Earthquake Analysis – Impact simulation(Southern Alaska)

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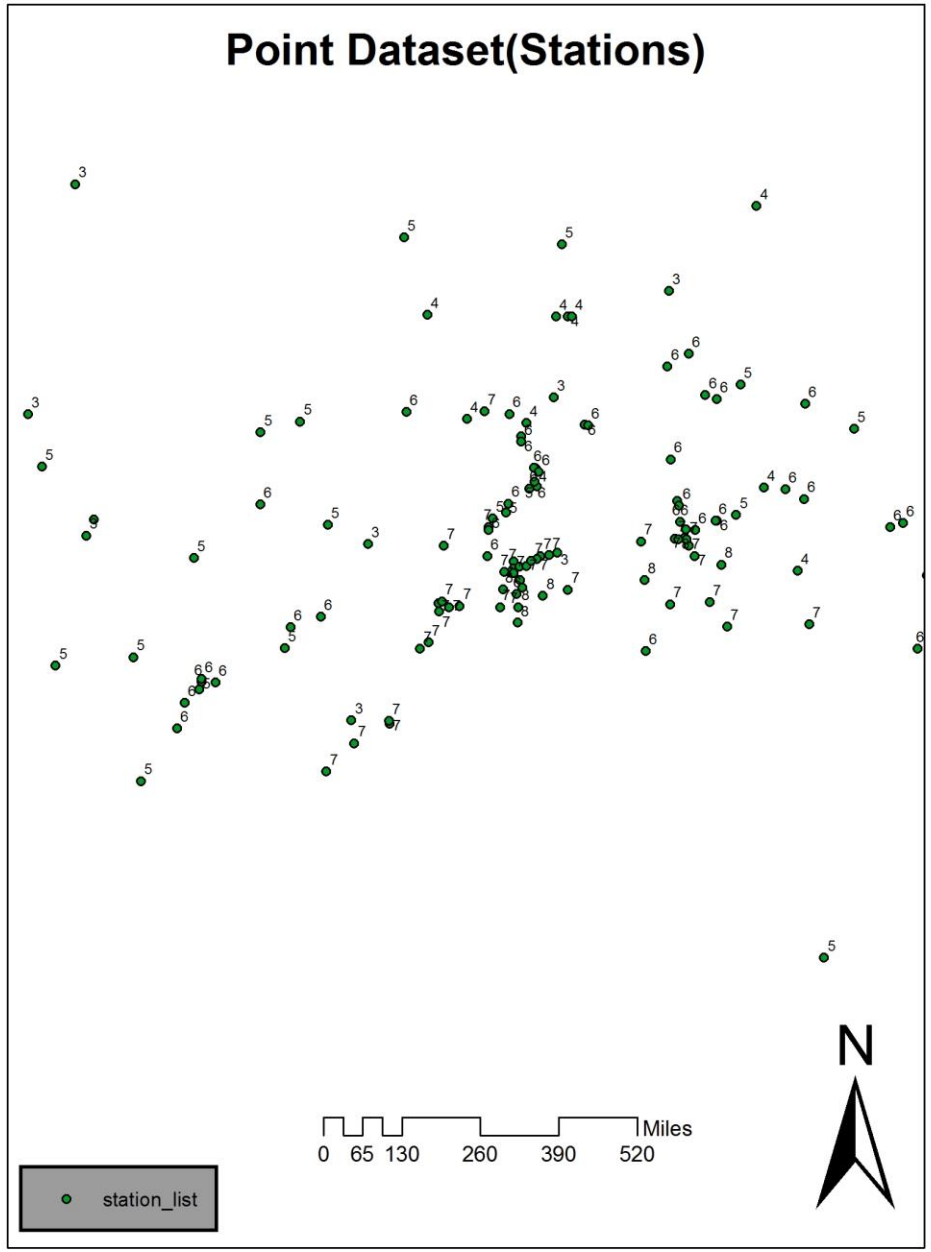
Introduction

- Earthquakes are major source of disasters as losses are exponential
- Main purpose for project was to simulate earthquake impact using geostatistical interpolations
- Southern Alaska was chosen as study area for this project. Earthquake details:

Magnitude	: 9.2 (Richter Scale)
Time	: 1964-03-28 03:36:16 UTC
GPS Location	: 60.908^{o}N 147.339^{o}W
Depth	: 25km

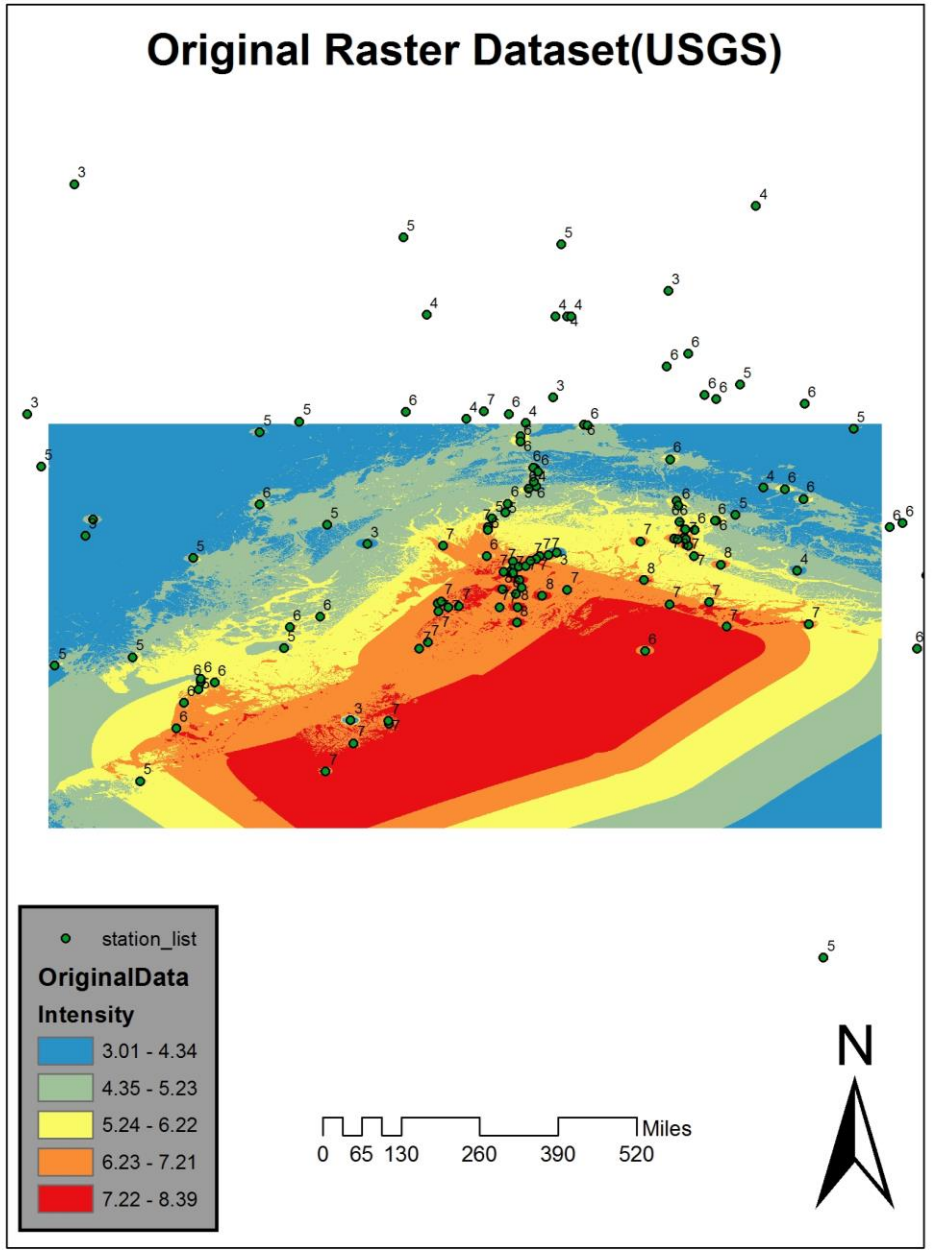
Problem Statement

- Creating an impact simulation based on point locations also known as stations
- These point locations contained earthquake impact on Richter scale



Problem Statement

- Final shake map data collected from USGS web site
- Main objective for this project was to simulate/reproduce result



Data Collection

- Source of data such as:

    1. Point observation locations (stations) having GPS coordinates
    2. Shake map for study area both in raster and vector format
    3. Metadata such as depth of earthquake, Peak Ground Acceleration(PGA), Peak Ground Velocity(PGV)

- Above mentioned data was collected from USGS web site. Hyperlink below:

    https://earthquake.usgs.gov/data/

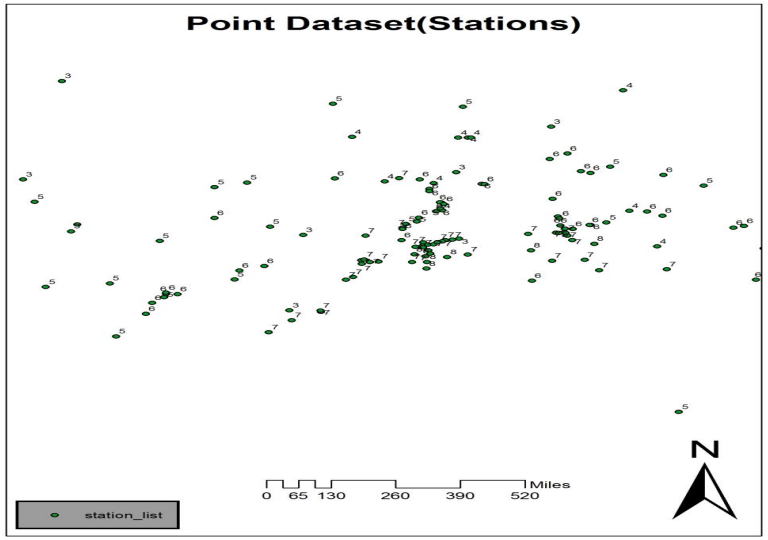
Methodology

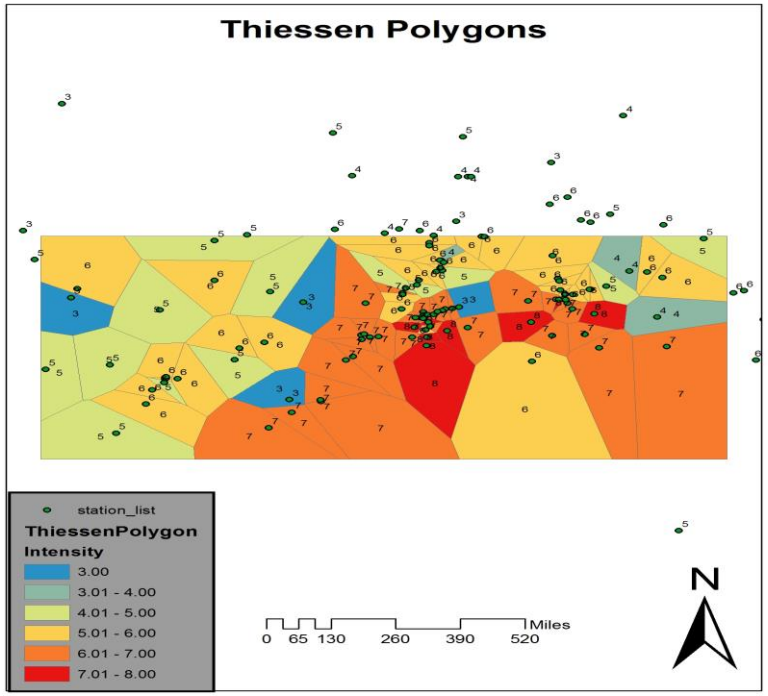
- This project can be broken down into below steps:

1. Extract point locations in CSV format from USGS
2. Import CSV file into ArcMap
3. Use ArcMap’s Display XY tool to create point locations(stations) shapefile
4. Use Define Projection tool to project these points into GCS_WGS_1984
5. Create Thiessen polygons around these point locations
6. Use Geostatistical analyst's IDW tool to create interpolated earthquake analysis
7. Use map algebra tool to create difference between IDW raster and original raster from USGS
8. Use map algebra to add raster created above with IDW raster to create final output

Results

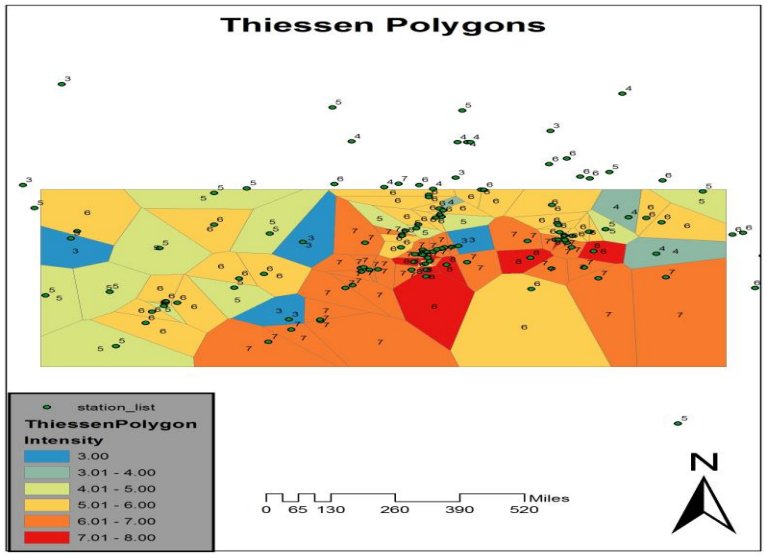
- Thiessen polygon creation
- Analysis Tools -> Proximity -> Create Thiessen Polygons

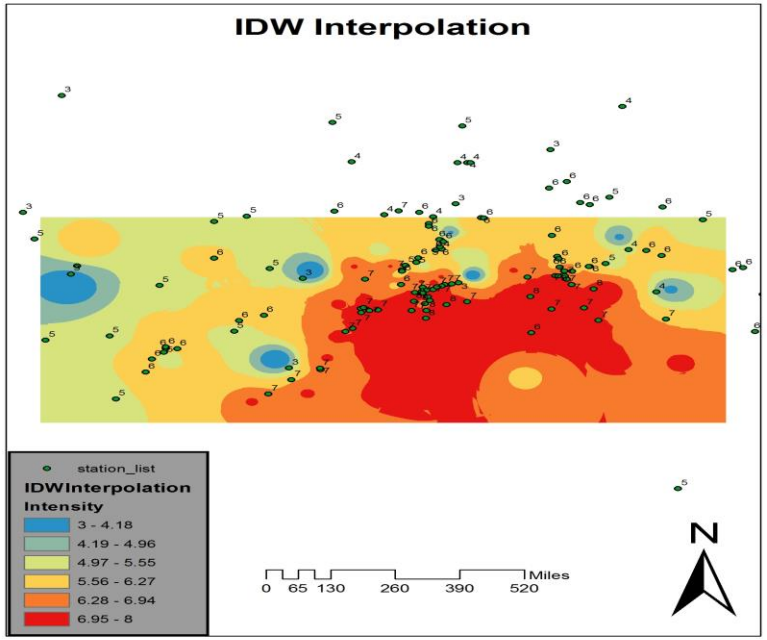




Results

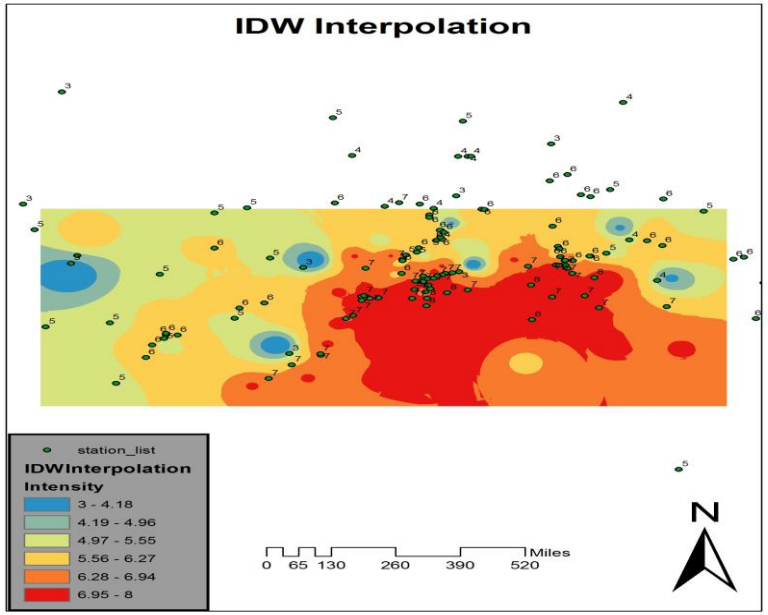
- IDW buffer creation around Thiessen Polygon
- Geostatistical Analyst Tools -> Interpolation -> IDW

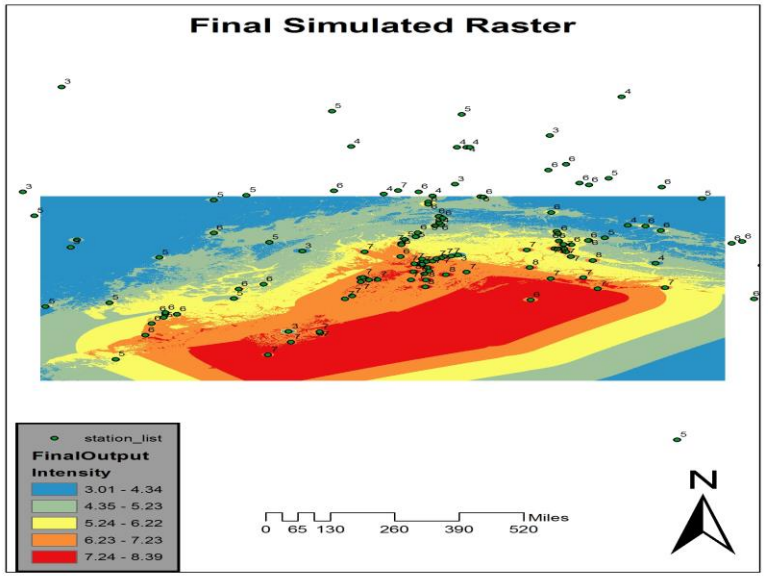




Results

- Difference, Addition onto IDW raster to create simulated output
- Spatial Analyst Tools -> Map Algebra -> Raster Calculator





References

- Required data collected from a Single source

  USGS "Data and Products." *U.S. Geological Survey*. USGS, 03 May 2017. Web.

- ArcMap(10.4.1) tool reference information

  ESRI. "Create and Share Maps, Analytics, and Data." *ArcGIS Desktop*. ESRI, Web.