliable source of finding the quickest, most cost efficient route for USPS drivers in the Tacoma area.

### SOURCES

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- Zhu, Xuan. GIS for Environmental Applications, A practical Approach. New York: Routledge, 2016.
- Anagnostopoulos, K., & Vavatsikos, A., Ph.D. (2012). Site Suitability Analysis for Natural Systems for usps route Treatment with Spatial Analytic Hierarchy Process. JOURNAL OF WATER RESOURCES PLANNING AND MANAGEMENT, 125-134.

#### Notes:

This route is produced for start at the USPS location at 320 Garfield Dr.

Tacoma, WA 98499. Doing so, the driver will be on the "best" route, while delivering to each of the libraries within the city.

Coordinate System: GCS North American 1983  
Datum: North American 1983  
Units: Degree

Produced by:  
Cathy Trinh

# [GEOSYSTEMS]



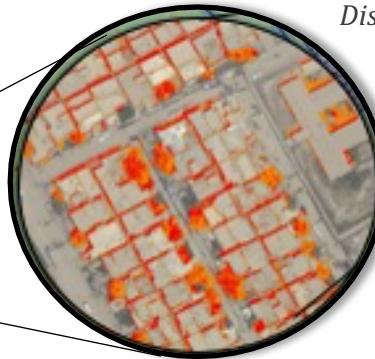
Fig. 1 Kirkuk City, 1999.



Fig. 2 Kirkuk City, 2010.

## ENVIRONMENT & SOCIETY

Successful and responsible management is the key necessity for today's ecosystem. Fig. 1 displays an elevated terrain with little industrial revolution in Kirkuk City in 1999. Fig. 2 displays the impact on the environment from manmade buildup and how quickly erosion, pollution, and physical impact has changed within a decade.

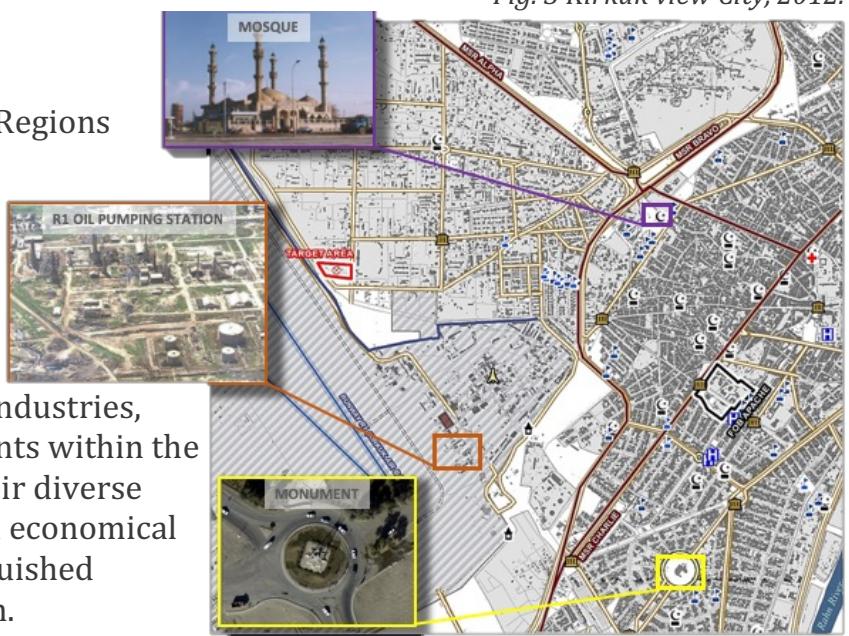


*Displayed is the inferred industrial built up that houses 3 to 6 families per household to preserve land territory. This method is used to "build Up" and grow more agriculture to abide to the demanding economy.*

Fig. 3 Kirkuk view City, 2012.

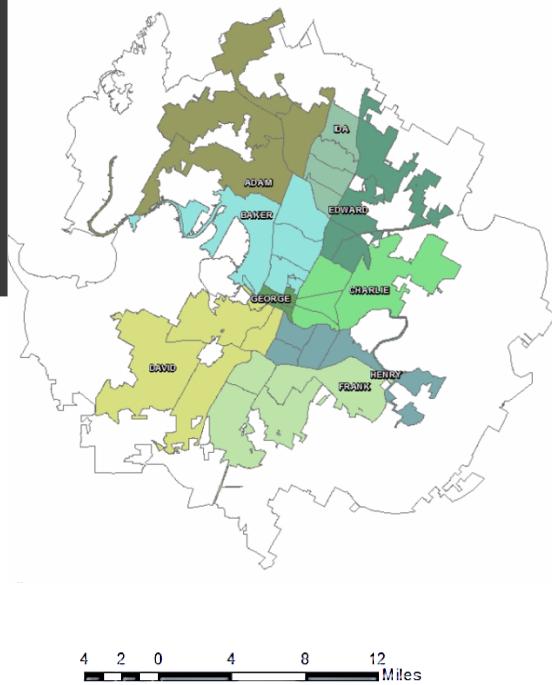
## PLACES & REGIONS

Like all concepts in Geography, Regions Are human constructs that help us visually inspect spatial extents. Conceptualize regions through boundaries, vegetation, climate, cultural practices, agriculture, etc. Fig. 3 displays some of the primary economic industries, churches, and cultural monuments within the the city of Kirkuk, Iraq. With their diverse territory, religious, cultural, and economical backgrounds bring their distinguished characteristics within the region.

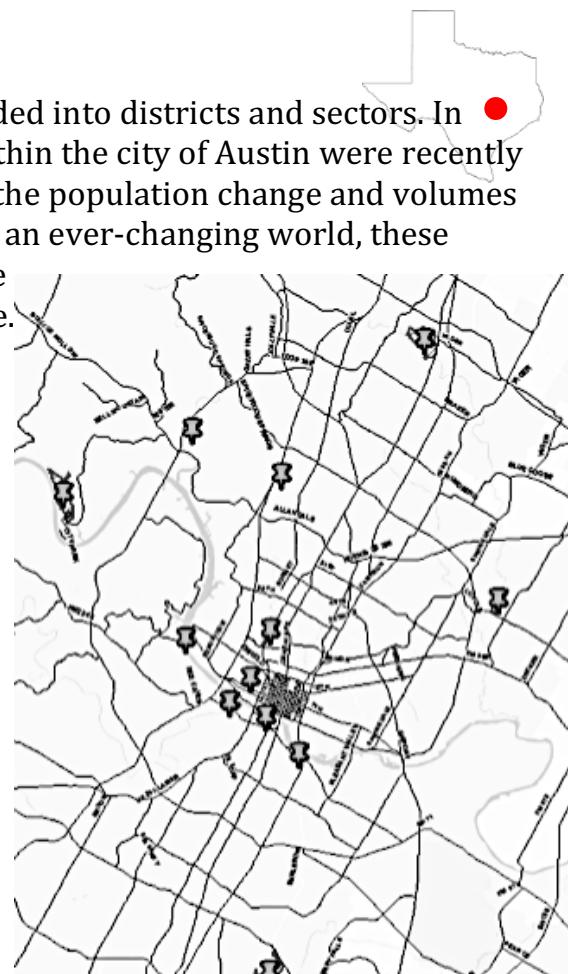


# [PATTERNS]

## SECTOR PRODUCTS

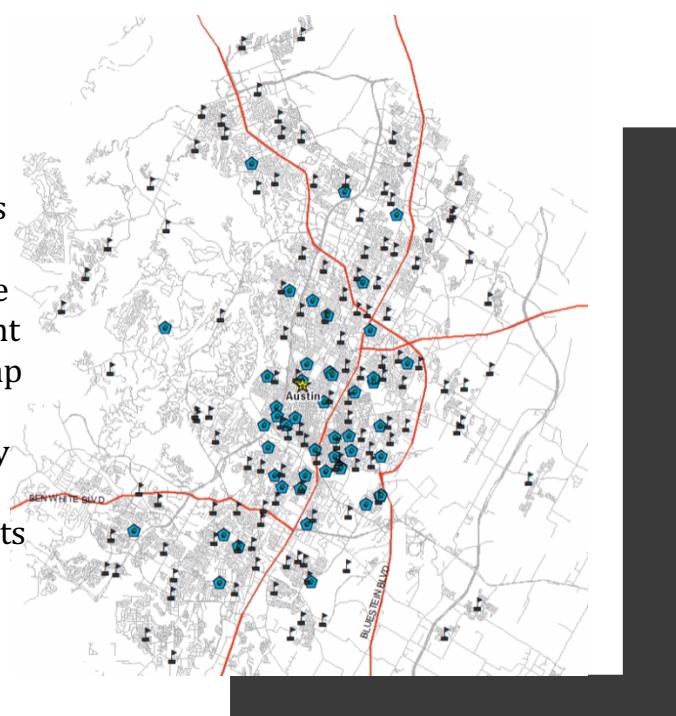


SECTOR	Population	Police Officer
ADAM	27871	27871
BAKER	26589	26589
CHARLIE	20991	20991
HENRY	8175	8175
EDWARD	13239	13239
DAVID	39102	39102
ADAM	28206	28206
ADAM	12895	12895
DAVID	27937	27937
DAVID	37499	37499
FRANK	19547	19547
EDWARD	10493	10493
FRANK	17997	17997
FRANK	15521	15521
EDWARD	18042	18042



## SPATIAL PERSPECTIVE PRODUCTS

Whether you need to figure the boundary school lines for your little one or simply the best route to get to school for your recent move, these spatial perspective maps use geographic tools and technologies to present and display features within an area. Displayed is a map with all elementary schools and the pools within the community. This is used so that parents could identify the neighboring pools after their children has been released from school. This is also useful so that parents could avoid areas



# GEOSPATIAL INFORMATION SYSTEM: PORTFOLIO

Reflective Learning Essay

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## Abstract

This reflective essay is based on my learning and comprehensions within the Geography Program at Park University. Ideas, brain storming, formally made decisions, and constructive identity was imbedded into this course in which I feel was the most I have received from this program. This essay will briefly go into depth on my experiences with the development of my geography/geospatial information system skills throughout my time at Park University as an Undergrad within the Geography major. Aside from the informative methods, I have found to become more geospatial productive within my own comfort zone combining layers of information about a place to give better understanding for others.

# GEOSPATIAL INFORMATION SYSTEM: PORTFOLIO

## Introduction

The portfolio before you are a collection of countless hours of Geospatial analytics and development throughout my time within the Geography program at Park University. The primary valuable lesson I've learned was what the producer displays is what the audience wants. Maps are a beautiful thing, but if you cannot interpret the overall message then is the audience wrong or is the producer wrong? This is a valuable lesson I have learned from the begging of our course. I use to hate constructive criticism because I have always felt that people with less experience than I have no say in what I complete. Therefore, I always just blamed the audience for misinterpreting the information that I display. The importance of efficiency and effectiveness displaying on these variables could be misconstrued. Many producers tend to create these maps for perceptual convexity, rather than displaying a thematic relevance.

## Spatial Perspective

Developing a spatial perspective is underlyingly the most important aspect when interoperating geographical information. Whether the primary focus is human patterns or even physical demands, this equal stronghold is tied within a geographical analysis. Spatial patterns are perceptual structure, placements, or arrangement of objects on this planet. The products pg. 3 (Spatial Perspectives) shows the most efficient way to deliver USPS mail that

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is the least cost effective to the company by adding in factors like turns, stops, lights, obstructions, and construction. This could influence the populace in many ways if their mail is not delivered in time. The characterization and comprehension of spatial patterns are the deep aspects of geological matters for today's everyday life. It is no doubt that geography promotes an immense platform with challenging analysis, comprehension, explanation, in both quantitative and qualitative terms. (Garters, 1995)

### Map Understanding

The “thinking geographically” mindset automatically sets into my head as I start any conduction of Geography work. Throughout my time within this program, I've learned to demonstrate how to use maps and other geographic tools and technologies to present and interpret geographic patterns (past, present, and future).

Interpreting maps is probably one of the most important skills map producers have today. The basic interpretations on a map includes the essentials that belong on a map which would include: Title, Legend, North Arrow, Scale, Location Reference, etc. With map interpretation we also ask a series of questions to include: 1. What area is the map covering? 2. What data is presented on the map? 3. What time of patters does the map portray? 4. What influences the data? The first question would always begin with exactly

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where that specified goal is located. This then crawls to the bigger characteristics of how? Where? Effect? Etc. The process of geographic inquiry is the primary bullet prior to execution of analysis.

Evaluating essentially means to critique something. Throughout the course, we've learned how differently we create maps from others. A poorly designed map could not only look very unpleasant to the eye, but also send the incorrect meaning. This could ultimately cause a series of terrible decision making in the future. The basic cartographic design of map in my opinion is simplicity. Above are two different maps that show poor production vs. good production.

Poor production:

1. Color scheme is not appealing (not continuous)
2. Legend doesn't tell the audience anything
3. Projection is off (looks like a Mercator)
4. Title is hard to read
5. Scale is incorrect

Good Production:

1. Color scheme is eye catching and blends well together.

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2. Order of elements are similar to T.A Slocums book (default setting for ESRI Software)
3. Contour color is contrasted easily with the rest of colors on the map.
4. Data granularity is coherent throughout the map
5. Legend is displayed well by the hue, lightness, and pattern

(Left)The population Trend map doesn't have a consistent flow to it.

All of the NO GO's on this map are aligned with the basic fundamentals on a map. These help the audience interpret what they're trying to inform therefore, these elements need to be corrected. (Right) The South Carolina Wildlife Map breaks down the zones of management. The data is well displayed and organized so that the audience can fully understand what they are trying to tell us. The principles of color here are truly impressive because they not only classify the zones but they show a transparency to dim the inside data, focusing mainly on the zones.

### Relevancy

GIS is one powerful technology that is recognized throughout many parts of the world. This system creates unimageable tasks far easier than the average person could accomplish like map creation, database management, and GPS associated spatial analysis. The distinction of GIS vs. simple map making systems is the fascinating work of analyzing spatial relationships within the data and associated networks. Simplified, the GIS methodology has

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technology has the power to portray vector/raster data pulled from multiple resources and analytically measure the geography of these input while comparing them to other spatial data. Even after over 50 years of research and a long histogram of spatial analysis techniques, only a limited amount has been displayed due to the fact that some have not been publicly served. The methods developed in this program to explore what the data you have compiled before you would include queries, spatial patterns and relationships amongst one another. The primary method for data interoperation is modeling your data so that you can easily challenge your hypothesis when some hitches are far more complicated than you think.

### Improves

Many products that I have initially created have taken such an immense amount of time because I like to be a perfectionist. Fig. 1 and 2 are simple elevation models with using the second return from LIDAR so that I could basically view the built-up areas as well. This was to show the buildup change that dramatically occurred in a ten-year time frame within the city of Kirkuk, Iraq. Some of the things that I wish I could of done before was minor things that would include map page setup, PowerPoint set up, and marginalia. It would take me over hours trying to perfect my work and what I “felt” like made since when I had the criteria in front of me the whole time.

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Over thinking about the situation practically means that extra time gets wasted as precious time gets used for nothing.

### Conclusion

My personal and intellectual growth throughout this program has climbed up the bar, dramatically. Looking at my work from when I first started this program to where I ended is extremely confident. Before, I was always able to create a map in a very short amount of time, but anyone could essentially press buttons all day as well and say they're Cartographers. I used to always struggle on things like the reasoning behind processes and how some of the GIS tools would run. I truly remember customers asking me questions as to why I created the product the way I did, and I simply just could not spit out the words. I was a star in map production but never understand the back concepts of it all and how it essentially worked. I mean, without the basic knowledge first, how are you supposed to understand what you're doing? I was honestly truly good at making a map look extremely pleasurable to look at. The second it came down to the analytical side of geospatial and geography, I looked completely lost. Coming out of this program, I've learned to appreciate more of the functions and processes that the system has to offer. There is just so much that GIS technology could provide, you can basically never learn enough.

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The future is currently on the data analysis side of the spectrum as I close out the chapter of my undergrad. My passion for Geography and GIS will always be full but I believe that these technologies have so much to learn from and so why learn more about the program when I can learn more about the system itself? Honestly, after pursuing my undergrad, I believe that GIS has taught me to love and appreciate technology more than I ever have before.