IMPACTS OF FLOODING ON THE HISPANIC COMMUNITY IN NEW BRAUNFELS, TEXAS:

A MIXED METHOD APPROACH TO UNDERSTANDING FLOOD VULNERABILITY

by

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I. Introduction

Existing research concerning flood hazards and their impact on human systems illustrates that different population subgroups experience these hazards differently (Collins, 2010; Rufat, 2015; Martin, 2011). Understanding which minority communities are present in a community, where they are located, and how they have been impacted by flooding is vital to providing better emergency services and aid to these populations. In order for emergency managers to better serve members of minority communities in flood preparation, recovery and mitigation activities, it is necessary to understand how minorities experience flood events differently than their white counterparts. The ability of individuals and communities to prepare for, respond to, and recover from a flood event, or any other disaster, is dependent upon numerous social and geographic factors, including race and ethnicity. Yet most flood and emergency management plans take a colorblind approach that does not attend to how communities of color experience disasters differently. In contrast, this study calls for consideration of racial and ethnic differences in flood management and elaborates a racially aware flood planning approach.

This project poses and answers several questions: Are members of the Hispanic community in New Braunfels more likely to be located within floodplain than their white counterparts? Second, do Hispanic residents experience flood exposure, recovery and adaptation differently from non-Hispanic white residents? Lastly, how do the experiences of the Hispanic community in New Braunfels inform our understanding of flood vulnerability and emergency management concerning minority populations in cities across the United States? To answer these questions, this research project explores flood experiences within the Hispanic community in the City of New Braunfels, Texas.

South Central Texas is prone to severe and reoccurring flash flooding (Ashely et al., 2008). Due to common and intense rainfall events, quick drainage of runoff, urbanization, a rapidly growing population, and climate change, this region of Texas will likely see more flood disasters in the future. As the population and the threat of flooding continues to grow, the way in which minority communities are impacted will continue to be of importance for emergency management. This examination of the city of New Braunfels may help other city planners, emergency responders, and policy makers in geographically similar areas across the South-Central Texas region and the Nation.

This study uses Geographic Information Systems (GIS) and an ethnographic approach to understand how flood events impact Hispanic communities in ways that differ from their white counterparts. This study demonstrates that the Hispanic population is disproportionately represented within floodplain areas. This disproportional representation results in the creation of unequal risk and inequities in impact and recovery following a flood event. Through the use of spatial and statistical analysis, this research illustrates that Hispanics are more likely to be located within a floodplain than their white counterparts.

In addition, qualitative analysis further illustrates the unequal ways members of the community experience risk, recovery and mitigation different than fellow white New Braunfels residents. This research illustrates that Hispanic members of New Braunfels experience less access to aid following an event, have less knowledge concerning mitigation and recovery efforts, and receive less mitigation support from city officials. Furthermore, this study finds that Hispanics experience flood events uniquely due to cultural and

linguistic barriers they experience as Spanish speakers, which feeds into a lack of access to knowledge that is perpetuated by colorblind policy and planning. These dynamics define daily life for many Hispanics in New Braunfels and around the United States, yet flood emergency management most often takes a colorblind approach to flood planning and management. This study calls for a racially aware and inclusive flood planning approach that will better serve all the city's residents.

II. Study Area: New Braunfels, Texas

Understanding the social and geographic characteristics of the surrounding area is important to provide context for both this study and emergency management in this area. There are certain aspects of the city of New Braunfels that make it a particularly suitable area to study the impacts of flooding to different minority communities.

The city of New Braunfels is located within Comal County and is along the I-35 corridor between San Antonio and Austin, Texas. Being situated along the Balcones Escarpment, New Braunfels is prone to flooding due to its physical geography. Changes in elevation along the escarpment occur from the west to eastside with a difference ranging from 100 to 500 feet (Jordan, 1977). This escarpment is a fault zone that consists of geologic features including normal faults, grabens, and horst (Jordan, 1977). The geologic makeup of the bedrock in the area consists mainly of limestone, either the Glen Rose or the Edwards formation, depending on the location along the escarpment. Soils over the bedrock of limestone are usually thin and include very little vegetation with extensive roots systems (Jordan, 1977). Climactically, this area experiences intense rainfall events that drop large amounts of precipitation in a short period of time (TWDB, 2012). The cities location and physical geographic characteristics combine to make it an area that is at risk to flood disasters (Sharif et al., 2015).

The presence of two large waterways and many ephemeral streams located within the city limits create high levels of exposure to flooding. The Comal and the Guadalupe Rivers both wind through the center of the city, as well as a number of dry creek beds that fill quickly during rainfall events. The Comal River originates at Comal Springs, protected at

Landa Park a few streets away from downtown, with the Comal combining with Guadalupe River near the downtown area as well. Understandably, the presence of these rivers makes New Braunfels a desirable and aesthetically pleasing place to live and visit. The rivers are a popular place for water recreation for both residents and tourists alike. In addition, these activities are an economic driver for businesses in the area. This economic activity promotes commercial and residential development in the downtown area and along the river and its floodplains. The city has a large interest in tourist and service-based industries, with the city reporting that 20% of the total employment in the city coming from the "hospitality industry" (Impact Data Source, 2013). The combination of physical and social dynamics present allows for some context of how and why different populations may be impacted differently during flood events, questions this research project aims to uncover.

New Braunfels was the second fastest growing city with a population under 500,000 in the United States in the year 2015 (Census Bureau, 2016). With the increase in population there has been a marked increase in urbanization, impervious surfaces, over narrowing and damming of waterways, and residential/commercial development within the FEMA floodplain (Zhao, 2016). The combination of reoccurring intense rainfall events, shallow soils, steep gradients, and urbanization creates an ideal scenario for extreme and damaging flooding. Numerous studies have been done that identify this region in Texas as one that has some of the highest rates of flash flooding in the nation (Ashely et al, 2008; Emrich et al., 2011; Rufat et al., 2015). Being geographically located in an area prone to flooding, the city has experienced a number of major to moderate stage flood events within the last 10 years (NOAA, 2017). Table 1 displays both historical and recent flood stage data

for the Comal River in downtown New Braunfels, the darker red indicating major flood events and the light red indicating moderate stage flood events for recent crests on the waterway. The largest historic crest and major flood event occurring only 19 years ago (see Table 1). The flood of 1998 killed at least 31 people and caused millions in damages throughout the Guadalupe river basin, with Comal County experiencing a large portion of the impacts (Earl, 2007; Zarahn et al., 2008).

Table 1. Comal River at New Braunfels Flood Data			
Historic Crests	**Recent Crests**	**Flood Categories (ft)**	
(1) 39.28 ft on 10/17/1998	1) 20.32 ft on 10/30/2015	Major Flood Stage:	23
(2) 37.65 ft on 10/17/1870	(2) 28.64 ft on 06/09/2010	Moderate Flood Stage:	15
(3) 36.91 ft on 07/08/1869	(3) 22.43 ft on 11/22/2004	Flood Stage:	11
(4) 36.55 ft on 05/11/1972	(4) 19.73 ft on 07/09/2002	Action Stage:	9
(5) 36.14 ft on 09/11/1952	(5) 39.28 ft on 10/17/1998		

Understanding changing demographics within the city and the state is also important to understand which minority populations may be more at risk to various types of natural disasters in the future. Texas has experienced a 9% increase in the number of Hispanic residents living within the state within the past 15 years (U.S. Census Bureau, 2016). Projections indicate that the number of Hispanic residents, as well as other minority populations, will only continue to increase in coming years (Texas Demographic Center, 2017). Overall New Braunfels mirrors the population trends and demographic make-up of the State (See Table 2). Identifying these trends and comprehending the potential impact to these populations will be helpful in planning for flood disasters, mitigating negative impacts, and providing aid.

Table 2. Race and Ethnicy Breakdown	Texas-2000	New Braunfels-2000	Texas 2010	New Braunfels 2010
Subject	Percent	Percent	Percent	Percent
Total population	100	100	100	100
RACE				
One race	97.5	97.8	97.3	97.7
White	71	84.3	70.4	86.8
Black or African American	11.5	1.4	11.8	1.9
American Indian and Alaska Native	0.6	0.6	0.7	0.7
Asian	2.7	0.6	3.8	1
Native Hawaiian and Other Pacific Islander	0.1	0	0.1	0
Some other race	11.7	10.9	10.5	7.3
Two or more races	2.5	2.2	2.7	2.3
Race alone or in combination with one or more other races				
White	73.1	86.3	72.7	88.8
Black or African American	12	1.6	12.6	2.4
American Indian and Alaska Native	1	1	1.3	1.2
Asian	3.1	0.8	4.4	1.5
Native Hawaiian and Other Pacific Islander	0.1	0.1	0.2	0.2
Some other race	13.3	12.5	11.7	8.3
HISPANIC OR LATINO AND RACE				
Total population	100	100	100	100
Hispanic or Latino (of any race)	32	34.5	37.6	35
Mexican	24.3	25.5	31.6	30.3
Puerto Rican	0.3	0.2	0.5	0.5
Cuban	0.1	0	0.2	0.1
Other Hispanic or Latino	7.2	8.8	5.3	4.1
Not Hispanic or Latino	68	65.5	62.4	65
Source: https://factfinder.census.gov				

The city is currently estimated to have a 35% Hispanic population, and it is continuing to grow (U.S. Census Bureau, 2017). There has been a history of racism directed at people of color since the founding of this nation, and Texas is not excluded from this

narrative. Anglo-Texans enforced segregation and engaged in discriminatory practices toward Hispanics since long before the Texas Revolution exacerbated racial tensions and inequalities (Leon and Calvert,2017). Systematic suppression of this minority group existed as a form of control and penetrated every facet of life. Black and Hispanic segregation became institutionalized and existed in schools, churches, public areas, and housing (Espinoza, 2005). The impacts of such types of segregation and suppression are still seen and felt by members of this community in not only New Braunfels, but the entire Nation.

The combination of physical and social dynamics present in this study area provide insight into how Hispanic residents experience the impacts of flooding differently from Non-Hispanic white residents. This research project elaborates on racial histories of inequality to better understand how the past still lives on in the racial geography of flood risk in New Braunfels. As well as to understand the additional barriers to mitigating risk and accessing services that Hispanics face.

III. Theoretical Framing

The impacts of flooding have been of great concern to researchers in recent hazards research in academia (Mitchell, 1974; Walker and Burningham, 2011). Existing literature focuses on both physical and social consequences of flooding on different communities at varying scales (Brody et al., 2008; Collins, 2010; Highfield et al., 2014; Tapsell, 2002). Major themes emerging from the literature are the racial and justice dimensions of flooding (Walker, 2010; Holifield, 2001), as well as, defining and measuring social vulnerability (Cutter et al., 2003; Dzialek, 2016). These two categories allow for a multifaceted approach to understanding how flood hazards impact different groups of people across space and time.

Defining and Measuring Social Vulnerability

Vulnerability to a hazard and an individual's preexisting level of social vulnerability are inherently linked. Across the literature, definitions of what vulnerability is, and which populations are more vulnerable to a hazard changes and is highly debated. People and communities can move in and out of vulnerability (Walker and Burningham, 2011). Social vulnerability has been described as a "societal resistance or resilience to hazards" (Blaikie et al., 1994). It has also been defined as the amount of variability within a population to prepare, respond, and recover from a natural disaster (Emrich and Cutter, 2011). The literature involving vulnerable populations and flooding allows for insight concerning the interconnectedness of preexisting social vulnerability and hazards vulnerability. (Wisner, 2004).

It is important to understand the social factors and dynamics that create disproportional amounts of social vulnerability to different populations. One way to achieve this is to examine the processes and mechanisms by which these populations experience uneven amounts of risk and how this is perpetuated by political and economic dynamics as well as emergency management practices. Studies attempting to identify universal drivers for social vulnerability to hazards find that there is no specific set of variables that will fit to predict and define vulnerability across all study areas (Dzialek et al., 2016). Research has found that there are certain factors to examine that will help identify who the vulnerable populations may be in an area, which include: demographic composition, socioeconomic status, and health (Zahran et al., 2008). Several studies show that the level of social vulnerability is related to the level of impact of a natural disaster that is assumed by a social group (Cutter et al., 2003; Rufat et al., 2015; Collin, 2008). In other words, those considered to be socially vulnerable prior to a natural disaster, are often impacted more by the disaster.

Research done at the national and the regional scale have identified South-Central Texas as an area that has a high risk of flooding and damage to vulnerable populations (Ashely et al, 2008; Emrich et al., 2011; Rufat et al., 2015). Risk and vulnerability to a hazard increases when high to moderate probability of flooding occurs in areas that have socially disadvantaged and vulnerable populations (Collins, 2009). There is a clearly defined relationship between economic disparities, political power and influence, and access to resources when examining how different social groups are impacted and recover from flooding (Blaikie et al., 1994; Emrich and Cutter, 2011). These studies show impacts to various segments of the population changes in severity depending on race, ethnicity, class,

and gender (Brody, 2008; Emrich & Cutter, 2011, Cutter et al. 2000). However, many quantitatively based studies do little by way of understanding how and why these disparities in impacts are created. There is often little explanation given behind the presence of a socially vulnerable population. Understanding the social impacts of flooding to vulnerable populations can be done by looking at both tangible, physical impacts (Brody et al., 2008) as well as psychological, health impacts (Tapsell et al, 2008; Collins et al., 2013). It is important to understand that how a population is made vulnerable will change with the population being studied, the area of study, and severity of a hazard.

This project will seek to understand the social vulnerability of the Hispanic populations as related to flood disasters within New Braunfels, aiming to inform understanding across the South-Central region of Texas. This research project will ask the questions of how specifically the Hispanic community in the city of New Braunfels is impacted by flood events and why they are impacted the way they are. This case study will provide information and an alternative approach to management practices that will allow city planners and policy makers to provide aid to socially vulnerable groups when, where, and in the way they need it most.

Race, Justice and Flooding

The racial dimensions of hazards and hazards research relates to concepts and activism surrounding justice and inequities in hazard impacts. Race relations and the United States' history of discrimination and segregation have shaped our present day physical and social landscapes (Schein, 2006). Discrimination and injustice to people of color has translated to unequal hazard exposure and risk to these communities. Much like

the concept of vulnerability, environmental injustice has multiple definitions (Holifield, 2001). What is considered just will vary depending on who is asked, making the concept an inherently political one (Holifield, 2001; Walker, 2010). Environmental justice has been defined as the equal treatment of all people regarding environmental legislation, policy making, practices, and impacts regardless of a person's race, ethnicity, religion, income, or cultural background (Holifield, 2001; Higgs 2009.) Environmental injustice work demonstrates that that there are systematic and structural processes and practices that created and continue to uphold the unequal impacts and risk that certain disadvantaged and socially vulnerable communities experience (Walker and Burningham, 2011). The body of literature pertaining to environmental justice has identified patterns of inequity and risk (McMaster et al., 1997; Higgs and Langford, 2009; Walker 2009), as well as set the stage for understanding how and why inequity and injustice are produced and perpetuated, a goal of this research project.

Research regarding race, ethnicity and hazards overwhelmingly concede that there are large disparities in the way that different racial and ethnic groups are impacted, prepare, respond to, and recover from flood events (Finch et al., 2010; Cutter and Smith, 2009; Faber, 2015; Grineski et al., 2014). Two studies involving the cites of El Paso, Texas, (Collin et al. 2013) and Miami, Florida, (Maldanado, 2016) explore the social and spatial relationship between exposure to hazards and the development of unequal risk for two different racial groups. These studies show that exposure to a hazard does not always indicate a high level of risk. Existing economic inequalities mean that some populations will be able to mitigate and cope with natural disasters better (Collins, 2009; Collins 2010; Maldonado et al., 2016). Often minority and marginalized populations experience lower

levels of exposure, but still experience greater level of risk due preexisting social vulnerability (Blaikie, 1994).

People of color often experience institutionalized and structural racism in multiple forms, which contributes to an increased level of social vulnerability, and thus risk and impact of hazards (Cutter and Smith, 2009). Maldonado et al. (2016) illustrate this point by examining the risk and impact of flooding on Hispanic immigrant populations in Miami and Houston. The researchers illustrate that immigration status impacts access to resources, influence in the community, and awareness of the hazard more pointedly. This concept demonstrates the importance of understanding the economic, social, and cultural aspects that influence the level of vulnerability a population will have in a given study area. Other research examining how people of color experience government support and recovery efforts before and in the wake of destructive flood events reveals disparities in access to these resources (Finch et al, 2010; Cutter and Smith, 2009). Race, ethnicity, class, age, and gender all contribute to varying degrees of social vulnerability and vulnerability to hazards (Faber, 2015; Grineski et al., 2014).

In the context of the study area for this research project, the history of segregation and discrimination offers interesting insights into how the Hispanic community experiences flood events disproportionately than Non-Hispanic white residents. This project will add to the depth of vulnerability studies in hazards research by taking a mixed method look at the racial dimension and social vulnerability in relation to flooding for New Braunfels. The findings of this project will help government officials and emergency managers to enact management plans that are racially inclusive.

IV. Methods

I employ a mixed methods approach to answer my research questions by combining qualitative and quantitative techniques. Mixed methods are informed by an engagement with multiple epistemologies and ontologies (Creswell, 2009). Mixed methods use both quantitative and qualitative types data, collection techniques, and forms of analysis (Elwood, 2010). Mixed methods are necessary because I want to understand if Hispanics are more likely to be exposed to floods and to understand if they experience the impacts and recovery from flooding differently than their white counterparts. This requires the use of both quantitative and qualitative methods. The methods employed in this project consist of spatial analysis, descriptive statistics, qualitative interviews, and content analysis of interviews and grey literature.

Part I: Spatial and Statistical Dimensions of Hispanic Flood Vulnerability

The quantitative portion of this research aims to understand and quantify the relationship between being classified as Hispanic in the census and being located within the floodplain in New Braunfels. Examining the total population and the percentage of Hispanic residents within the city limits, this study expects that Hispanic residents will disproportionally represent the majority of individuals located within designated floodplain areas. This possibility was investigated using a combination of spatial analysis in ArcGIS and a chi-squared test for independence in Microsoft Excel.

Data Collection

The data needed for the quantitative portion of the study was collected via free public sources. City information used in mapping and analysis such as street names, land use, and waterways, etc. was collected from free open data sets. The specific data sets I downloaded from the City of New Braunfels were: City Limits, Counties, Lakes and Ponds, and River and Streams. Texas Natural Resource Information System (TNRIS) provided the street name and classification data from the "Texas Roadways" file. All data concerning the boundaries and extent of floodways and floodplains I also downloaded through the TNRIS, sourced from Federal Emergency Management Agency (FEMA). The data included in this National Flood Hazard Layer, published by FEMA, incorporates Flood Insurance Rate Map and Letters of Map Revisions. This dataset delineates flood zones, base flood elevation, and floodway locations. The fields that were important to understanding and delineating areas that are at risk to flooding were “FLD_ZONE” and “ZONE_SUBTY”. The first field is the flood zone designations and the second identifies flood zone subtypes. A FLD_ZONE identified as “AE” and a specified ZONE_SUBTY of “FLOODWAY” indicates as area that is part of the FEMA regulatory floodway of a channel or another watercourse (FEMA, 2018). This area is reserved for the base flood discharge. A FLD_ZONE identified as “AE” and no designated ZONE_SUBTY indicates the 100-year floodplain (FEMA, 2018). A FLD_ZONE identified as “X” and a specified ZONE_SUBTY of “0.2 PCT ANNUAL CHANCE FLOOD HAZARD” identifies an area as being within the 500-year floodplain (FEMA, 2018). For analysis, the areas of the defined 100 and 500-year floodplains were combined.

In order to identify Hispanics living in my delineated flood area, I relied on U.S. Census data. Census data concerning population statistics and demographic breakdowns was obtained from TNRIS. The data set I used was the 2016 population estimates at the block group level published by the Unites States Census Bureau. The block group level is the smallest unit used by the Census Bureau for summarizing socioeconomic data. The city of New Braunfels spans two counties, so the census data were collected for both Comal and Guadalupe county. The demographic variables used to distinguish population by race and ethnicity were B03002E3- "Total population - Total: Not Hispanic or Latino: White alone -- (Estimate)" and B02001E1- "RACE - Universe: Total population - Total: -- (Estimate)". The "Estimate" in the variable indicates that the number is based on a sample of the total population.

Data Analysis

After data acquisition, I uploaded the basic mapping layers, the floodplain layers and census data into ArcGIS; the data processed and displayed accordingly. In ArcGIS I used the clip tool to limit the boundaries of the roadways, water bodies, floodplain, and census layers to fit within the city limits. Given that the city of New Braunfels spans across two counties and the census data I collected were from Comal and Guadalupe county, the merge tool was used to create a new layer that combined the two clipped census layers for easier data handling and analysis.

The first steps involved developing a spatial understanding of floodplain extant and Hispanic population densities. I mapped and displayed the floodplain data to show the floodway, 100-year, and 500-year floodplain based on the variables mentioned previously.

The census data were also mapped and displayed to show Hispanic population density within the city using block group level data. It became clear that there was considerable amount of overlap between block groups that contained high percentages of Hispanic residents and designated floodplain areas. In order to verify and quantify this observation, I used the chi-square test of independence (See Figure 1.) This test is used to determine if there is a statistical relationship between two categorical variables. For the purpose of this analysis, the two variables used were location in the floodplain and whether or not a person was considered a "person of color". For this analysis, a person of color refers to any individual that is classified in the census data as not being "White, Non-Hispanic". In Microsoft Excel, I ran the chi-square test of null hypothesis that living within a floodplain and being a person of color are independent. All persons of color were grouped together for this analysis in an effort to include all minority racial and ethnic backgrounds present within the city, no matter how small of a percentage they represent in the total population count (see table 2.). It should be noted that the Hispanic population makes up 35% of the total population, thereby making it the largest racial, ethnic minority in the city limits (see table 2). For this reason, I use the variable "persons of color" as a representative value for Hispanic only population values.

Figure 1.

Chi-Square Test of Independence Formula:

$$\chi^2 = \sum_{i=1}^{r} \sum_{j=1}^{c} \frac{(O_{i,j} - E_{i,j})^2}{E_{i,j}}$$

χ^2 *= Chi-Square test of Independence*

$O_{i,j}$ *= Observed value of two nominal variables*

$E_{i,j}$ *= Expected value of two nominal variables*

***Degree of Freedom Formula**:*

DF = (r-1)(c-1)

DF = Degree of freedom
r = number of rows
c = number of columns

In order to perform this test, it was necessary to obtain quantitative data that included: the total population within the city limits, the total population living within the designated floodplains, the number of white Non-Hispanics living within the city limits, and the number of white Non-Hispanics living within the floodplain. I used a simple form of areal interpolation in ArcGIS to obtain these values. Areal interpolation is essentially the aggregation of data from one polygon to the other (ESRI, 2018). This is necessary because census block group polygons do not align with the natural boundaries of the floodplain polygons. In this study, basic areal interpolation allows for an estimation of population counts within the floodplain based on the fraction of the area of the census block polygons that overlap with the floodplain. The floodplain boundaries tended to only take up a portion of a block groups, but the population counts are for the entire block group. For that reason, I obtained a value for populations located within the floodplain by calculating the areas where floodplains intersect with block groups. I did this by using the "Calculate Geometry" function in the layers attribute table. The result is the entire area of each block group within the city limits and the entire area of the floodplain within the city limits. I exported the calculated areas into Excel. From there I divided the total area for each block group by the total area within the floodplain for each block group, creating a floodplain multiplier. I subtracted the number of white, Non-Hispanic residents within the entire city from the total population in each area, giving the total number of people of color living within the entire city. I multiplied this number by the floodplain multiplier to produce the estimated value of people of color living within the floodplain.

Once these values were obtained I created and calculated expected values for population counts within the floodplain in Excel. From there I performed the chi-squared

test with a 95% confidence level. The resulting p-value allows for an evaluation of the null hypothesis that race, ethnicity and being located within a floodplain are statistically independent. These calculations allow for an understating of the representational differences and likelihood of people of color being located within the floodplain as compared to their white counterparts.

Limitations

Limitations of the quantitative portion of the analysis include accesses, time, and skill. The availability of data sets was limited to free online sources. Furthermore, the data sets obtained, and the variables analyzed are able to provide only an estimate of the disproportional representation of Hispanics living within the floodplain. The floodplain data does not represent an on the ground survey of current conditions for the entire geographic area. Various forms of infrastructure will impact how floodwaters actually rise across the landscape and are not depicted on the FEMA maps. Floodwater will disperse differently from each event to the other, depending upon weather, climate and soil conditions. Along with that, census data represents only a sample of the total population and does not correlate well with the boundaries and scales of floodplains. This created the necessity of areal interpolation. Areal interpolation in the analysis provides an estimation of population values and distribution of people located in the floodplain within a block group, allowing for a level of uncertainty. Beyond such limitations, my skills in ArcGIS limit the resolution at which the census data was displayed and analyzed. Given the time and skill, disaggregation of the data and dasymetric mapping using tax parcels may allow for a higher resolution when analyzing how many people of color are located within the

floodplain and where (Nelson, et al., 2015). Given time and access to other resources and data I may have been able to better identify areas at risk for flooding and calculate population totals within those areas.

Part II: Flood Impacts and the Hispanic Community

Quantitative analysis is just one way of understating the vulnerability of the Hispanic population to flooding, lived experience is another. To capture how the Hispanic community is vulnerable to flood hazards, I employ multiple qualitative methods. Interviews and content analysis provide an opportunity to understand how this population is impacted differently and why this disproportion exists. Interviews with various stakeholders allow for an exploration into the experiences of flood survivors, community leaders, service providers, and those who have the privilege to not experience these flood events the way the disproportionately represented portions of the population do. Content analysis of city websites, government grey literature, and newspapers informs the understanding of discourses reinforcing the unequal representations and experiences of flood hazards to this population.

The qualitative analysis draws on grounded theory, coding, content analysis, and discourse analysis (Charmaz, 2008; Cope, 2010; Dittmer, 2010). Ground theory is a research tool that allows a researcher to conceptualize and understand social patterns and discourses surrounding a researched phenomenon (Charmaz, 2008). This approach allows for an understanding of how and why the Hispanic population is impacted by flood events differently through emerging patterns and themes observed in interviews and content analysis from different sources. This approach allows for theories to come from the data,

rather than beginning the research with developed and preconceived theories (Charmaz,2008; Corbin and Strauss 1990). Coding is a necessary method when using grounded theory. Coding is used to develop these themes and patterns that emerge from grounded theory (Cope, 2010). Coding defines and categorizes the information that falls from the data. These codes are used to develop theories about how and why the Hispanic population is impacted differently during flood events. This process of coding was used in the content analysis of the text materials gathered for the qualitative analysis. Discourse analysis was used in the analysis of the interviews and the text materials. Discourse analysis is a way to explore social phenomena by examining language, non-verbal interactions, texts, and visual images (Dittmer, 2010).

Interviews

The participants for this research project included both male and female Hispanic and non-Hispanic residents in New Braunfels, Texas. The subjects varied in age, and all were over the age of 18 years old. Income levels and occupations varied from participant to participant. There was a total of 15 interviewees. Participants consisted of various types of community members and fell into one of the following categories; city and public officials, business owners, non-profit service providers, and/or flood survivors. These categories were not exclusive. The participants were recruited via the snowball sampling technique. This technique meant that one interviewee lead to another, and so on.

The interviews took place in public spaces in the city of New Braunfels, of the participants choosing. Before I began any interview, I gained verbal consent for audio recording and participation in the project. All interviews lasted no more than 1 hour and

were semi-structured with both open and close-ended questions (See Appendix for a list of prepared questions that were used). The interviews often took on a conversational nature with both the interviewer and the interviewee. All interview questions, study parameters, and verbal consent forms were approved by the Texas State Institutional Review Board (See Appendix for IRB Application information).

During the interviews, field notes were taken on important points made and on information shared. After the interviews were conducted, they were transcribed, coded, and analyzed using grounded theory and discourse analysis (Dittmer, 2010; Corbin and Strauss, 1990). I worked through each interview's recordings and field notes to create partial transcriptions, detailed annotations, and in vivo codes. In this process I looked for patterns of similarities, differences, frequencies, sequence, correspondence and causation of various phenomena related to flooding and its impacts (Saladana, 2008). After this step I developed descriptive codes biased on the initial codes created from in vivo coding concerning how and/or why the Hispanic community experiences flood events differently than white residents. The descriptive codes assigned to emerging themes helped to categorize the data generated from the interviewees' experiences. Close analysis of the context, perceptions, and lived experiences of interviewees reveals how the New Braunfels community has been impacted, responded, and recovered to previous flood events.

Content Analysis

The sources for the content analysis were retrieved from government agency websites, government grey literature, public meetings, and newspapers. The websites I analyzed were the emergency management pages for city and Comal and Guadalupe

counties, Texas Division of Emergency Management, and FEMA. The grey literature consisted of published reports, studies, and policies at the local, state, and federal level. The newspapers I analyzed were the New Braunfels Herald, Austin American Statesman, Daily Record, and San Antonio Express News. The total number of article analyzed was 67. The articles I selected were based on if the content was related to flooding in the South-Central Texas region and if it was published in 2000 or sooner. The articles varied in length and focus. The public meetings attended were for Comal County's hazard mitigation plan. The content analysis served as a method to examine approaches to emergency management in juxtaposition to the lived experiences of the Hispanic community. This highlighted the inequities present racially exclusive colorblind emergency management approaches.

The process of analysis for this data was similar to analysis of the interview data. The websites, grey literature, and newspapers were analyzed for information and patterns regarding emergency management discourses. I read the material and organized it based on descriptive codes that were generated by emerging themes. These themes were compared to those that arose from the interviews with various stakeholders. This cross-theme analysis allows for an understanding of how lived experiences compare against emergency management discourses present. The government websites and grey literature provided information on emergency management plans and resources. The newspapers provided information on the discourses present regarding focus, perspective, and representations concerning flood impacts to the Hispanic population in this region.

Limitations

Just as the quantitative analysis portion of this project has limitations, so does the qualitative analysis. Limits to this portion of the analysis include time and access. The number of people interviewed is a small sample of the total population in the city. Due to time and access regarding who and how many people were interviewed there was a limited number of experiences analyzed. Along those lines I had limited access to some of the most vulnerable members of the population such as undocumented immigrants, children and the disabled.

While maybe a limitation of my project, but inherent to all research, I recognize that power relations influence my topic, my methods, and my data collection in conducting interviews and content analysis. The relationship between the researcher and the researched is one latent with power and often overlooked and taken for granted (England 1994). For this project one form of data and analysis is meant to inform the other to "enhance the explanatory power of [my] research" (Elwood, 2010). I argue, like Kim England (1994), that this approach will allow greater reflexivity, inclusiveness, and attention to power relations in my work. In the same way that I argue that flood management needs to be racially aware and attuned to racial difference and power relations.

V. Spatial Dimensions of Hispanic Flood Vulnerability

One way to measure Hispanic vulnerability to is to determine if Hispanic residents are more likely to be located within a floodplain. Increased vulnerability in this sense is the likelihood of living in a flood prone area. Systematic racism in the United States translates to minorities collectively being more likely to be located in areas that put them at a greater risk to flooding, and other natural disasters. This section aims to answer the question of whether or not the Hispanic resident in New Braunfels, Texas are more likely to be located in flood prone areas by using statistical analysis and GIS.

First, I identified and mapped the floodplain geography within the city limits. I also identified and mapped the racial/ethnic demographics within the city limits. I broke down these demographics and displayed in the different maps by white Non-Hispanic residents, Hispanic, and people of color. Second, I used the Chi-squared analysis to test the null hypothesis that racial/ethnic status is independent of being located within a floodplain. With this analysis I chose to look at people of color rather than just Hispanic residents because to both simplify the analysis and to include all people of color that live in New Braunfels. Being that Hispanic residents make up the majority of the minority population in New Braunfels, using all people of color within the city for this analysis serves as a representation on how likely the Hispanic population specifically is to be located within a floodplain.

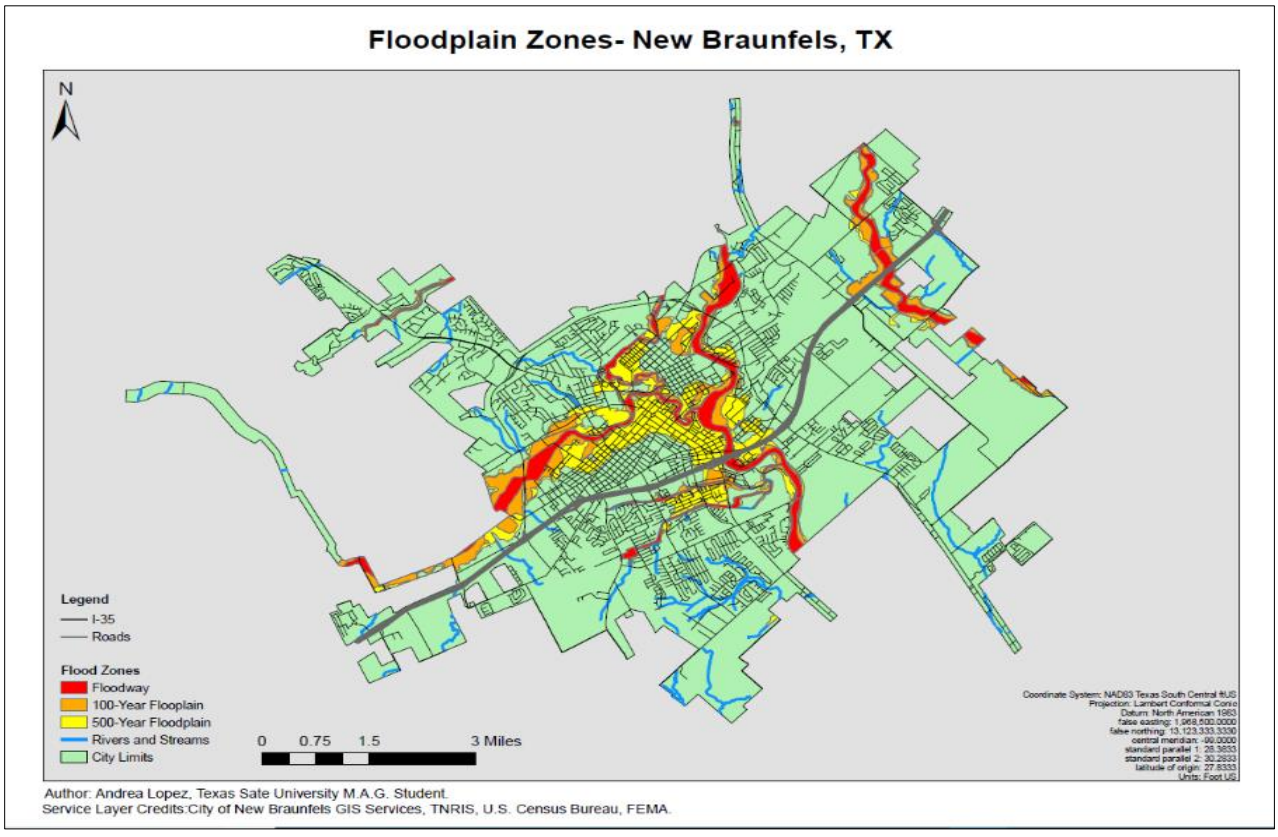
Following statistical analysis, the null hypothesis was rejected. This means that being a person of color and being located within the floodplain are statistically dependent. In other words, people of color in New Braunfels are statistically more likely to live in flood

prone areas than their non-Hispanic white counterparts. Based on both the spatial and statistical analysis, this research concludes that being a person of color, and more specifically a Hispanic resident, means that an individual is more likely to be located within a floodplain.

New Braunfels Floodplain Geography & Population Density

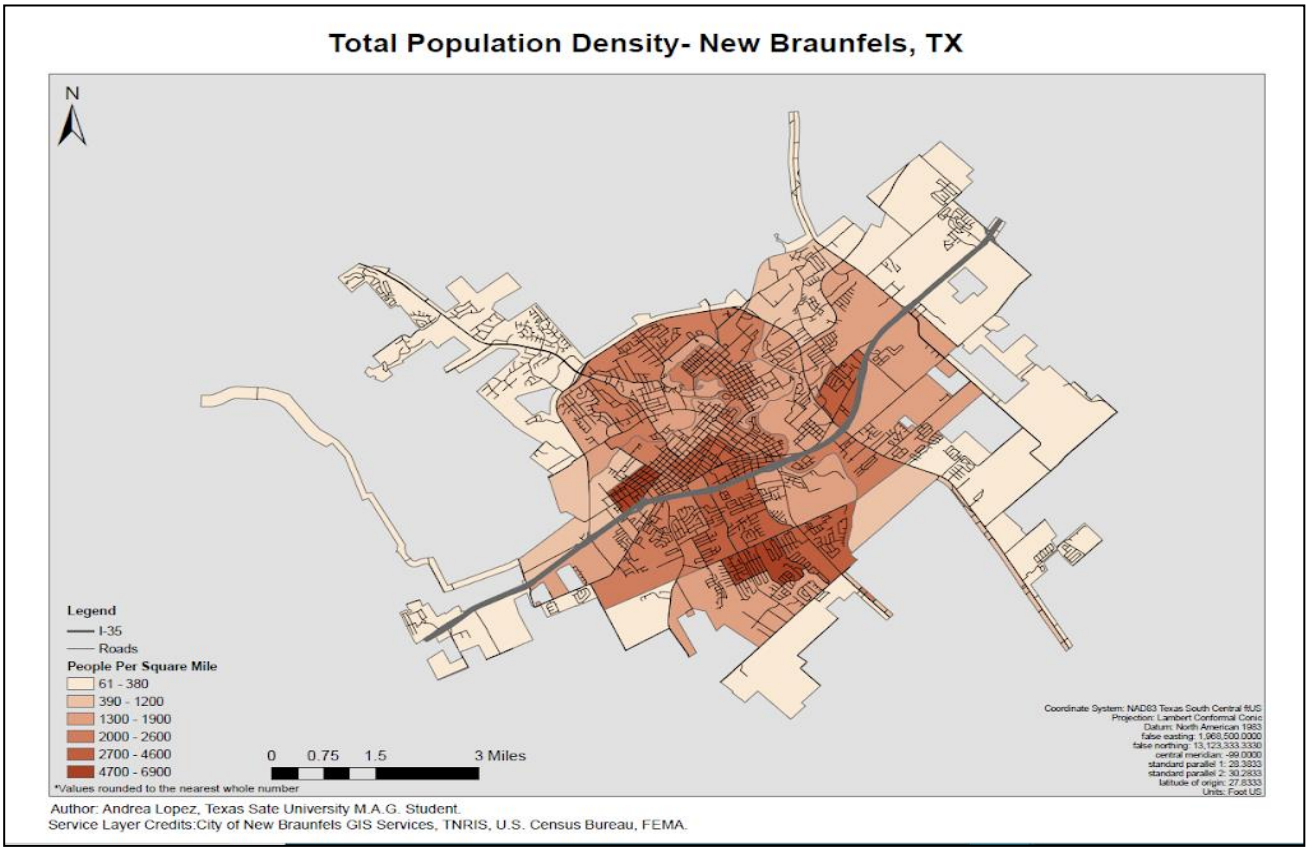
Analyzing and displaying the floodplain data in ArcGIS reveals that a large portion of the city is located within the floodplain. Figure 2 shows the delineation of the FEMA floodway, 100-year, and 500-year floodplain within the city limits. By taking the calculated land area within the city limits and the calculated area of all the flood zones and their extent within city limits, it was discovered that 21% of the total city area is within a flood zone (see figure 2).

Figure 2



The majority of these flood prone areas being located inside of Loop 337 in the downtown area in both the East and West sides of the city and South of I-35. A look at the elevation variation across the city shows that the North of Loop 337, outside of the downtown area, there is over a 100-foot elevation difference in some spots. This means that areas inside the loop are not only in the floodplain, but also are downhill of the run off generated from the urbanization north of the loop.

Figure 3



After mapping the floodplains, I mapped population density, using block level data (see figure 3). The map reveals that the more densely populated areas are located within loop 337, in the downtown area, the Westside, and the Southwest side of the city. Figure 2 illustrates that densely populated areas overlap extensively with floodplain areas. Using population totals within the city limits and populations totals within exclusively the

floodplain, it was observed that 25% of the cities total population is located within a 100 or 500-year floodplain.

The waterways that run through the city continue to drive demand for urban development in the downtown area. This is creating and intensifying the threat to New Braunfels residents lives and property. In addition, growth and continued urbanization North of Loop 337 add to this problem by increasing runoff and worsening drainage issues in lower lying areas. These observation and analyses allow for a better understanding of how people of color, and particularly the Hispanic population, are more vulnerable to flooding within the city.

Geography of Race and Ethnicity in New Braunfels

The analysis of the spatial distribution of people of color, and Hispanic residents specifically, shows that these populations are located in areas identified as being in or in close proximity to flood zones and densely populated areas near the downtown area (See Figures 3 and 4). Figure 3 depicts the percentage of individuals considered persons of color for each census block group, with the darker purple color block groups indicating a larger percentage or racial and ethnic minorities.

Figure 4 shows the population density of Hispanic residents alone. This map also shows the percentage of people considered Hispanic per block group, with darker green colors indicating a higher percentage. Block groups that show the greatest percentage of Hispanic residents are on the West and East sides of the downtown area. The two maps closely resemble each other due to the Hispanic population making up that largest percentage of people of color for New Braunfels. When seen broken down, it appears that

Hispanic residents makeup a large percentage of the densely populated areas within the city. These areas are also areas prone to flooding.

In contrast to figures 3 and 4, figure 5 shows the population density of white residents within the city. The darker the shade or orange the higher percentage of white residents living within the block group. Block groups that tend to have a lower percentage of people of color have a higher percentage of white residents. This is most notable on the Northwest side of the city, outside of Loop 337, and directly downtown along the river. Figure 1 shows how some areas with the highest percentage of white residents do not overlap with the floodplain boundaries very much if at all.

Figure 4

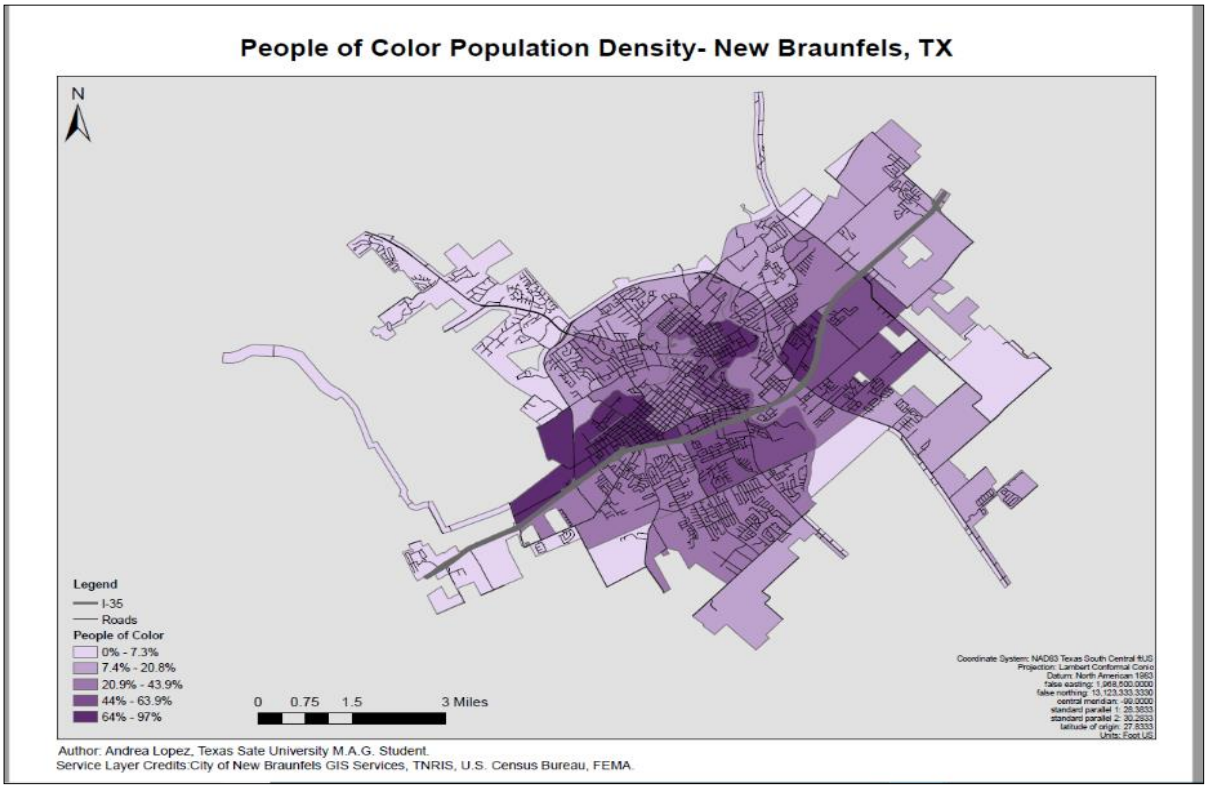


Figure 5

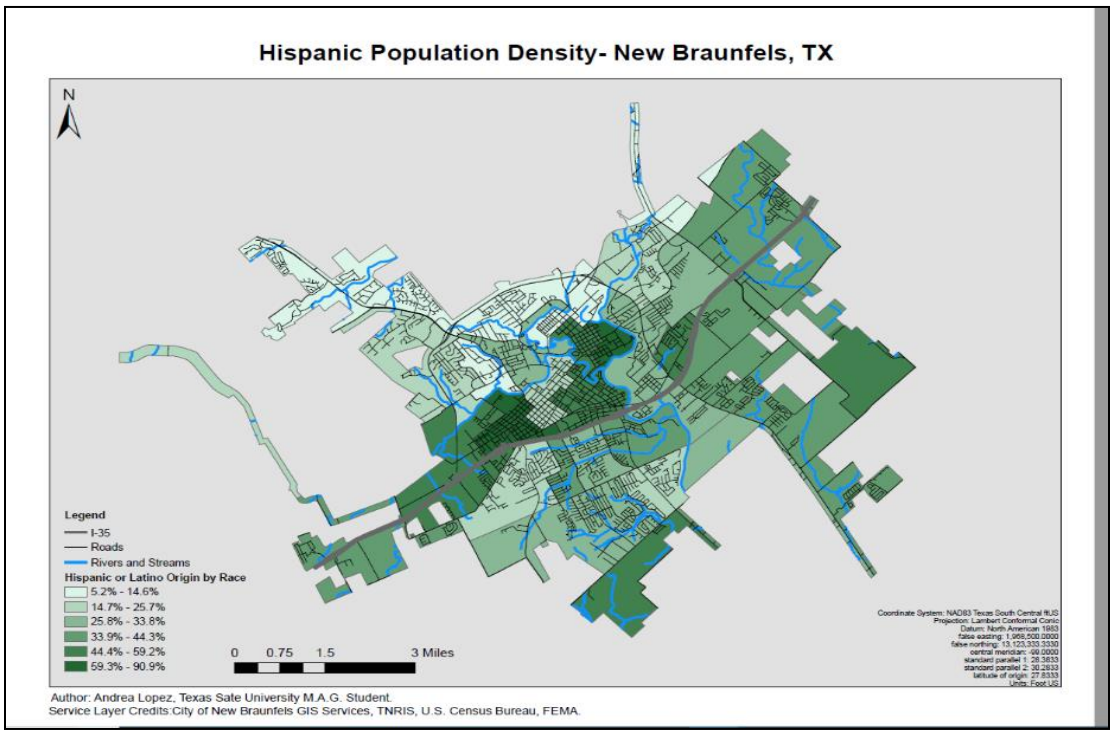
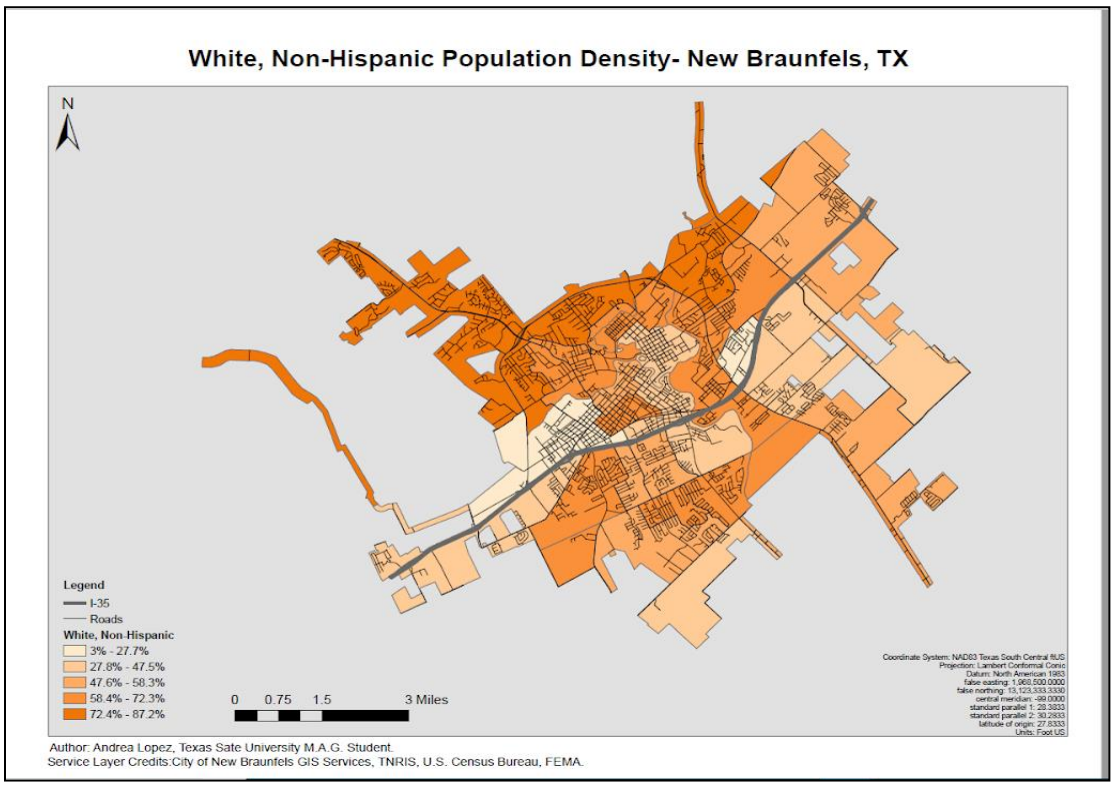


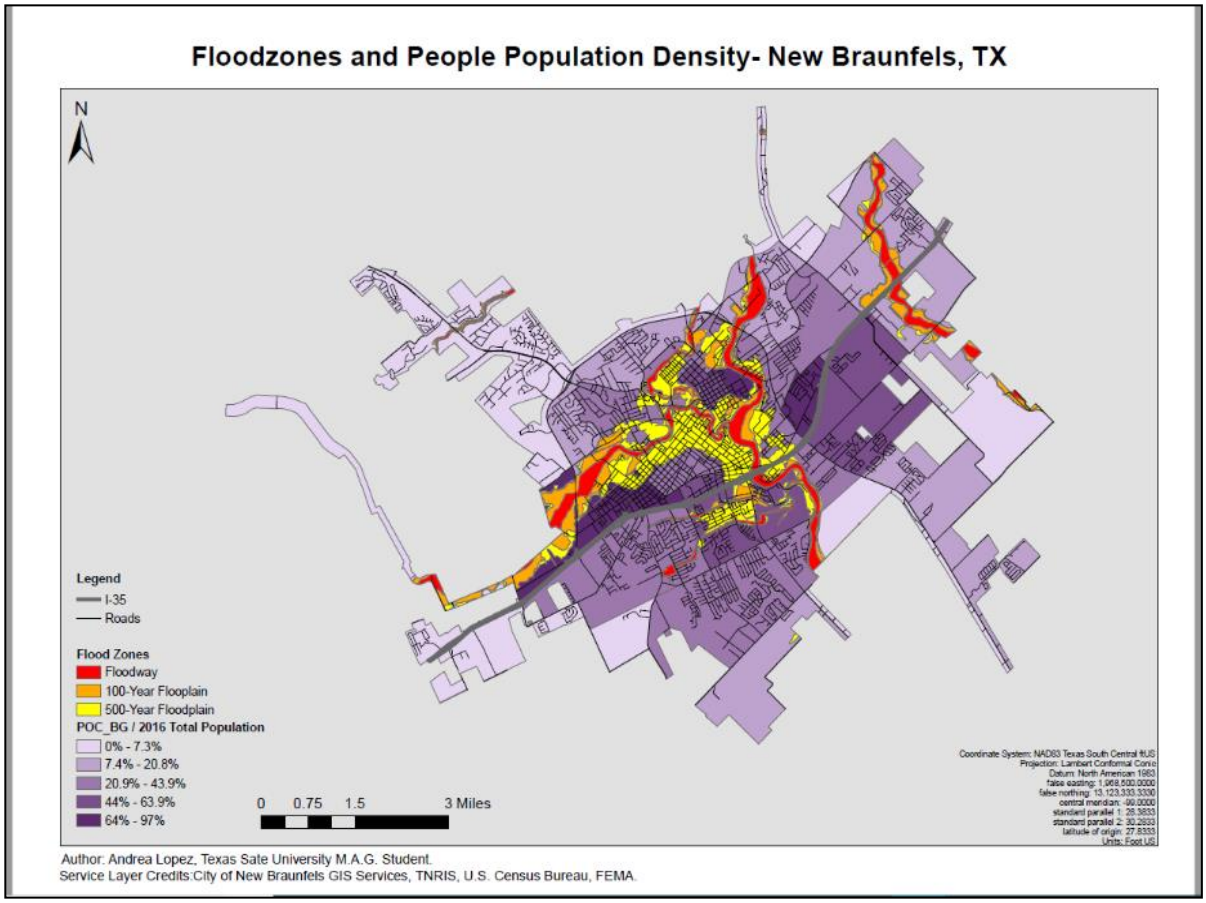
Figure 6



Spatial and Statistical Dimensions of Flood Vulnerability

Layering the floodplain data with the population data in ArcGIS suggest that block groups that have high percentages of people of color and/or Hispanic residents are more likely to be located within a flood zone (See figure 5 & 6). Though these observations indicate a relationship between ethnic category and flood zones, the quantification of this relationship is left to the Chi-squared analysis.

Figure 7



Based on census data, the area within the city limits, and the area within flood zones; population totals were calculated for each area. (See table 1). These population

values are estimated totals for the number of people living within the city limits and the 100 and 500- year floodplains combined. The values below exclude the population totals in the extra territorial jurisdiction (ETJ) of New Braunfels. This was done because the block group sizes are larger in the ETJ, leading to inaccuracies when calculating population values within the floodplain. These values show that 34.4% of all people of color that live within the city limits are located within the floodplain and that 47.3% of all people that live within the floodplain are considered people of color. Given population totals of white non-Hispanic and persons of color, these percentages show a patter of misrepresentation and disproportion within the floodplain.

Table 3

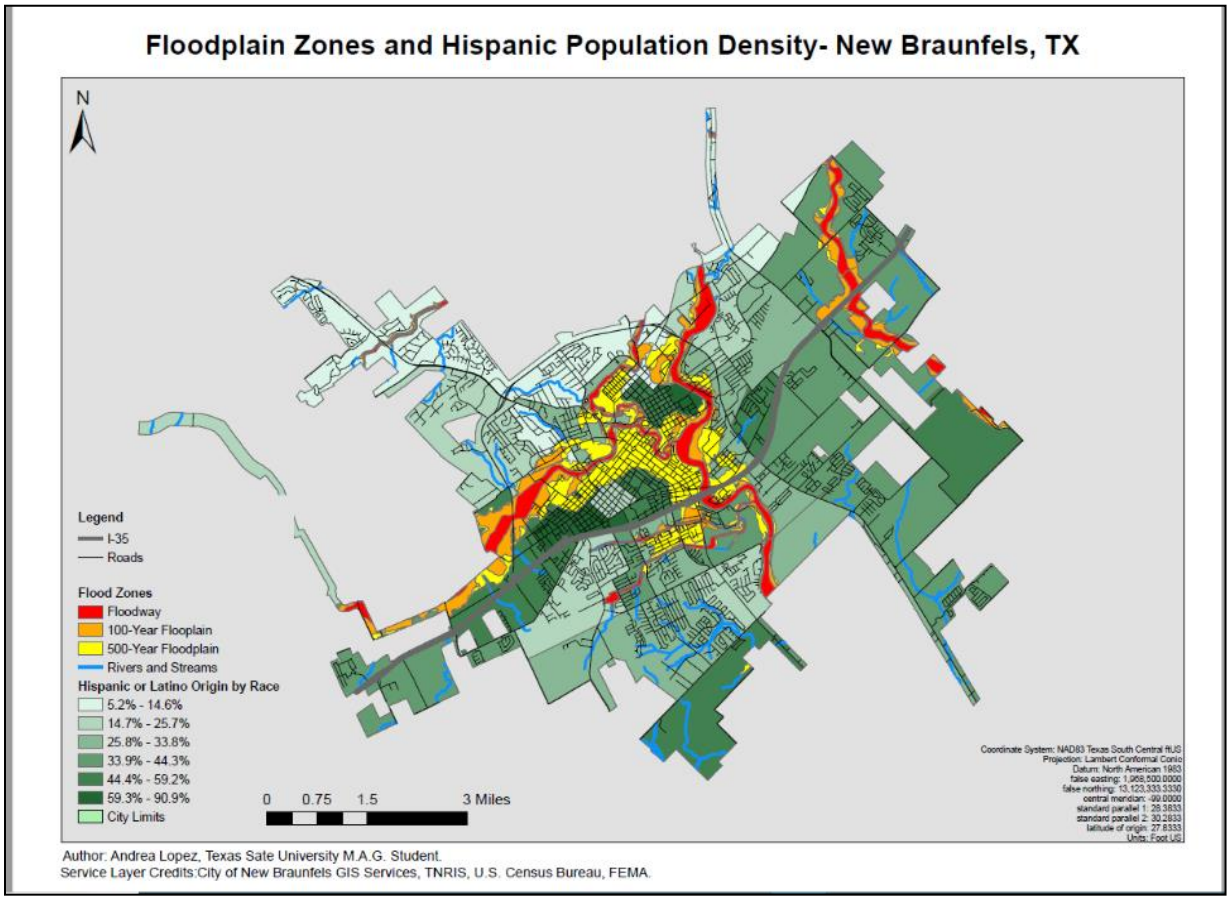
Observed Values Table				
	Number of People Flood Zones	**Number of People Not in Flood Zones**	**Row Totals**	**Row Percentages**
Persons of Color	5500	10505	16005	0.404688105
White, Not Hispanic or Latino	6134	17410	23544	0.595311895
Total	11634	27916	39550	
Column Percentages	0.294162823	0.705837177		

Chi Square Test Statistic	316.95
p-value	<0.001

The chi-square test for independence between variables can be used to determine if there is a significant relationship between racial, ethnic category and living in the floodplain. In other words, I tested the null hypothesis that ethnic category and being located within a floodplain are independent. To do this I created a table of the observed values of people of color, non-white Hispanics, and total population of both within the floodplain and out of the flood plain (See Table 1). Next, I calculated expected values based

on totals and row/ column percentages. The observed values and the expected values were plugged into the chi-squared formula to give me a chi-squared test statistic (See Table 2). The analysis was run with at a 95% confidence level, meaning that a p-value less than 0.05 indicates statistical significance, whereby the null hypothesis of independence is rejected. As seen in table 2, the p-value from the chi-square test is less than 0.001, and the null hypothesis of independence is rejected. Based on this statistical analysis the variables of ethnic category and location within in the floodplain are dependent. This means that Hispanic residents are already at a disadvantage regarding flood vulnerability. This landscape is racialized in such a way that the Hispanic residents are observed to be disproportionately at risk.

Figure 8



If the lived experiences of food vulnerability are dependent upon race and ethnicity, flood planning, recovery efforts, and mitigation actions should be as well. The spatial statistics have demonstrated that Hispanics in New Braunfels are more likely to live within a floodplain. Next, I turn to the experiences and opinions of Hispanic and non-Hispanic residents, public officials, community leaders, service providers and flood survivors to better understand the racial dynamics of flood vulnerability present in New Braunfels.

VI. Racial Experiences of Flooding in New Braunfels

The statistical and spatial analysis demonstrated that there is a disproportional flood exposure and impact to the Hispanic community in New Braunfels, Texas compared to their white counterparts. Speaking with various stakeholders and collecting their lived experiences allows for added depth to the knowledge that the statistical and spatial analysis revealed. These experiences help to unpack how and why these inequities exist, as well as their impacts on people's lives. Using grounded theory (Charmaz, 2009) and open coding methods (Cope, 2010), the qualitative analysis produced arguments detailing how Hispanics experience flood events differently than their white counterparts. First I argue that historical segregation contributes to this inequality. Second, gentrification in traditional Hispanic communities is further putting Hispanics at risk. Third, barriers to accessing information and aid due to citizenship status and understanding of English emerged as sources of inequity and unequal risk as well.

A History of Segregation and Racism

The narrative that New Braunfels is a German town has led to an erasure of the Hispanic histories present in the cultural and physical landscape of the city (City of New Braunfels, 2018). New Braunfels is locally known as a city that is celebrated for its rich German history. Driving through the city you can see a number for shops and restaurants with names derived from German words, parks named after German settlers, and advertisements for German festivals. The visual and cultural landscape shows a disproportional representation of the German residents. This disproportion in the cultural landscape translates to disproportion in the physical landscape. Beyond a few restaurants names there is not much evidence of the Hispanic cultural heritage and history outside of

the Westside. When discussing perceptions of diversity within the city one resident commented on misrepresentation of they observed:

> *"My initial concept of New Braunfels is that it wasn't too diverse. Um, I initially thought that the population here was pretty Caucasian. And then in moving into my house now that is in downtown New Braunfels it kinda re-affirmed that. I mean most of my neighbors now are white. It took a couple of years of like coming outside of the downtown bubble to see that towards the South and Westside of New Braunfels that there is a Hispanic culture there that you don't see, really if you stay in downtown New Braunfels."*

It is clear that the history of the Hispanic culture and contributions to the cities settlement has been all but erased. The remaining areas that show any representation of this community are restricted to a small portion of the city. Outside of the Westside the Hispanic experience is invisible. Here, another resident comments on this misrepresentation of cultural heritage within the city:

> *"You know when I moved here they called the West-end 'Little Mexico.' Which I never understood, but where I worked before where I am now, you know I worked with a lot of people, and it was production, meaning sewing and stuff and a lot of Hispanics were seamstresses...And you know, knowing the people I worked with and where they lived I know that [the Westside] has been a Hispanic area."*

These residents' experiences illuminate not only their perception, but also the common discourse that is present among the city residents. The colloquialism "Little Mexico" that the participant mentions proves that not only do Hispanics live in the Westside, but that the culture associated with the community is restricted to this area as well. Not to mention the racism that this colloquialism assumes. Referring to a part of town that has Spanish speaking residents as "Little Mexico", assumes that all residents that speak Spanish are Mexican, and by default, not American citizens. The color of skin and the language these residents speak has been racialized to the degree that the area of the city

that they live in is separated out and classified as "alien." Here a community leader discusses the Westside and the representation of the Hispanic community they have observed.

> *"I think that the Hispanic population is distributed throughout the whole city, you definitely have a lot of heritage in the West end a lot of history here in this area, a lot to celebrate, and a lot of, and a lot of history you know a lot of just historical markers recently on Grape and Katy street. The history of this area and the celebrations that occurred years and years ago in this area. This would be a strong Hispanic population and culture. "*

This participant points out that there is an extensive cultural history rooted in the Hispanic population in the city, but that the representation of this community is restricted. Beyond the confines of "Little Mexico" this history goes unseen and represented, creating a segregated landscape.

These segregated and racialized landscapes have been created and perpetuated by the history of racism and disproportional representation present within the city. This segregation and racialization has further compounded the inequity in the Hispanic experience following a flood event. These histories provide evidence to explain the contemporary racial segregation within the floodplains seen in the maps created with the spatial and statistical analysis. The North side that is located out of the floodplains and the expensive properties located directly on the rivers are predominately white communities. The Hispanic community being located in the Westside and covered so extensively by floodplains shows that the landscape and flood events reflect structural racism operating in the city. One long-time resident and flood survivor provided an example of this racism and segregation present within the city. The participant was asked about their experience with racism and segregation growing up and presently. Having worked at Lone Star Elementary in the Westside, they were able discuss their firsthand experience.

> *"I'll tell you a story, this school right here. We had um, there were all the people from the richer side of town that would ask for transfers out of this school. It got so bad. Back then it was broken up by grade. So, when they had to go to that school they would transfer out and go to private school or whatever. Then after those two years go back to public school… But there was a lot of people that just didn't like driving through that neighborhood. They hated the location. It got so bad that this year the campus is only pre-K campus. The enrollment was so small because people with a high income didn't want their kids to go to school there."*

The example of the elementary school demonstrates both the segregation and racism occurring in the city still today. Wealthy white residents did not want their children to attend a school that was located within the Westside, so the school could no longer function as a primary school. This discrimination present within the school is indicative of how the Hispanic community has experienced and continues to experience racism within the city of New Braunfels. These practices of segregation and discrimination translate into landscapes of inequity, and these landscapes of inequity shape Hispanic residents' experiences during flood events.

In a draft of the Comal County Hazard Mitigation Plan a small section on the overview of the County attributed the establishment of permanent settlement and rapid growth to the "German American" settlement of New Braunfels (Hazard Mitigation Action Plan, 2017). Though the overview is brief, the following section about population and demographics shows no racial or ethnic diversity in their "population break down." Even when mentioning "vulnerable populations" only age and income is mentioned. Age and income are important factors, but this colorblind approach to determining vulnerability and developing mitigation plans is problematic for the other vulnerable populations located within the county and the city. The Westside and the Hispanic community that has been confined there is a vulnerable population that should be not only recognized in the

county wide hazard mitigation plan, but their unique experiences and higher than average exposure to risk should be accounted and planned for.

Intersectional Approach to Flood Vulnerability

The inequities in flood vulnerability and impact seen and felt are not exclusive the Hispanic community in New Braunfels. Although I foreground the Hispanic experience for this study area and this research project, vulnerability requires an intersectional understanding of various factors of social difference, including race, ethnicity, nationality, income level, occupation, gender/sex, and age (Hill-Collins, 2011; England, 1994). One resident comments on a few factors that combine to create and heighten vulnerability saying, *"...you know you see that everywhere the lower income areas are not really addressed. Part of that is tax base."* They speak about not only the segregation of the Hispanic community, but the observed income gap associated with Westside. This resident made a point of mentioning that not only is the Westside predominantly Hispanic, but also associated with low-income families. This intersectional approach to conceptualizing how different communities may be impacted by a flood event is critical in providing the right types of aid and developing the correct types of mitigation plans. A member of a non-profit organization that specializes in providing aid to families following various types of disasters makes further comments on the relationship between race/ethnicity, income level, and age when asked about what minority populations they feel are impacted by natural disaster the most:

> *"A: You know I would say that yes, minority populations, but the low-income. It just kinda depends. You know depending on the emergency. But you usually see the minority populations are also low-income, so…. And you know senior citizens, and yeah it's a little bit different depending on the situation."*

As this participant points out, class plays a major role in the level of vulnerability an individual experience. Residents that are considered to be of the lower class are not restricted to the Hispanic community in New Braunfels. Individuals perceived as having a lower economic and social standing across all racial boundaries remain vulnerable to flooding and its negative impacts. Specific to New Braunfels and the experience of its low-income residents, one public official discusses the issue of flooding in the cities lower-income areas.

> *"...I mean Live Oak has rain and the whole street gets closed off. I mean that is some of our poorest areas. There is some low-income housing and duplex things, a mobile park across from the HEB field and it gets essentially cut off."*

Both of the residents make the point that areas that are more prone to flooding not only have some of the poorest residents in the city, but also seem to be ignored. Along those lines, but beyond race and class, a multitude of factors combine to create varying levels of vulnerability. Gender, sexuality, and age are only a few of these factors that intersect and impact how vulnerable a person is to a natural disaster. The counties mitigation plan includes a look at age and income but fail to include any other factors that contribute to vulnerability. This colorblind approach fails to take an intersectional approach to understanding vulnerability. Despite the recognition that an intersection approach is critical and race, class, gender and other markers of difference are always intertwined, I foreground ethnicity and racial dynamics in this study because I want to make about how racial and ethnic differences in flood events matter but are not recognized, accounted for, or planned for.

New Drivers of Racial Vulnerability: Gentrification

Beyond the history of racism and segregation based on race and class, gentrification in the Westside is a new driver of racial vulnerability of Hispanic residents. Gentrification has created both economic and physical changes that have impacted the Hispanic residents and the way they experience flooding. A participant pointed the gentrification that they are experiencing first-hand.

> *"There are a lot of homes being flipped and being put on the market over there. A lot of money and people are inching more past Walnut, so you are starting to see homes that are on the other side of Walnut. You know, and people are starting to flip homes over there and its inching closer to Lone Star elementary and the jail…… Now we can't afford to buy a house downtown unless you know maybe we go towards the West end. I would definitely say a lot of gentrification."*

White-middle class residents have been purchasing homes on the Westside and renovating them. This creates a rise in property values, which in turn raises property tax rates for home owners in the area. For those that do not own the homes they live in on the Westside, their rental rates go up as landlords raise rates to cover their costs. Though this process brings money into the Westside, these economic changes result in low-income and Hispanic residents and business owners being pushed out because they can no longer afford to live in the area. Here one public official comments on the changes taking places and slated to take place on the Westside.

> *"I think that the focus has been to you know kinda bring um, you know hopefully get this city to kinda revamp that area little bit. Stuff with small business loans and other small programs. We think that if we can fix the roads, fix the streets bring in some people that want to do business there and you know revitalize that area. Cus you know it used to be the gateway in to town, and it still kinda is if you are coming from San Antonio, but you can't tell that by the way it looks, it just kinda has been forgotten about."*

The arrival of white-middle class residents has created a feedback loop, creating change. This change is inadvertently resulting in negative impacts to the Hispanic community. The same official mentions the building and growth that has and continues to take place in the Westside and how it has created drainage issues, specifically in the Live Oak and Katy area. The official mentions a new bond slatted to be approved in 2018 that will provide funds to fix some of these areas that is "*desperately needed."*

The increase of white residents with disposable income has created an incentive for the city and investors to put money into infrastructure and local business. This is demonstrated by the simultaneous observed gentrification of the Westside and the desire to “revamp” the area by fixing the roads, drainage to “bring in some people that want to do business”. This narrative of gentrification excludes the residents that have been living, working and owning business in this area for years. It begs the questions, why is the city investing in the area now?

This investment has, and will continue to, lead to "revitalization" and improvements to drainage, sidewalks, and roads. Ideally this is good change for the residents of the Westside. However, due to the economic changes associated with gentrification, the Hispanic community that has traditionally lived in the Westside will not experience these benefits of gentrification because they are being pushed out. The participants also note that the Westside has always been "forgotten about" regarding city funding and economic support. It is clear that the incentive for change and funding is marked by the influx of white middle-class residents. Here long-time resident comments on the improvements to drainage in a part of town that is whiter and middle class.

> *"See and that's the other thing I was thinking too, like, was it just that they had the land available to do the drainage area back there? Um, by that Wal-Mart area between Walnut and 725, or is it because those people are middle class versus the Westside."*

This resident identifies that neighborhoods that are predominantly white and middle class receive the attention of city funding and projects that the Westside has not be privileged to in the past. This process of gentrification is creating white landscapes in areas of the city that were once predominately brown. As one participant already pointed out, tax base is driver for change, and the gentrification of the Westside is creating an increase in tax base leading the city to invest in "revitalization" projects for the area. Improvements to the Westside roads, sidewalks, and drainage is needed, yet these changes should not be dependent upon the income and race of the neighborhoods residents. Investing in the Westside and the Hispanic businesses and homeowners will not only help to revitalize the area but also prevent the negative impacts that accompany gentrification

Barriers in Navigating Bureaucracies and Seeking Aid

Hispanic residents not only experience flood events differently than their white counterpoints, but also the recovery process that follows. New Braunfels' racial and segregated landscapes have created an inequity in the likelihood and way that Hispanic residents have experienced flood events, and they also impact the way this community recovers. Specific to the experience of the Hispanic community, lack of English proficiency creates a gap in knowledge transfer concerning vulnerability and disaster awareness. The U.S. Census Bureau reports, that as of 2016 approximately 24.4 % of the city's total population spoke a language other than English at home. The Bureau also reports that about 60% of the population classified as "Hispanic or Latino" in New Braunfels speaks

Spanish. Of that 60% about 14% of these residents speak English "not well" or "not at all." This means that an estimated 1,794 residents need information about flooding and aid in Spanish. Though 86% of the 60% of Hispanic residents that speak Spanish report that they speak English "very well" or "well", these numbers do not consider literacy rates. Interviews with participants and a look at local, state and city resources revealed a lack of resources for residents that are not proficient in speaking and reading English. One Hispanic resident that was impacted by flooding discussed their experience and that of their family following a flood event in the city.

> *"I think there was definitely a language barrier there... we could have definitely you know, used someone who spoke Spanish going around and giving out information."*

For this particular survivor, though they understood English and Spanish, they had family members that did not. These survivors experienced not only the loss of their own home, but severe damage to their family's homes in the Westend. They point out the lack of service providers, with not only the city but non-profit service providers, that were able to help communicate with people that knew little English. These survivors felt that there was a lack of communication between the local government and the Hispanic community, specifically residents that did not know English (personal interview, 10/16/17). Examining both the city and county emergency preparedness websites, there lacks any information in Spanish. Considering the breakdown of residents reported to speak Spanish, the absences of information in Spanish leaves these residents more vulnerable. For people who can read in English these websites provide a wealth of information ranging from helpful links on current conditions, preparedness tips, and signing up for emergency alerts. These resources do not reach some of the most vulnerable residents who need it because of the

gap in knowledge transfer to Spanish speakers. A non-profit service provider mentioned their struggle with finding way to communicate to people who do not understand English.

> *"You know I would say that can be an issue for some. We do have bilingual resources, pamphlets, and handouts. But yes, I can think that that is an issue sometimes, you getting the information if you don't know the language. Now we do try our best if we have a volunteer or someone that speaks Spanish you know to help, but it can be an issue"*

This provider explains how they do have some literature available for those who do not understand English, but they still struggle with being able to speak with these individuals. This not only makes it difficult for these individuals to be aware of a disaster, but also to access disaster relief and apply for aid. The lack of information in Spanish creates a barrier in even identifying opportunities for aid.

Language barriers can create frustration on the part of not only the person seeking aid, but also the service provider. While conducting my interviews with a few non-profit service providers I was able to witness this frustration first hand. There was a woman filling out a form to apply for aid while I was conducting an interview. The woman understood very little English and was also unable to read it. She was struggling to put down the correct information and came up to ask my interviewee multiple questions. My interviewee was able to speak Spanish and told her the information that was needed. The woman was still unable to understand when she went to sit back down. Frustrated with not being able to understand, having already asked multiple questions, the woman got mad yelled at the interviewee loudly in Spanish, and left without applying for the aid. Following this, both of the interviewees went on to express their frustration with situations such as these. The participants explained that they help a lot of people who speak Spanish and understand very little English, often times with the people who are applying for aid getting

frustrated, and as one participant said, "getting ugly." One of the participants expressed that they felt that if people have lived in this country for a period of time that “they should learn the language.” They commented that speaking to them in Spanish and having Spanish on forms was a form of enabling these individuals.

The sentiments this participant expressed is not exclusive to this individual, nor to this study area. Taking a look at the current political climate, sentiments of a similar nature are felt by many people.. Individuals who do not speak English well or not at all, experience the barrier of accessing information pre and post disaster when applying for aid, and the added barrier of racism and discrimination for not knowing English. These barriers add to how Hispanic residents experience and recover from the impacts of flood disasters. These experiences and these barriers are not exclusive to flooding disasters, residents of New Braunfels, or Hispanics.

Accompanying the barriers associated with navigating bureaucracies and not understanding English, citizenship status can also impact the level of vulnerability an individual, household, or community experiences. Based on the U.S. Census Bureau data from 2016, an estimated 3,435 people in New Braunfels, Texas are not U.S. citizens. The bureau does not give a breakdown of the country of origin these people are from or if these individuals are here legally. Data from the Migration Policy Institute show that as of 2016 17% of the total Texas population is foreign born (Migration Policy Institute, 2014). The Institute reports that 1,470,000 people in Texas are "unauthorized" or undocumented in the country. Of that 1,470,000 about 1,324,000, or 90%, are reported to be from Mexico

and Central America. Also, of the this total 1,470,000 "unauthorized" population, 1,292,000 or 89% speak Spanish at home.

People who are here undocumented, or have family members who are undocumented, have both less resources available to them, and the fear retaliation when seeking aid. Misconceptions in the media perpetuate and fuel this fear. Looking back at hurricane Harvey, there were social media posts circulating that claimed that undocumented individuals that showed up to a shelter or called emergency services were being asked to show proof of citizenship. This misconception was so widespread that the Mayor of Houston and other public officials and public offices took to posting on social media that individuals who were seeking shelter or aid in the wake of the hurricane were not at risk for being detained by immigration services. One participant was able to comment on their experience with this misconception among undocumented individuals and receiving aid.

> *"That's a common misconception that people have, I saw it a lot around social media with Harvey, you know that people in the country illegally cannot receive aid. That is not true. We will not ask anyone's citizenship status. We don't care. We just need proof of address or residence of the home that was damaged or lost or whatever. So basically, some sort of proof or verification that you lived there. With that we can provide immediate short-term aid. And you know with some of those other agencies, I'm not sure that may not be the case. But yeah I not too sure about that."*

Not only does the threat of deportation among undocumented immigrants and families with undocumented members create fear, but it also increases these individual's vulnerability by deterring them from evacuating or seeking aid. Again, looking back at Hurricane Harvey, people were not evacuating to shelters due to a fear of being detained by immigration services. This meant that people were staying in their homes despite the

imminent danger of flood waters. These misconceptions are further perpetuated when coupled with current racist sentiments that are prominent in the media and common discourse, regarding people of color and specifically Hispanic individuals.

Following a disaster these individuals also experience barriers when trying to access aid. Many undocumented immigrants are either unaware that the can qualify for any type of aid, as mentioned by the participant above, or are completely excluded from qualifying for aid. Based on qualifications listed on the FEMA website, in order to qualify for cash assistance, households program assistance, or disaster unemployment assistance you must be a U.S. Citizen, Non-Citizen National, of a Qualified Alien. A Non-Citizen National is defined as an individual born in an outlying possession of the U.S or born abroad to at least one U.S. Citizens. A Qualified Alien is legal permanent residence or 'green card.' There is no federal aid available for undocumented immigrants. A non-profit legal services collaborative based out of Houston provides information about available assistance for those impacted by the hurricane for citizens and undocumented immigrants alike. The site offered information about resources for aid and the eligibility requirements. Of the resources listed for undocumented immigrants all are nonprofits such as the American Red Cross and religious organizations. Given that an estimated 17% the total population in Texas is undocumented and 90% of that number are from Mexico and Central America, there should be more information in Spanish and aid available to this already vulnerable population.

Language and citizenship barriers combine with the intimidation, inconsistencies and lack of resources across various agencies and non-profit organizations that provide aid

to make it even more difficult to navigate the different bureaucracies providing information and aid. The path to applying for aid is often convoluted and tedious to find. Pages filled with jargon that are difficult to understand for even people who speak English as their first and only language, make these resources inaccessible to some of the people who need it most. A participant with a non-profit organization who works with different survivors by providing aid in the form of immediate cash assistance, basic living necessities, counseling, and help when applying for aid with government agencies commented on the process of applying and receiving government aid saying "*I do really think that sometimes they make it difficult on purpose. All of that stuff is just so difficult to get through and understand."* This participant deals with these agencies and applications on a regular basis and still feels that these agencies are difficult to access. Another experience that a couple of participants had speaks to the difficulty they had following a flood event where they lost everything.

> *"My family and I, being Hispanic, I'm not going to say we were… we just didn't even know where to begin where to go the next day. Like we washed our clothes and put them on the next day, but we didn't even know what to do, we had never experienced anything like this in our lives."*

The participant goes on to speak about their experience as a couple. They ended up trying to seek aid from the Red Cross immediately following the flood event and the loss of their home. When asked about how they knew about this resource, one member of the couple commented that it was because of their spouse's ethnicity, saying "*I don't think we knew that [about the Red Cross], no one knew that, it had to have been a gringo* (white guy/American)." These participants recognize that the access to information and aid is shot through with racial inequalities. Without the knowledge of their white partner, they would have no idea where to even start looking for aid. They also spoke of the treatment they

received when seeking help, saying that their appearance when arriving for help after only having the clothes on their back following the flood. The couple that survived the flood said that they looked "grimy and poor," and that their appearance resulted in the individuals charged with providing information and aid from the Red Cross treating the couple poorly. They felt that because they looked poor that they were treated differently. The Red Cross workers turned the couple away without offering any type of information or assistance. Though their experience may not be that of others who have sought aid from the Red Cross, their experience does speak to common attitudes and discourses about different races, ethnicities and income levels. These flood survivors felt that because these individuals perceived that they were "poor and looking for a handout" they were treated differently. The exchange between the woman who got frustrated because she could not understand the aid application to apply also speaks to the difficulty people experience when trying to navigate through these flood relief bureaucracies.

Moving forward, the history of segregation and racism, gentrification, class inequalities, citizenship status, and language barriers should be taken into consideration when developing flood mitigation and emergency action plans for both the city and the region at large. The knowledge of how these factors have combined to increase vulnerability and create unequal risk can be used to create more racially inclusive and aware management plans that move beyond colorblind approaches. By understanding how and why these inequities exist stakeholders can work together by eliminating the underlying factors that create and perpetuate these inequities.

Racially Aware & Inclusive Approach to Emergency Management

The racial inequities defining vulnerability, risk, impact and recovery experienced for the Hispanic community in New Bruanfels, Texas calls for racially aware and inclusive approach to emergency management. Characteristics of such an approach include bilingual resources, diversity education and training of employees of government and non-government agencies, Hispanic community outreach and involvement to overcome language and bureaucracy obstacles, and ensuring protections from deportation for the undocumented populations in the wake of flooding disasters when seeking evacuation assistance or aid services

A first step in moving beyond colorblind approaches to emergency management would be having information in both English and Spanish available on all government websites pertaining to emergency preparedness, response, aid and other important materials. Along with bilingual literature, government and non-government entities should make their best effort to hire either staff qualified bilingual employees that can aid in translation or implement available technical translation services. The staff for both government and non-government entities that are a part of collective emergency responses should be mandated to participate in race and diversity training to reduce the cultural discourse of racism and discrimination. This training can include information on systematic racism, structural racism, and personal bias. Having a tolerant and culturally competent staff will help to eliminate the barriers of discrimination and racism that members of the Hispanic community face when seeking aid. Emergency preparedness and response outreach efforts would include partnering with community-based organizations such

churches and schools to better involve and inform the Hispanic community of preparedness and response efforts.

Another component of the racially inclusive emergency response approaches includes scheduling city and county meetings about local efforts to improve flooding and preparedness around schedules of working families. This would allow for more involvement and participation from the Hispanic community. Here having leaders, members, and staff that not only speak Spanish but are a part of the Hispanic community would be useful in bridging the gap between policy makers and the public.

Additionally, immediate response efforts following flood events should prioritize basic humanitarian aid regardless of citizenship. This would include food, shelter, medical care, and cash assistance. All levels of government should make clear that detention and deportation will not be a threat to any person or family seeking aid in the wake of a flood event. It should be implemented and made clear that any information obtained when applying for any type of aid will not be used against any undocumented person or persons. There should be expansion and consistency of available government resources for undocumented people and/or families with undocumented members.

Along with that, the process of navigating through the different bureaucracies that offer aid should be simplified and streamlined. Ways to do this could include creating a sort of online collection of resource that allows for simple searches of all available resources. This could be split up and listed by government and non-profit organization, accompanied with program contacts and criteria, of course in both English and Spanish. Another way to streamline and simply the access to resources would be to have all service providers come

together in a public space following a major flood event. Government organizations, non-profit groups, health care providers, and other groups that provide aid an assistance could come together in one space to allow for easy access to all types of aid following a major flood event. This would be a way to reduce some of the confusion and barriers to accessing aid following a flood disaster.

Implementation of all the above suggestions may have some practical barriers when confronted with policy, politics, and people. Though the mentioned characteristics of a racially aware and inclusive approach to emergency management may not be exhaustive of the ways to help the Hispanic community, it is a good start to moving away from colorblind approaches.

VII. Conclusion

Research demonstrates minorities experience social vulnerability differently during flood events compared to their white counterparts, yet, most emergency management plans take a colorblind approach that does not attend to and plan for these differences. This project seeks to address this problem by determining whether people of color are more likely to exposed to flood events and investigates how Hispanics experience flood disasters and recover in New Braunfels Texas.

Understanding how and why the Hispanic community is impacted by flood events requires a geographically and historically specific examination of the factors that increase vulnerability and create unequal risk. Texas, and the rest of the country, will continue to experience an increase in extreme flood events and an increase in populations considered to be socially vulnerable. This project questions the assumptions that are often made when conducting hazard risk analysis and implementing emergency management and mitigation plans. By pointing out the implications that race and ethnicity have on an individual and community's ability to mitigate and recover from flood events, I argue that a racially aware and inclusive approach to emergency management is necessary to better help vulnerable populations.

This research project aimed to answer the questions: Are members of the Hispanic community in New Braunfels more likely to be located within floodplain than their white counterparts? How do Hispanic residents experience flood exposure, recovery and adaptation differently from non-Hispanic white residents? If so how and why? And lastly, how do the experiences of the Hispanic community in New Braunfels inform our

understanding of flood vulnerability and emergency management concerning minority populations in cities across the United States?

Using a mixed method approach illuminates a variety of factors that combine to effect vulnerability, impact, and recovery. This mixed method approach is used to understand the racial dimensions of flood vulnerability across various scales, study areas, and context. The goal of this research is to advocate for a mixed method approach to help move past colorblind approaches to emergency management and better serve disadvantage populations. Spatial and statistical analysis show that the Hispanic population in New Braunfels is disproportionately at risk to flood events because they are more likely to be located within the floodplain. An examination of the lived experiences of Hispanic residents provided insight into how and why this inequity exists and the impacts it has on peoples lives and livelihoods. This examination showed that the history of segregation and racism, gentrification, class inequalities, citizenship status, and language barriers that Hispanic residents experience creates unequal risk and vulnerability to flood events in the New Braunfels, Texas.

The knowledge gathered from this research can be used to develop racially aware and inclusive management strategies that target the populations that are affected by the drivers of unequal risk. Policy implications accompanying this approach would mean working with various stakeholders within the city and the Hispanic community to help improve areas of the city that have been traditionally neglected due to the history of segregation of the landscape. This would mean mitigating for drainage issues on the landscape that result in these areas getting flooded and planning to minimize the negative

impacts that urbanization can have on drainage and run off. Creating literature and informative materials for those who do not understand English, providing clear and easily accessible paths to finding and receiving aid, and as well as developing community outreach programs that are aimed toward this community can be effective ways to better help the community. These policy implications have the power to save lives in New Braunfels and in other study areas across the State and the Nation.

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Appendix

A. *IRB Approval Letter*

TEXAS STATE UNIVERSITY
SAN MARCOS
The rising STAR of Texas

In future correspondence please refer to 2017894

August 31, 2017

Andrea Lopez
Texas State University
601 University Drive.
San Marcos, TX 78666

Dear Ms. Lopez:

Your IRB application 2017894 titled "Understanding the Impact of Flood Events on the Hispanic Community in New Braunfels, TX" was reviewed and approved by the Texas State University IRB. It has been determined that risks to subjects are: (1) minimized and reasonable; and that (2) research procedures are consistent with a sound research design and do not expose the subjects to unnecessary risk. Reviewers determined that: (1) benefits to subjects are considered along with the importance of the topic and that outcomes are reasonable; (2) selection of subjects is equitable; and (3) the purposes of the research and the research setting is amenable to subjects' welfare and producing desired outcomes; that indications of coercion or prejudice are absent, and that participation is clearly voluntary.

1. In addition, the IRB found that you need to orient participants as follows: (1) signed informed consent is not required as participation with imply consent; (2) Provision is made for collecting, using and storing data in a manner that protects the safety and privacy of the subjects and the confidentiality of the data; (3) Appropriate safeguards are included to protect the rights and welfare of the subjects.

This project is therefore approved at the Exempt Review Level

2. Please note that the institution is not responsible for any actions regarding this protocol before approval. If you expand the project at a later date to use other instruments, please re-apply. Copies of your request for human subjects review, your application, and this approval, are maintained in the Office of Research Integrity and Compliance.

Report any changes to this approved protocol to this office. All **unanticipated events and adverse events are to be reported to the IRB** within 3 days.

Sincerely,

Monica Gonzales

Monica Gonzales
IRB Regulatory Manager
Office of Research Integrity and Compliance

Dr. Jennifer Devine

OFFICE OF THE ASSOCIATE VICE PRESIDENT FOR RESEARCH
601 University Drive | JCK #489 | San Marcos, Texas 78666-4616
Phone: 512.245.2314 | *fax:* 512.245.3847 | WWW.TXSTATE.EDU

This letter is an electronic communication from Texas State University-San Marcos, a member of The Texas State University System.

B. *Oral Consent to Participate in Research*

Study Title: Understanding the Impact of Flood Events on the Hispanic Community in New Braunfels, TX

Principal Investigator: Andrea Lopez

Co-Investigator/Faculty Advisor: Jennifer Devine

Introduction and Purpose

My name is Andrea Lopez and I am a graduate student at Texas State University. I am doing this study because I want to understand how the Hispanic Community in the city of New Braunfels is being impacted by flood events. I would like to invite you to take part in my research study. I am asking you to take part because you have been identified as someone who has a role in either response, recovery, aid, or survival regarding flood events in the city. I'm going to tell you a little bit about the study so you can decide if you want to be in it or not.

Procedures

I will be asking you a few questions relating to flood events here in the city of New Braunfels. Some of the questions will be close-ended and will require a simple answer, while others will be more open-ended and allow us to have more of a conversation. The interview will take about an hour. If you give me permission, I will audio record the interview. If you prefer that I do not audio record the interview, I will take notes while we talk instead.

Benefits

There is no direct benefit to you from taking part in this study. It is hoped that the research will provide scholars, government officials, and grassroots leaders more information about how floods in Central Texas impact different segments of our community differently.

Risks/Discomforts

There is minimal risk to you from participation in this research. If my presence makes you feel uncomfortable or upset, feel free to ask me to leave or not write about any aspect of the tour I observe. With all research, there is a chance that confidentiality could be compromised, however, I take several precautions to minimize this risk (see below for more detail)

Confidentiality

Your study data will be handled as confidentially as possible. If results of this study are published or presented, individual names and other personally identifiable information will not be used unless you give explicit information to do so below. To minimize the risks

to confidentiality, I will de-identity my observation notes by assigning them a random number. I will encrypt and store the data file in a lock box in a secure location. When the research is completed, I may save the tapes and notes for use in future research for a period of five years after the study is over, after which the data will be destroyed.

Compensation

You will not be paid for taking part in this study.

Rights

Participation in research is completely voluntary. You are free to decline to take part in the research. You can decline to answer any questions and are free to stop taking part in the project at any time. Whether or not you choose to participate in the research, there will be no penalty or loss to you.

Questions

If you have any questions about this research, please feel free to contact me. I can be reached at [(210)-445-6550] or a_l253@txstate.edu. You can also contact a Spanish-speaking member of my dissertation committee with any questions: Jennifer Devine, devine@txstate.edu

If you have any questions about your rights or treatment as a research participant in this study, please contact Texas State University Internal Review Board at (512)-245-2314.

****

CONSENT

You will be given a copy of this consent form to keep for your own records.

Do you agree to be participate in the interview?

[ ] YES, I give my permission.

[ ] NO, I do not give my permission.

Do you agree to allow your name or other identifying information to be included in all final reports, publications, and/or presentations resulting from this research?

[ ] YES, I give my permission to have my name or other identifying information included in reports, publications, or presentations resulting from this research.

[ ] NO, I do not give my permission to have my name or other identifying information included in reports, publications, or presentations resulting from this research.

Do you agree to allow me to audio record the interview?

[ ] YES, I give my permission.

[ ] NO, I do not give my permission.

C. *Interview Questions for Different Stakeholders*

City and Public Officials:

What areas of the city do you feel like are most impacted during major flood events?

What areas of the city do you identify as being predominantly Hispanic?

What recent flood event stick out in your memory, and why?

What services and resources are available for people impacted by flooding?

How does the local government prepare for major flood events?

How does the local government respond to major flood events?

What is your knowledge of the how the Hispanic population has been impacted and recovered from major flood events?

Do you feel that this community could be better helped? If so, how?

In general, how do you feel like the local government and citizens can better prepare for such disasters?

Is there any other city or public official that you think I should speak to for this project?

Business Owners:

What areas of the city do you feel like are most impacted during major flood events?

What areas of the city do you identify as being predominantly Hispanic?

What recent flood events stick out in your memory, and why?

How have local business owners helped with the response and recovery to major flood events in the past?

How have you specifically helped?

Do you feel that this community could be better helped? If so, how?

What resources do you know of are available to you, and the Hispanic community, before, during and after major flooding?

In general, how do you feel like the local government and citizens can better prepare for such disasters?

Is there any other business owners or individuals involved in commerce that you think I should speak to for this project?

Non-Profit Service Providers:

What areas of the city do you feel like are most impacted during major flood events?

What areas of the city do you identify as being predominantly Hispanic?

What recent flood event sticks out in your memory, and why?

How has your organization helped during and after flood events?

Do you feel that this community could be better helped? If so, how?

In general, how do you feel like the local government and citizens can better prepare for such disasters?

Are there any other non-profit or religious organizations that you think I should speak to for this project?