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**ENVIRONMENTAL RACISM IN A GROWING CITY: INVESTIGATING
DEMOGRAPHIC SHIFTS IN SALT LAKE CITY'S POLLUTED NEIGHBORHOODS**

by

Emma Nathel Jones

**Capstone submitted in partial fulfillment of
the requirements for graduation with**

University Honors

with a major in
Conservation and Restoration Ecology
in the Department of Wildland Resources

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ABSTRACT

Studies investigating the spatial distribution of environmental hazards have repeatedly demonstrated the existence of environmental racism -- the disproportionate impact of environmental hazards on communities of color. We aim to contribute to research on environmental racism by asking how relationships between race and hazard exposure change over time. Our study area, Salt Lake City (SLC), UT, USA is one of the largest cities in the intermountain west and is expected to see continued population growth. SLC was 99% white from 1860-1950. 2019 census estimates indicate that SLC is becoming more racially diverse with 35.6% of the population identifying as racial categories other than “white alone.” Latinx people represent the largest proportion of SLC’s growing racial diversity (21.2%). We analyze American Community Survey (ACS) demographic data comparing 2 years spanning a ~10 year period (2010 and 2019) to determine whether census tracts with high densities of environmental hazard sites have a growing, shrinking, or unchanging proportion of Latinx residents. We connect this analysis to mortgage redlining practices that promoted urban segregation along race and class lines and ask whether these practices and the resulting geographies of housing inequality have created conditions restricting the growth of communities of color to polluted areas. We argue that racist planning practices effectively weave environmental racism into the fabric of cities and that cities with growing communities of color must consider how existing spatial patterns of segregation may perpetuate exposure to environmental harms.

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INTRODUCTION

Environmental racism theory states racial minorities are more likely to experience adverse impacts of environmental pollution compared to White people (Pulido, 1996). Pulido (2017) describes these disproportionate impacts as the “environmental racism gap” and observes that despite growing attention to environmental justice in the US these disparities “have not diminished and that the situation may have worsened.” Scholars have found that race is the most significant predictor of environmental pollution exposure, and can intersect with other factors including income disparity, education level, and neighborhood location (Crowder et al., 2010). Pulido has argued that when investigating environmental racism, race and class should not be reduced to independent variables and should emphasize how different forms of inequality relate and cyclically feed into each other (Pulido, 2000). Implicit housing separation along racial and economic divides perpetuates the “environmental racism gap” (Downey, 2005). The intersection between housing segregation and environmental pollution is the result of racist structural policies that actively block opportunities for people of color.

Environmental discrimination has been studied for decades in the U.S. for both air pollution and terrestrial pollution. Crowder and Downey (2010) found that Black and Latinx households experience higher levels of proximate industrial pollution compared to White households. Downey (2006) also found that though the disparate social impacts of environmental pollution on Latinx communities vary, consistent detection of environmental inequality is found in the western US. These studies exhibit the importance of investigating how pollution impacts Latinx communities in urban areas, especially in the western US.

Due to Utah’s continued struggle with air pollution issues, the environmental racism gap in SLC has primarily been documented using air pollution data. Disproportionate air pollution

exposure around predominantly minority schools in Salt Lake County has been documented, and areas of SLC at lower elevations where racial segregation patterns in housing exist may explain for strong associations between race and PM 2.5 exposure (Mullen et al., 2020). We aim to contribute to research on environmental racism in SLC by investigating spatial patterns of terrestrial pollution. In this paper we connect our study of the spatial distribution of terrestrial pollution to historic and present-day planning practices that perpetuate housing segregation and ask how these institutionalized policies have impacted SLC's Latinx community over time.

SETTING AND HISTORICAL CONTEXT

Environmental racism is institutionalized in the way cities are developed. Following the Great Depression, the US federal government implemented mortgage lending guidelines which aimed to stabilize housing markets across US cities as a part of the New Deal. These guidelines, created by the federal Home Owners Loan Corporation (HOLC), were presented as redlining maps which classified city districts into zones based on their proximity to industrial areas, housing conditions, average income, and racial demographics to evaluate mortgage default risk for different neighborhoods (Faber, 2020). Conflating race with mortgage default risk and by extension home equity growth created not only policies that justified racial discrimination, but also created a foundation for future federal programs like the Federal Housing Administration (FHA) and GI Bill that institutionalized and essentialized discriminatory risk metrics (Freund 2007, Faber, 2020). The ultimate outcome of redlining in cities has been targeted, perpetuated disinvestment in communities of color. These maps and their legacies were complicit in perpetuating the phenomenon of racializing urban space by presuming that “certain spaces are intrinsically doomed to welfare dependency, high street crime, [and] underclass status, because

of the characteristics of its inhabitants, so that the larger economic system has no role in creating these problems” (Mills, 1997, pg 49-51).

In the 1930s the HOLC produced a redlining map for SLC. In this map, areas of SLC with a higher proportion of residents of color and pollution densities, such as industrial sites associated with the railroad industry, were classified as ‘Hazardous’ or ‘Definitely Declining’, while white neighborhoods located at a greater distance from industry were classified as ‘Still Desirable’ or ‘Best’ (*Mapping Inequality*). While there is evidence of racially restrictive covenants existing in SLC starting in the 1920s, redlining helped solidify patterns restricting where Black and Latinx residents could own and rent property in SLC and kept communities of color isolated to the parts of town with more pollution (Korevaar, 2014).

SLC was 99% white from 1860-1950, but 2019 census estimates indicate that SLC is becoming more racially diverse with 35.6% of the population identifying as racial categories other than “white alone” (World Population Review, U.S. Census Bureau). Latinx people represent the largest proportion of SLC’s growing racial diversity, representing 21.2% of the population. Utah’s historic Latinx communities were comprised of Mexican immigrants that came to the state in the 1880s and 1890s due to the expansion of the railroads (Mayer et al., 1973). They became a critical part of Utah’s economy, working on railroads, mines, farms, and ranches across the state.

Latinx residents were pushed into the neighborhoods around Pioneer Park on the west side of SLC from the 1880s-1920s due to its proximity to railroads and more affordable housing (Westwood & Clark, 2020). Redlining in the 1930s and 40s further perpetuated neighborhood divides, reinforcing the places Latinx immigrants could and could not buy property (Mayer et al., 1973). A study investigating “Mexican assimilation in SLC” conducted in 1947 by Joseph Allen,

a graduate student in the department of Sociology at the University of Utah, found that the majority of the Mexican residents interviewed lived between 8th South, 2nd North, West Temple, and 8th West. These boundaries represent the historic limits of the Pioneer Park neighborhood (Allen, 1947, Figure 2). To this day, Latinx communities in SLC are predominantly found on the west side of town, with I-15 dividing Latinx neighborhoods from white neighborhoods (Figure 3). This division corresponds with the concentration of “redlined” districts on SLC’s west side and shows the spatial legacy of redlining in modern SLC’s development.

The Pioneer Park neighborhood is located along SLC’s industrial corridor in part due to its historical proximity to the railroads. This location has made Pioneer Park a center of pollution in SLC for decades. During Salt Lake City’s pioneer and territorial periods between 1847-1896, canals would drain industrial and septic runoff through the community that would later be the Pioneer Park neighborhood, causing a disproportionate contraction of waterborne illnesses in the area (Westwood, 2020). As SLC began to develop modern sewage systems, the Pioneer Park neighborhood was one of the last areas in town to receive these amenities. This meant most residents in the area didn’t have access to indoor plumbing until much later than the rest of the city. This part of town was also one of the last communities to have paved roads, a sign of continued disinvestment in the west side of SLC (Westwood & Clark, 2020). The conditions on the west side greatly influenced SLC’s reputation as one of the U.S.’s dirtiest cities in the early 20th century and impacted the quality of life of western SLC residents for decades (Westwood, 2020).

Religion has also been an integral part of Utah’s history, impacting SLC’s Latinx population in both positive and negative ways. The Mormon church (the Church of Jesus Christ

of Latter-Day Saints) brought waves of settlers to Utah in the 1850s, and their communities greatly influenced the way cities and political systems developed in the state. Early zoning efforts in SLC often reflect the pressures from the LDS community to develop the city as a religious center, population center, and state capitol (Korevaar, 2014). In 1939 the Utah State Planning Board stated that planners in the SLC region had ‘obligations to systematic planning out of respect for the church’ (Korevaar, 2014). The LDS church was the original owner of the block Pioneer Park would later be built on, demonstrating the comparative wealth and status the church had in the city (Westwood, 2020). Affluent, white LDS residents separated themselves from the rest of SLC and were often the first to receive modern amenities and improved municipal structures. Historic Latinx communities in SLC had mixed religious affiliations, with both a Spanish speaking LDS congregation and a Catholic diocese on the west side of SLC (Iber, 2000). LDS Latinx residents noted different treatment compared to their Catholic counterparts, and that their LDS affiliation brought more ‘economic, social, and psychic benefits including employment and tuition assistance, networking, and character references’ when local police officers discriminated against them (*Latinos and Salt Lake City’s West Side*, 2020).

The LDS church continues to have a large influence on SLC’s residents. A 2018 study by Collins and Grineski found that whiteness and the LDS affiliation of a community were the strongest predictors of reduced exposure to air pollution, and that Mormon residents’ ‘collective power serves to protect them from air pollution’ (Collins & Grineski, 2019). In contrast, SLC’s Latinx and Black communities were at greater risk of air pollution exposure, and often are not LDS. These findings are concerning and may worsen as SLC becomes more racially diverse.

Current planning practices continue to impact the quality of life for SLC’s communities of color. Salt Lake County, like many counties across the country, implements tax increment

financing (TIF) projects to redevelop areas of town that typically have lower property values. TIF projects establish a district, and then use the projected change in property tax value over time to take out bonds to develop infrastructure and change land use within the district with the goal of increasing property values (Baker et al., 2016). TIF projects are often criticized for being tools of gentrification, pushing out minority residents who can no longer afford the increased housing prices (Baker et al., 2016). Though gentrification may not always have racial motivations, it is difficult to separate the impacts of gentrification from racism within the context of racialized urban geographies (Zimmer, 2020).

Investigating how Latinx communities are continuing to evolve in SLC is a critical step in ensuring that Latinx residents continue to have vibrant, established communities in Utah. Utah's non-Mormon, non-white history is frequently ignored or undervalued, and the prevailing narrative of a white Utah leaves out the diverse experiences of Latinx residents in SLC. Collins and Grineski's (2018) study connecting pollution exposure to race and religious affiliation provided a foundation for investigating race and pollution exposure in SLC. We build on this research by connecting environmental pollution to historic and present-day planning practices that perpetuate racial inequality. By contributing to research on race and environmental inequality in Utah, our study and others highlight the importance of bringing the histories and experiences of Utah's BIPOC communities to light to question who benefits from the narrative of a white, LDS Utah.

METHODS

To observe where Latinx residents live in Salt Lake County today, we analyzed American Community Survey (ACS) 5 year estimates from 2010 and 2019 to determine whether census

tracts have a growing, shrinking, or unchanging proportion of Latinx residents. The number of residents identifying as ‘Hispanic or Latino’ in each census tract was divided by the total population of the census tract to calculate Latinx population density per census tract for 2010 and 2019. These densities were divided using five natural breaks (0.00-.07, 0.08-0.15, 0.16-0.26, 0.27-0.38, 0.39-0.66) and visualized using a choropleth map. We also calculated the change in Latinx density for each census tract between 2010 and 2019 by subtracting 2010 Latinx densities from 2019 Latinx densities and dividing this by the 2010 density. This metric allowed us to quantify changes in the number of Latinx residents living in census tracts in 2010 and 2019.

It should be noted that census demographic data assumes that race is constant and objective. This assumption is not an accurate representation of the evolution of racial discourse and does not reflect that racial categories are socially constructed (Omi and Winant 1994, Wade 1997). Despite the questionable use of words like “Latino” or “Hispanic” to accurately describe groups of people, often they persist in environmental justice literature due to the way race and ethnicity are woven into political discourse in the US. Though these terms may simplify identities within the Latinx community, these terms do help describe trends in issues that impact Latinx people, like health, education, and socio-economic mobility (Carter, 2016). We use ACS data in this study while recognizing its limitations because this data provides one of the only large-scale datasets for researching US population demographics through time.

Polluted sites used in the study include hazardous waste and used oil facilities, solid waste facilities, superfund sites, brownfield sites, and remediation sites (UT AGRC). We used a wide variety of pollution types to investigate spatial patterns of terrestrial pollution in SLC. It should be noted that we did not account for pollution severity in our analysis because several of the datasets didn’t have any severity metrics and because there was no meaningful way to

accurately compare each polluted site type to another polluted site. Polluted sites were combined into one, comprehensive pollution dataset, which was then used to conduct a hotspot analysis.

The hotspot analysis was conducted in GeoDa (Anselin et al., 2006) on a ~0.5 mile² grid spanning the extent of Salt Lake County. The Getis-Ord G_i^* statistic was used to identify spatial clusters of polluting industry hot and cold spots. This method compares individual features' sums to neighboring features' sums and calculates p-values that identify statistically significant spatial clusters of high (hot) and low (cold) values. Significant hot spots and cold spots are those where the difference between the local sum and global sum is too large to be the result of random chance (Deitz & Meehan, 2019). The G^* statistic is less sensitive to assumptions of normality in data and is designed for data that is not normally distributed. It is also less sensitive to false positives and less likely to identify incorrectly significant clusters (Getis & Ord, 1992). In our analysis, hot spots represent clusters of grid cells with significantly higher concentrations of polluting industry sites. Statistically significant cold spots were removed from the final maps to aid in clearer visualization.

Pollution hotspots and Latinx population densities were compared to the location of redlining districts from the 1930s and TIF projects in Salt Lake County to visually inspect spatial patterns of pollution, race, and city planning practices. TIF project boundaries were digitized from project records published by Salt Lake County, and redlined district shapefiles were downloaded from the Mapping Inequality project. Maps of Latinx population densities, redlined areas, and the pollution hotspots were mapped using the Pioneer Park neighborhood as a landmark.

RESULTS

There is a clustered toxic site hotspot in downtown and west SLC that follows the I-15 corridor from Murray to Temple Square. We see the most significant concentration of toxic sites in W Salt Lake in the Glendale Neighborhood. In 2010, census tracts with the most Latinx residents were predominantly located in west SLC and there is substantial visible overlap between the toxic site hotspot and census tracts containing the largest Latinx populations (Figure 5). These spatial patterns also conform to the redlined ‘Hazardous’ and industrial areas of SLC (Figure 4). Conversely, areas designated as ‘Best’ or ‘Still Desirable’ by the HOLC have minimal overlap with significant pollution hotspots, which corresponds with historic accounts of fewer polluting industries located in the predominantly white, LDS communities in east SLC.

In 2019 we see a decrease in the percent of Latinx residents in downtown Salt Lake census tracts and census tracts further west see an increase in the percent of Latinx residents (Figure 3). Some of the census tracts which see a loss in Latinx residents, most notably the census tract directly south of Pioneer Park, are tracts that have been targeted for downtown TIF projects. Census tract 49035114000 which was targeted for TIF projects had a 44% decrease in Latinx residents between 2010 and 2019. In 2019 there appears to be a 4-9% increase in Latinx residents that have moved into the eastern neighborhoods of SLC near the University of Utah, the Salt Lake City Cemetery, and to a lesser extent the Lower Avenues neighborhood.

DISCUSSION

The concentration of Latinx residents in redlined areas in west SLC suggests that early Latinx communities were restricted to areas that were being developed for industry and likely had the highest pollution exposure. Many of the census tracts around Pioneer Park were

designated as ‘Industrial’ by the HOLC, suggesting that urban planners and HOLC appraisers didn’t even view these neighborhoods as inhabitable. The census tracts where the majority of Latinx residents reside today in SLC fall within HOLC grades B7, C4, C5, C6, C7, D4, D5, D6, and D7. Phrases used to describe these specific D grade areas include: ‘houses are old, poorly kept up, and practically not saleable’, ‘shacks’, ‘security is poor, being old and obsolete’, ‘homes are old and modest in every degree’ (*Mapping Inequality*). The language used to describe these areas communicates the lack of value HOLC appraisers saw in these communities, noting the poor quality of housing but not addressing the people that lived there. The fact that the impacts of redlining remain visible today illustrates the pervasive legacy the HOLC had on SLC’s development for nearly a century.

The redlined districts D1 and D2 are noted to be some of the first areas of the city that were ‘abandoned’ when presumably wealthy white residents moved to districts on the eastern bench (*Mapping Inequality*). Interestingly, D1 is noted to be the only place in the city where Black people lived, one of the only explicit racial references made in the entire document (*Mapping Inequality*). The language used in these redlining documents is often sterile and dehumanizing, focusing on the worth of properties from a mortgage lending standpoint instead of on the needs of the people that lived there.

The movement of Latinx residents to census tracts farther west and south in Salt Lake County may be attributed to a shift in housing prices from redevelopment projects that pushed Mexican-American communities in downtown SLC to more affordable areas, or may be due to the increase of Latinx immigrants Utah has seen in the 21st century. Without more detailed demographic data it is difficult to detect the nuanced identities within the Latinx community and the drivers behind their movement.

The drastic decrease in Latinx residents in the census tract south of Pioneer Park may be the effects of gentrification due to the TIF redevelopment project in this neighborhood. This shift in composition may be because of increased housing prices that pushed out Latinx residents or may be because of an increase in commercial development in the neighborhood. These visual patterns may illustrate that the TIF projects in SLC do more harm than good to local Latinx communities, pushing them out in the process of redevelopment and environmental remediation.

The slight increase of Latinx residents in eastern SLC may be due to increased socioeconomic mobility in the Latinx community over the last decade, or it may be attributed to an increasing number of Latinx immigrants in the city. There may also be a higher rate of converting older housing into more affordable apartments in these areas to appeal to the student population, which may in turn draw Latinx residents to also live in these areas.

There are many questions that this study leaves unanswered. Further research needs to be done to investigate the impacts of targeting Salt Lake City's Brown and immigrant communities for TIF projects and how contemporary urban planning strategies may perpetuate the environmental racism gap. Future studies should also investigate how shifting land prices in SLC and changing incomes for Latinx residents may impact their mobility and ability to flee polluted neighborhoods. Though investigating income may create a clearer picture of how Latinx residents move within Salt Lake County, it should be noted that Pais et. al (2014) found that controlling for income among other variables like education and homeownership status still yielded statistically significant racial differences in pollution exposure. Downey and Hawkins found that a neighborhood's racial composition was the strongest indicator of environmental quality, even in areas with similar incomes and that income and race cannot be fully understood as separate variables in the U.S. because of generational poverty upheld by structures of

oppression (Downey & Hawkins, 2008).

Investigating the movement of different ethnic groups within the Latinx community would shed important light on how pollution exposure impacts established Mexican-American communities versus recent immigrant communities from other countries in Latin and South America. Bakhtsiyarava & Nawrotzki (2017) found that immigrants in the US generally resided in environmentally safe areas except for Mexican immigrants, who tended to migrate to environmentally unsafe neighborhoods in high income areas. Knowing these specific patterns within the context of SLC would help local policy makers take targeted action to address environmental pollution. These actions should recognize and aim to correct the impacts of past planning practices like mortgage redlining which have concentrated pollution in SLC's communities of color.

CONCLUSION

Environmental racism impacts the levels of pollution communities of color experience across the U.S. In SLC, redlining practices concentrated both Latinx communities and polluted sites in the same areas of town. Latinx residents seem to be moving farther west and south in Salt Lake County, which is where the majority of SLC's industrial pollution is located. While there may be many reasons for individuals and households to move, we find a considerable reduction in the Latinx community in a census tract in SLC targeted for TIF projects. The identification of these spatial patterns suggests a need to further investigate how present-day planning practices in SLC, like TIFs, may reinforce the impacts of past practices like redlining and continue to predispose Latinx residents to disproportionate pollution exposure compared to white residents. Observing the legacy of redlining on SLC's development is critical for helping municipal

planners move away from racist, classist development practices that are currently woven into the city's history. Interrupting these intentionally constructed systems of oppression through changes in public policy will ensure the prosperity of SLC's vibrant, growing Latinx communities.

Word Count: 3,643

FIGURES

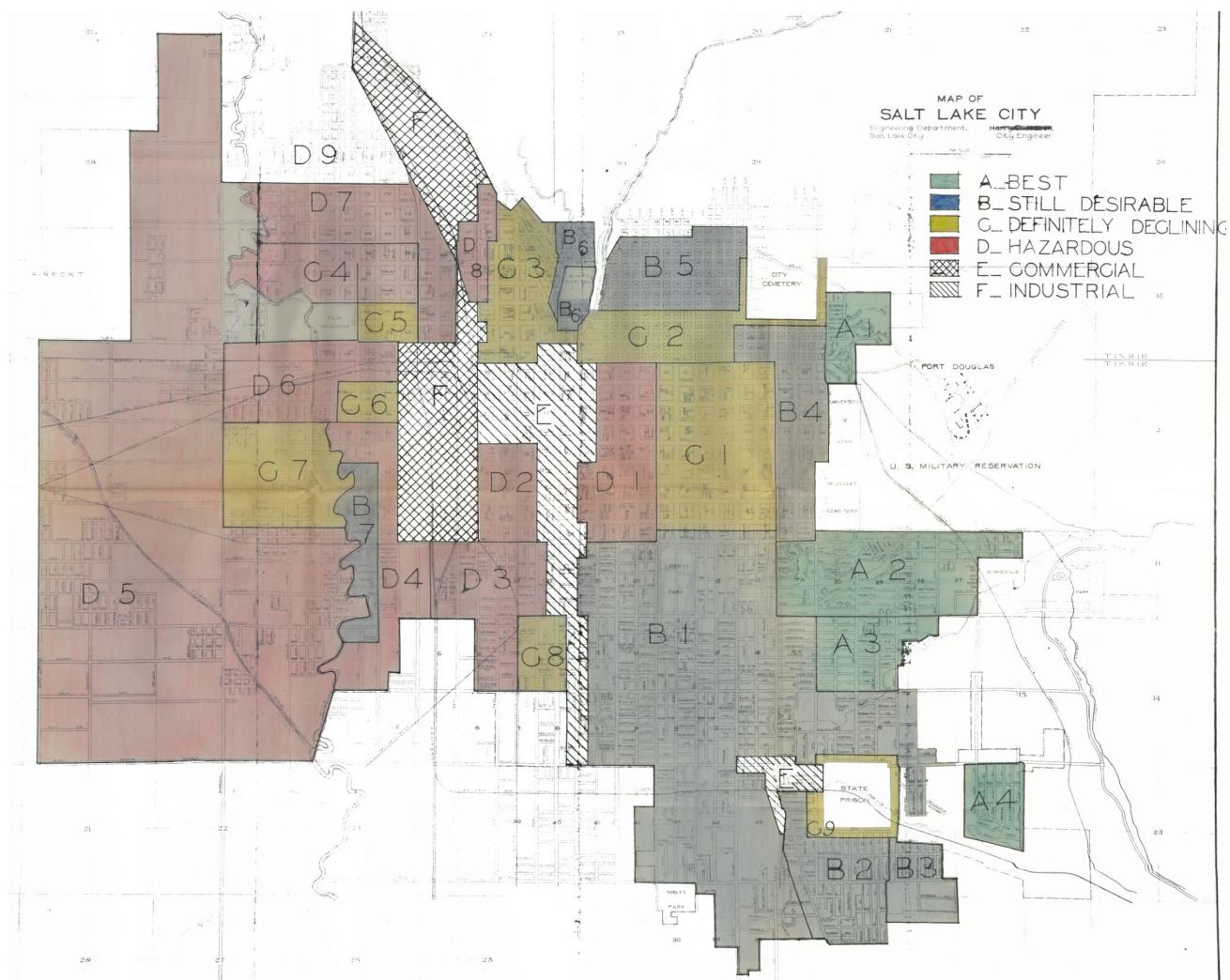


Figure 1: Redlining map of SLC from the 1930s. Note that the western side of SLC is almost entirely graded as “D_Hazardous”, “E_Commercial,” or “F_Industrial.”

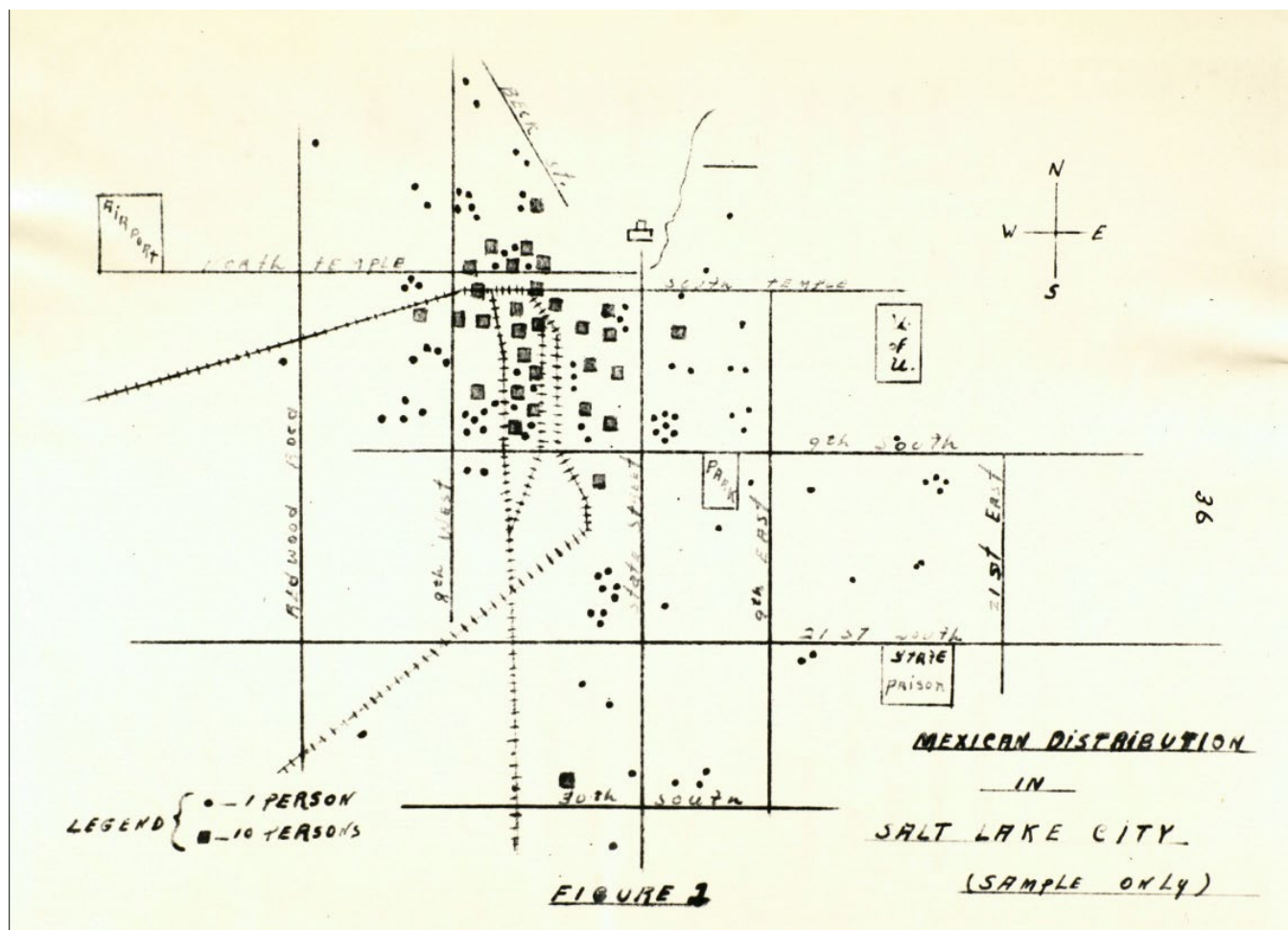


Figure 2: Map from Allen (1947) that illustrates where a portion of Mexican immigrant survey respondents were living in SLC. This area is clustered between 8th South, 2nd North, West Temple, and 8th West, the historic boundaries of the Pioneer Park neighborhood.

% Latinx People per Census Tract- Salt Lake County, UT

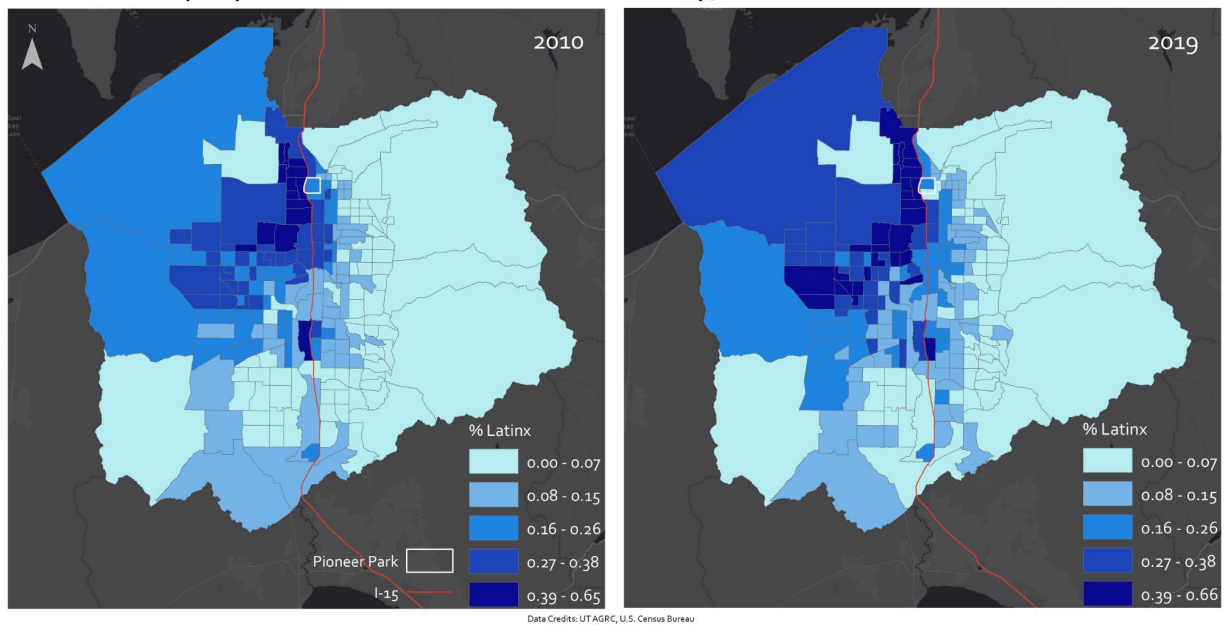


Figure 3: Proportion of Latinx People per Census Tract in Salt Lake County, UT. % Latinx per tract calculated by dividing the number of residents identifying as Hispanic or Latinx per tract by the tract’s total population.

Redlined Districts in Salt Lake City: % Latinx in 2010 and 2019

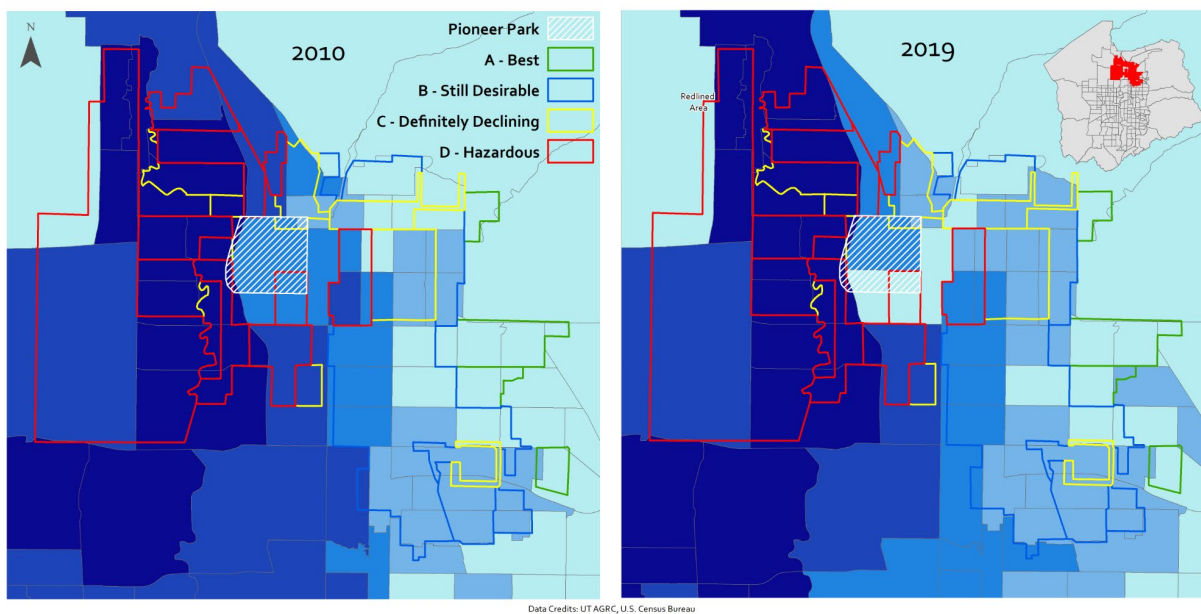


Figure 4: Redlined districts in SLC with % Latinx residents for 2010 and 2019.

Terrestrial Pollution Hotspots- Salt Lake City

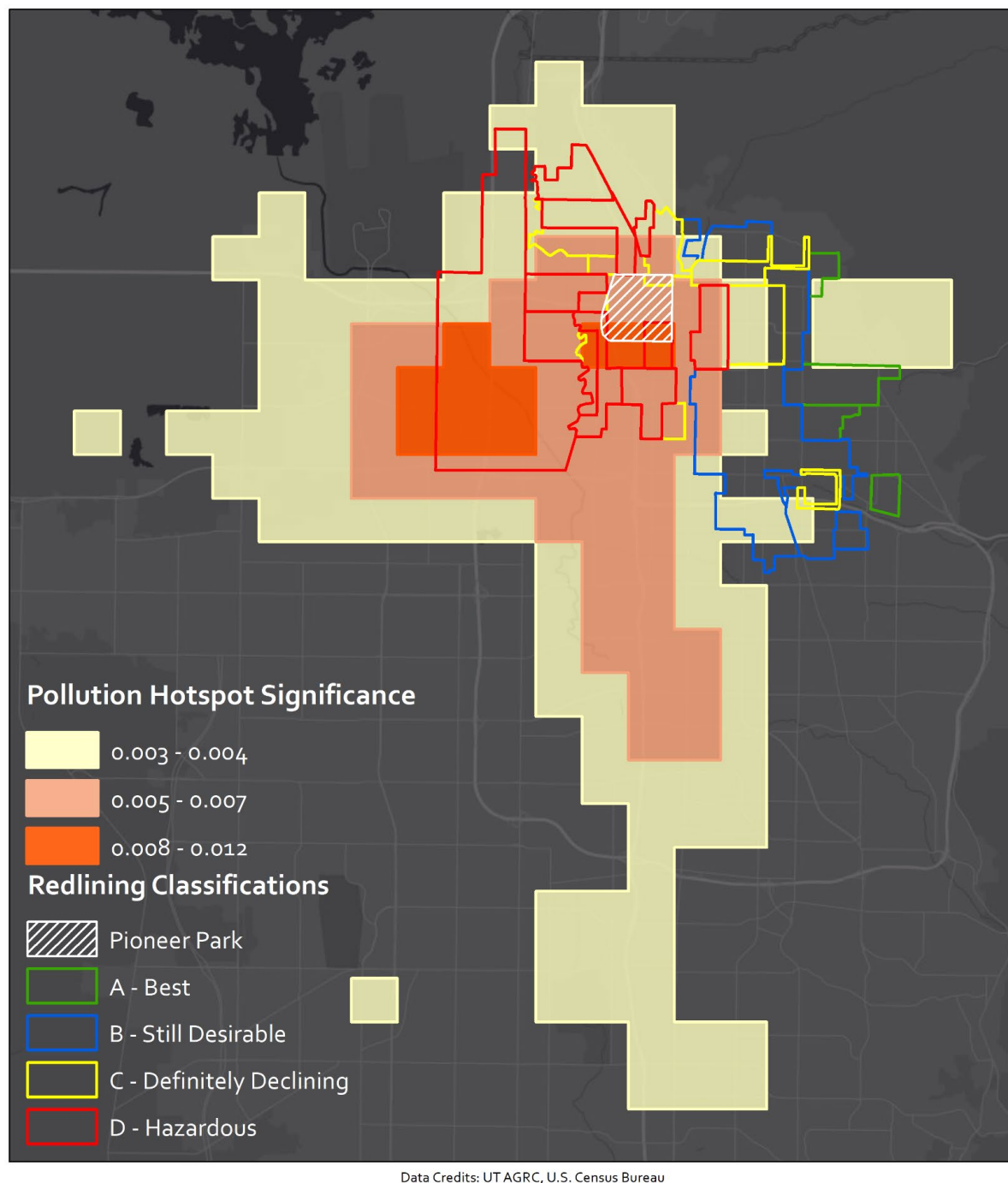


Figure 5: Terrestrial pollution hotspots in SLC in relation to redlined districts.

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The final thesis project was the part of the honors curriculum I was the most worried about when I began the Honors program as an undergraduate student in 2016. I was a part of the Undergraduate Research Fellowship, but I honestly didn't think that research was something I was interested in doing long term. The thought of being stuck picking through data for hours sounded like punishment, not academic enrichment. But here we are, the project finished somehow. There were many points during the last year that I didn't think this project was going to come together, or that I wouldn't be proud of my work. But this capstone experience ended up being the most fulfilling thing I've worked on during my undergraduate degree and has entirely changed what I want to pursue in my future academic studies and career.

This project originally began as a final project in an advanced GIS class. I took this class with the intention of helping me develop the GIS skills I knew I would need for my thesis, but otherwise I was pretty intimidated by the class material. GIS didn't come easily to me, and I often struggled to understand concepts. But by the end of the advanced class I had gained so much personal confidence in my analysis skills, and for the class final I created a project analyzing the relationship between polluted site density and racial minority population density in Utah. This project gave me the first inklings of what I wanted to study for my capstone, but by the time the project was complete it was clear that there were a lot of changes I'd need to make to the analysis before it went anywhere. Though my initial findings were interesting, the study left many questions unanswered regarding how other variables like income, the spatial resolution of the available datasets, and the analysis techniques used affect the experiment's outcome. I also quickly realized that I would need to read more literature to understand the social issues driving the patterns I saw in my research.

My personal interests and biases impacted the project's course. As someone primarily interested in brownfield and superfund sites, I gravitated towards selecting terrestrial pollution data instead of air pollution data for this study. More studies have been done in SLC using air pollution data, but having specific metrics associated with pollution intensity for certain neighborhoods may have allowed for a more complete understanding of how pollution impacts Latinx communities. Using data with measurable pollution metrics would have also changed our analysis process. If we had used air pollution data, our analysis would need to consider wind patterns within the city instead of solely relying on a hotspot analysis. The point in time I planned my capstone also influenced the way this project developed. The formative stages of planning happened to occur at the same time racial justice movements were happening across the country over the summer of 2020 and solidified my desire to create a capstone project that not only looked at environmental issues, but also social justice issues.

As the project took shape I was able to find an amazing faculty mentor. It felt like we were meant to work on this project together- she had just recently moved to Utah to join USU's Environment and Society faculty, ironically to fill the position of the last faculty mentor I worked with on undergraduate research. She not only had knowledge about GIS, but also had the social science background I repeatedly found myself coming across in the environmental justice literature. Due to covid, Mariya has been one of the only regular people I've had contact with this last year. I've not only come to appreciate her as an academic that I deeply admire and respect, but also as a friend. She's taught me so much about geography and social justice, and has always focused on supporting me at my own pace. Now that the project is complete, we've been emailing with a curator at the Utah Department of Heritage and Arts to potentially publish portions of our project on their website. Maryia has really felt like a mentor, not just a faculty

member, and I'm excited that I'll be able to continue working with her over the summer to share our project with UDHA.

My honors thesis gave me the opportunity to learn about different disciplines I was interested in and helped me hone in on what career I wanted to pursue in the future. When I started this project last year I thought I was going to grad school for restoration ecology. Then geography. But as I learned about redlining and urban planning for this project, I was inspired to take an Urban Planning class last fall, which I loved. Now I'm going to the University of Utah next fall for their City and Metropolitan Planning master's program. This project helped me explore the topics I was interested in so that when it came time to apply for grad school, I knew for sure what I wanted to study. It's also given me the opportunity to research the community that, also ironically, I'll end up living near during grad school at U of U. The program has a couple studio classes that specifically work on planning issues on the west side of SLC, and I'm excited to take what I've learned in this project and learn hands on in the community I've studied this year.

Overall this project has helped develop my personal confidence. Before my capstone I struggled a lot with academic anxiety and didn't think I knew enough to take risks and complete challenging projects. My thesis gave me the opportunity to show myself that I can do hard things, and that the things that initially scare you will help you grow. Not to be dramatic, but I really do feel like this project has changed my life. Though this project was the most challenging thing I did during my undergrad career, it has taught me the importance of dedication, hard work, and the payoff of confronting the seemingly insurmountable things in life. I'm grateful for the opportunities I've had at the USU honors program and am deeply grateful for everyone who helped me along the way.

AUTHOR BIOGRAPHY

Emma Nathel Jones graduated Magna Cum Laude with Honors in the spring of 2021 with a Bachelor's of Science in Conservation and Restoration Ecology with an emphasis in GIS and a minor in Landscape Architecture. During their time at Utah State University they worked on a variety of undergraduate research projects concerning sustainable energy development and sustainable agriculture as a part of the Undergraduate Research Fellowship. They also worked in the USU GIS Lab analyzing LiDAR data for water conservation projects in Salt Lake City. They presented the work associated with this thesis at the American Association of Geographers conference and the Collegiate Association for Inequality Research Conference on Inequality and Social Justice. They will continue their work while pursuing a master's in City and Metropolitan Planning at the University of Utah.