THE GREAT SHAKE

RISK ASSESMENT OF EARTHQUAKE HAZARD AND VULNERABILITY IN SALT LAKE COUNTY, UTAH

INTRODUCTION

Salt Lake City is a growing metropolitan area nestled between the Wasatch Mountain Range and The Great Salt Lake in northern Utah. With just over one million people, Salt Lake County is notable for its famous ski resorts and Mormon temples, but the city also exists within a large and active fault zone. The Wasatch Fault is “one of the longest and most active normal faults in the world” (Christenson et. al., 2008) and it stretches immediately adjacent to Salt Lake City. Based on knowledge about past earthquake occurrences, including interval timing and magnitude measurements, experts forecast the Wasatch Front at a 57% probability of having a 6.0 or greater magnitude earthquake in the next 50 years (DuRoss, 2016).

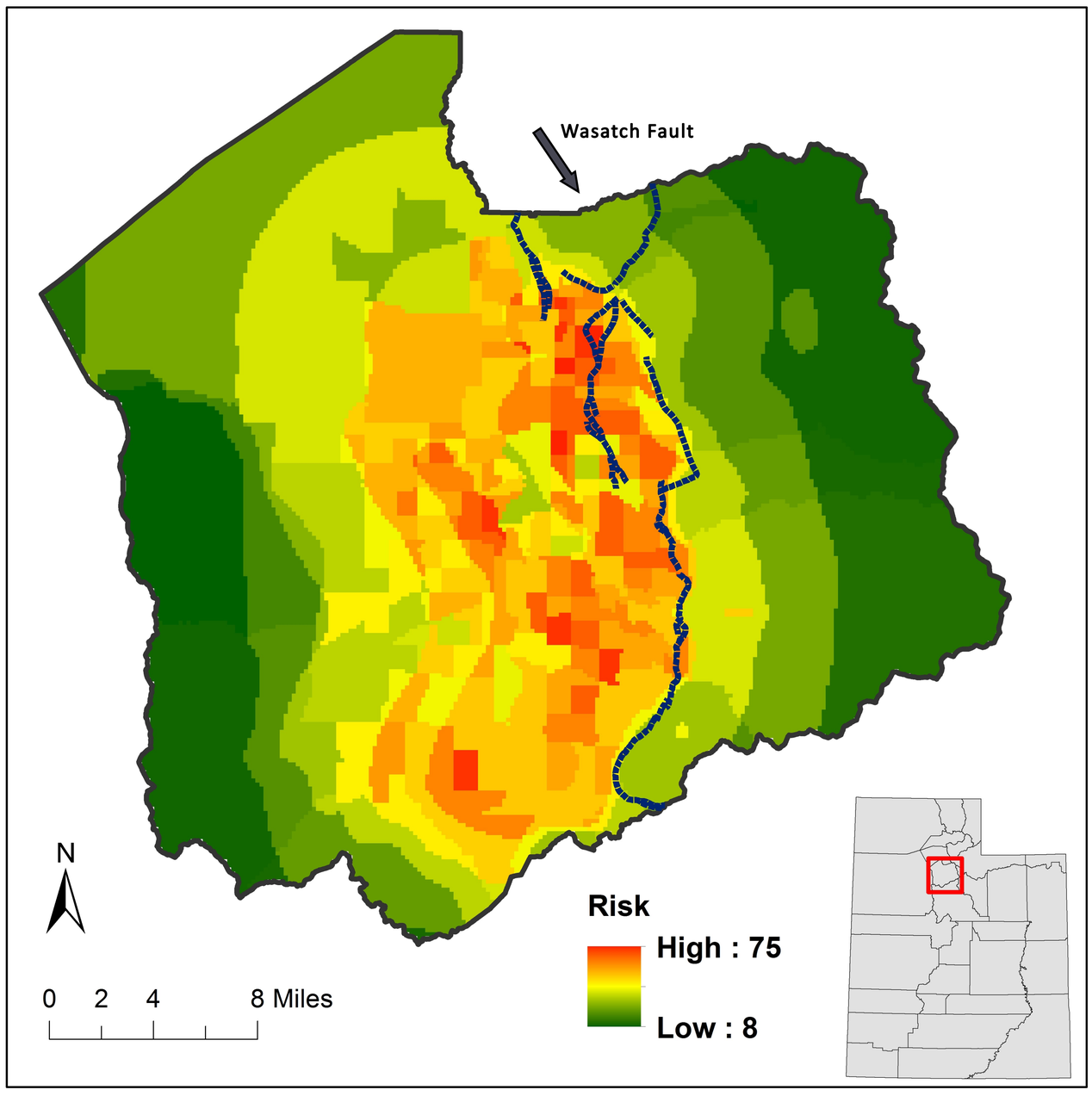
Factors that can affect the severity of earthquake damages include magnitude of the shake, distance from the epicenter, and soil and terrain type in the surrounding areas (DuRoss, 2016). The objective of this spatial analysis is to identify areas within the Salt Lake County that are at highest risk of damages if a major earthquake were to occur. By examining infrastructure features, shaking, and population characteristics, this project will identify areas throughout the Wasatch Valley that are at the highest risk during and after an earthquake in and around Salt Lake City, Utah.

METHODOLOGY

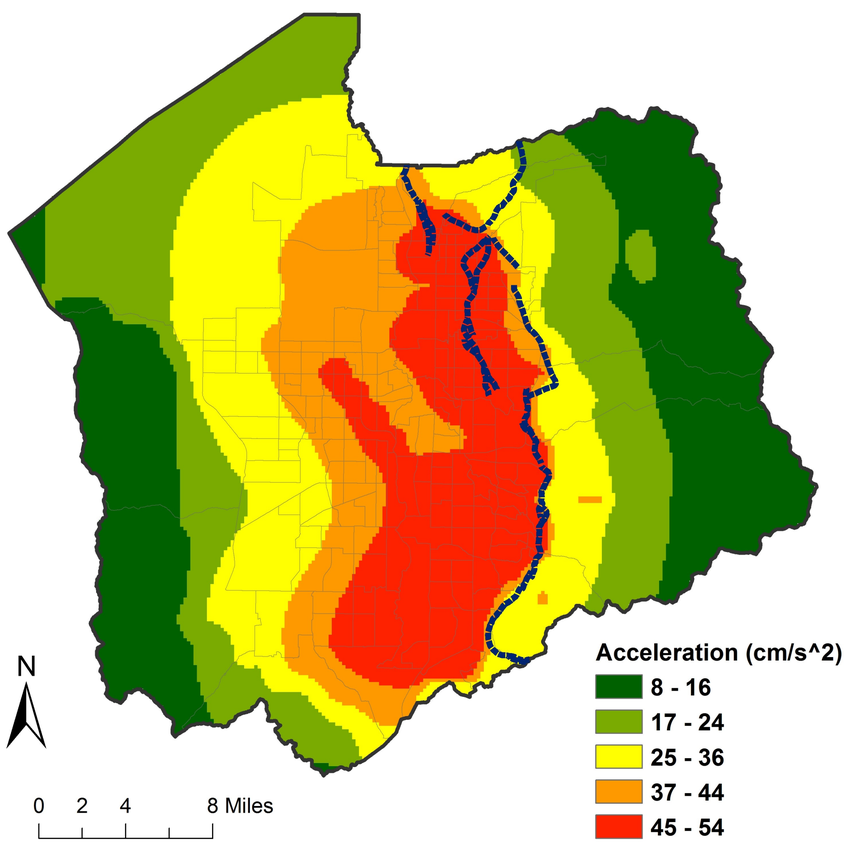
I compiled various data layers to create a final map that showed the areas throughout Salt Lake County that are at high risk in the event of an earthquake. The main hazard that I identified was shaking. I created a visual representation of the areas in which the greatest shaking will occur. These are the highest hazard spaces during an earthquake.

The human population is also very vulnerable to harm caused by an shaking during a quake. I created separate figures to show the distribution of population and infrastructure features throughout the census tracts of the Salt Lake County. Areas with a greater population density, number of schools, and number of dams are more vulnerable. Healthcare facilities, on the other hand, can reduce risk by aiding in recovery following a shake. I considered these four aspects of vulnerability when examining the earthquake risk of Salt Lake County.

Finally, I completed a raster calculation to compile the hazard and vulnerability factors identified above. By multiplying the shaking hazard by the sum of the vulnerability factors I was able to identify areas throughout Salt Lake County that face the highest risk in the event of an earthquake.



SHAKING



CONCLUSION

The final figure in this analysis identifies the regions in Salt Lake County which face the highest risk of earthquake damages. Tracts in the northernmost and central areas of the county are regions that show these dangers. While healthcare facilities can help with rescue and response following a shake, areas with high levels of shaking and dangerous infrastructure features still contain very vulnerable populations. A great shake would be incredibly destructive to Salt Lake City.

It is important to use earthquake risk assessment when creating public policy and infrastructure. Additionally there are a large variety of additional risks, ranging from geographic features to other human factors, that should be considered when examining risk. By identifying regions with the greatest hazards, efforts to address potential human damages can be addressed. Earthquake risk analysis is an important assessment to protect Salt Lake City and all areas along active faults.

RISK CALCULATION

Classification	1	2	3	4	5
Shaking (Acceleration in cm/s^2)	8-16	17-24	25-36	37-44	45-54
Population Density ($People/m^2$)	0-.000456128	.000456128-.001368385	.001368385-.002088587	.002088587-.002904816	.002904816-.00612172
Number of Schools	0-1	2	3	4-6	7-8
Number of Dams	0	1	2	3+	na
Number of Healthcare Facilities	12-17	8-11	5-7	3-4	0-2

Annie Bricker

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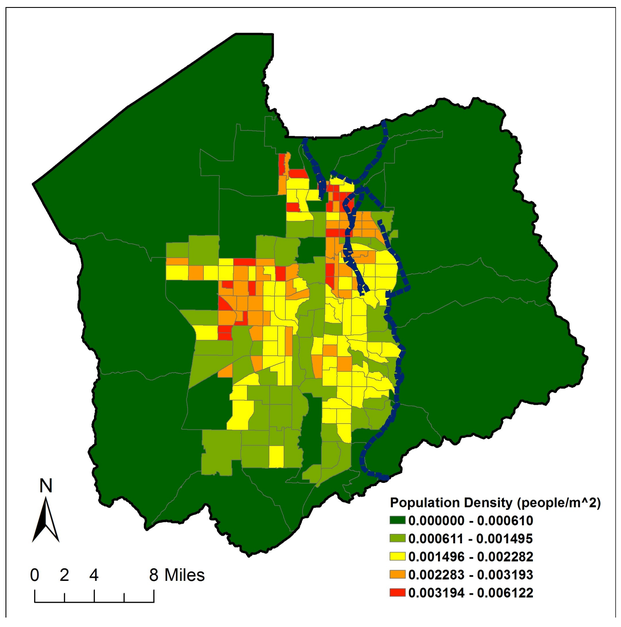
Cited Literature:

Christenson G., DuRoss C., Eldrege S., Hylland M., et. Al. (2008). Putting Down Roots in Earthquake Country: Your Handbook for Earthquakes in Utah. Utah Seismic Safety Commission.

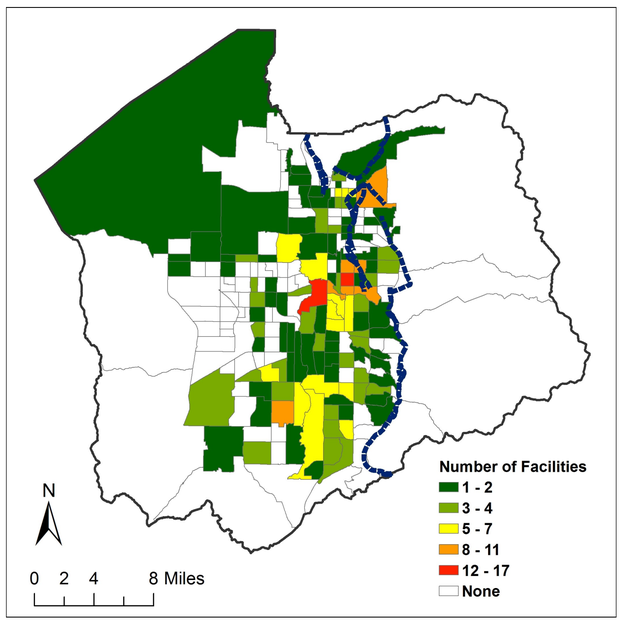
DuRoss, C.B., 2016, Earthquake forecast for the Wasatch Front region of the Intermountain West: U.S. Geological Survey Fact Sheet 2016–3019, 2 p.,

Map data from Utah AGRC

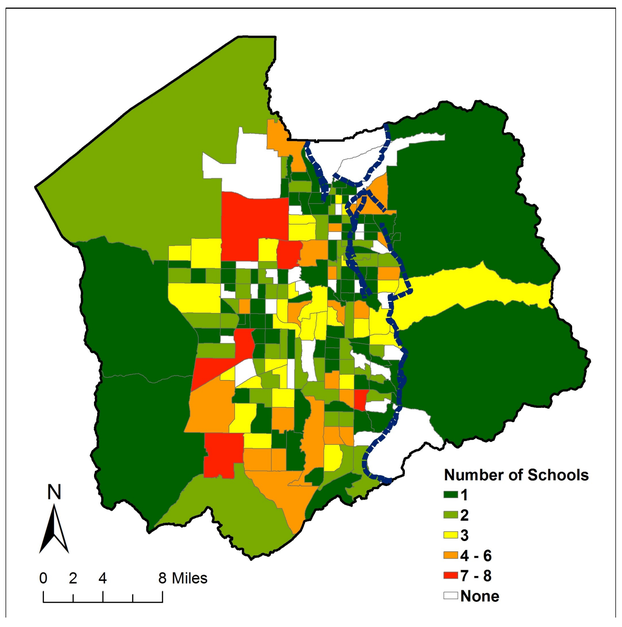
POPULATION DENSITY



HEALTHCARE FACILITIES



SCHOOLS



DAMS