The National Flood Insurance Program in Texas:
An Assessment of Non-Participating Communities

By

Morgan White

mas519@txstate.edu

Applied Research Project

Submitted to the Department of Political Science
Texas State University-San Marcos
In Partial Fulfillment for the Requirements for the Degree of
Master of Public Administration

Summer 2019

Abstract

The purpose of this research is to describe the characteristics of Texas communities that do not participate in the National Flood Insurance Program (NFIP). The secondary aim is to prioritize which communities are the best candidates for participation in order to target NFIP enrollment outreach efforts. The NFIP reduces a community's flood risk by offering federally-subsidized flood insurance to residents and by requiring communities to regulate floodplain development. Non-participating communities face various sanctions that negatively impact a community's flood resilience. This paper provides background information and a brief history of the NFIP to provide context for this research. The scholarly literature supports describing non-participating communities in the following categories: flood risk factors, institutional capacity, type of community, floodplain map status, and history of NFIP participation. A scoring system was created based on the flood risk and institutional capacity variables and communities were assigned a score from 0 to 4, indicating their relative suitability for NFIP enrollment. This research identified the top 20 municipalities and the top 5 counties to target for NFIP enrollment outreach efforts. This research concludes with a discussion of the limitations of this study and ideas for future researchers.

Keywords: flood, risk, National Flood Insurance Program, community, participation

Table of Contents

Chapter 1. Introduction

In October 2018, residents in Ozark County, Missouri opened their mailboxes to find a disturbing letter from the Federal Emergency Management Agency (FEMA). The county was devastated by flooding in April 2017 and FEMA offered financial assistance, at a maximum amount of $33,000, to each flood survivor. Then, 18 months later, those flood survivors received a letter requesting the funds be returned to FEMA, stating, "FEMA has carefully reviewed the assistance provided you and determined you may NOT be eligible" because Ozark County is not a participant in FEMA's National Flood Insurance Program (NFIP) (Jones, 2018). The same situation could happen in Texas. As of January 28, 2019, there are 1,485 Texas communities eligible to participate in the NFIP; however, only 1,254 of those communities participate in the program (FEMA, 2019). The remaining 231 communities do not participate in the NFIP (FEMA, 2019).

1.1 NFIP Background

The NFIP operates on a quid-pro-quo basis. The federal government makes affordable, federally backed flood insurance available for residents to purchase only in those communities that participate in the NFIP. In turn, participating communities must adopt and enforce floodplain management regulations to reduce future flood damage. There are three pillars of the NFIP – regulations, mapping and insurance.

Regulation

The NFIP defines community as a political subdivision, "which has authority to adopt and enforce floodplain management regulations for the areas within its jurisdiction" (44 CFR § 59.1). In Texas, this includes cities, counties (in their unincorporated areas), villages, special districts and Indian tribes. Texas Water Code Section 16.315 states that all political subdivisions in Texas are, "authorized to take all necessary and reasonable actions that are not less stringent

than the requirements and criteria of the National Flood Insurance Program." Participating communities must adopt and enforce flood damage prevention ordinances or court orders that meet FEMA's minimum requirements for regulating floodplain development. Development is defined as "any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation, or drilling operations or storage of equipment or materials" (44 CFR § 59.1). Through these ordinances or court orders, the community commits to monitoring development within its jurisdiction and issuing or denying floodplain development permits. The goal of a community's floodplain management program is to keep residents and structures reasonably safe from flooding. This involves ensuring newly constructed buildings in flood-prone areas are elevated at or above the base flood elevation. The base flood is the flood that has a one percent chance of being equaled or exceeded in any given year, also called the 100-year flood, and the base flood elevation is the elevation (above sea level) to which the 100-year flood would rise in a specific location. Other requirements include ensuring manufactured homes are elevated and securely anchored to prevent flotation, and ensuring recreational vehicles are either road-ready, temporarily on site, or meet requirements of manufactured homes. Owners of commercial properties have the option of floodproofing instead of elevating and the local community must assure the floodproofed buildings are constructed in compliance with the flood damage prevention regulations. In addition to these and other FEMA minimum standards, many communities adopt higher standards that make their community more resilient to flooding.

Mapping

FEMA has generated floodplain maps, called Flood Insurance Rate Maps (FIRMs), for many communities in Texas. Figure 1 details the status and age of FIRMs in Texas. These maps

are generated by FEMA using hydrologic and hydraulic models, taking into account current infrastructure, land use, precipitation patterns, and historic flood events. Floodplain maps identify areas of high (100-year flood or base flood), moderate (500-year flood) and low flooding risk and are used by insurance companies to rate flood insurance policies. The 100-year floodplain is also called the Special Flood Hazard Area (SFHA). FIRMs are also an integral tool used by local communities to regulate floodplain development. Participating communities depend on floodplain maps to make determinations whether any new development is at high risk of flooding and to determine which NFIP regulations apply.

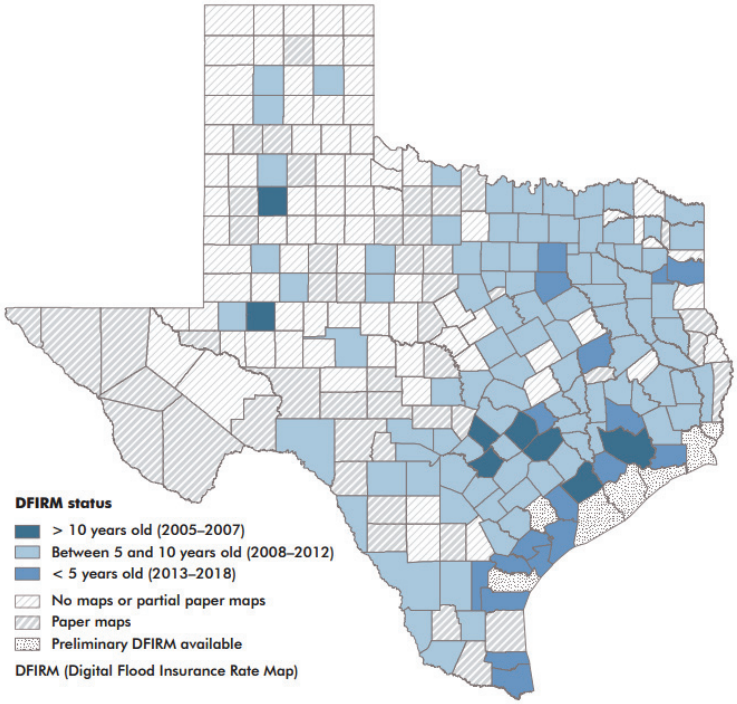

Figure 1. Status and Age of FIRMS

Source: Texas Water Development Board *State Flood Assessment* (TWDB, 2019)

Generating floodplain maps is expensive, so FEMA prioritizes their funding by performing mapping studies in developed communities with either rapid population growth, increased floodplain development, or high flood risk. FEMA floodplain maps are generated

based on coastal flooding and overbank flooding from streams and lakes. Areas that flood due to localized drainage issues will not be shown on official FEMA flood maps. Local communities can identify these problem areas by performing detailed drainage studies which require expensive engineering analysis.

Insurance

The NFIP provides affordable, federally-backed flood insurance to residents in participating communities. This insurance protects individuals from financial loss from flooding, including building repairs and damage to building contents. Flood damage is not typically covered under a homeowner's or renter's insurance policy. Flood insurance purchase is required by law for homes and businesses in a 100-year floodplain with mortgages from federally regulated or insured lenders. Flood insurance can also be required as a condition for receiving federal disaster aid. Any structure in a participating community – regardless of whether the structure is in a mapped floodplain or not – may be insured under an NFIP flood insurance policy. Properties outside of the mapped 100-year floodplain qualify for Preferred Risk Policies which offer significant cost savings. Approximately 25% of all flood damages occur outside of FEMA mapped floodplains (TWDB, 2015, p. 6).

Buildings built in accordance with a participating community's regulations have a lower risk of flooding and can be insured at lower rates. Insurance on improperly constructed buildings may be very expensive. This is one reason why it is important for communities to regulate floodplain development. Structures built prior to a community's participation in the NFIP may be less safe from flooding; however, their insurance rates are not based on actuarial rates (i.e. rates based on true risk): the rates are subsidized by the NFIP.

1.2 Penalties to Non-Participating Community Status

Participation in the NFIP is voluntary. If a community chooses not participate in the NFIP, has withdrawn, or has been suspended from the program, the community faces the following sanctions: (1) no resident will be able to purchase or renew an existing flood insurance policy; (2) no federal grants or loans for development may be made in identified floodplains under programs administered by federal agencies; (3) no federal disaster assistance may be provided to repair insurable buildings located in identified floodplains for damage caused by a flood; (4) no federal mortgage insurance or loan guarantees may be provided in identified floodplains; and (5) federally insured or regulated lending institutions, such as banks and credit unions, must notify applicants seeking loans for insurable buildings in flood hazard areas that there is a flood hazard and that the property is not eligible for federal disaster relief (FEMA, 2005, p. 2-15). These sanctions negatively affect non-participating communities and make the communities less resilient to flooding events, leading to financial strain on both the local government and flood survivors.

Residents and businesses in non-participating communities, being ineligible for federal NFIP flood insurance, are sometimes able to obtain private flood insurance coverage. Private flood insurance coverage is limited in availability and can be significantly more expensive than its federally subsidized counterpart. Though some residents are able to obtain affordable private flood insurance, the industry is not regulated as strictly as the NFIP, and residents could potentially see significant increases in premiums after a flood event.

1.3 Purpose

The Texas Water Development Board (TWDB) is the State Coordinating Agency for the NFIP in Texas. The TWDB serves as a liaison between FEMA and Texas communities,

providing technical assistance and training to participating communities and conducting enrollment outreach to non-participating communities. To date, the TWDB nor any other entity has analyzed the list of non-participating communities in Texas to identify the characteristics of these communities. Due to staffing and time constraints, the TWDB is not able to conduct regular outreach to all non-participating communities and the TWDB has not prioritized which communities are the best candidates for participation in order to target outreach efforts and maximize benefits.

The purpose of this research is to describe the characteristics of Texas communities that do not participate in the NFIP. The secondary aim is to identify which communities are the best candidates for enrollment outreach efforts.

Chapter 2. Literature Review

This chapter will provide a brief history of the NFIP to provide further context for this research followed by a literature review of the factors to be investigated in this study, broken into the following categories: flood risk factors, institutional capacity, type of community, floodplain map status, and history of NFIP participation. Predominant focus is given to the variables of flood risk and institutional capacity, as those are the most supported by previous research and are assumed to have the greatest impact on NFIP participation. This chapter concludes with the presentation of these categories and supporting literature in a conceptual framework table.

2.1 History of the National Flood Insurance Program.

The NFIP was created when Congress passed the National Flood Insurance Act of 1968. Before then, structural flood control projects were the primary way the government sought to reduce flood losses. Structural flood control projects include man-made flood control structures such as dams, levees, and floodwalls. As floods continued to occur in the U.S. and the amount of money the federal government was paying in federal flood disaster assistance increased, the government shifted away from structural flood control projects as a primary solution to flooding. One main reason flood damage continued to increase was because individuals continued to build, unrestricted, in floodplains. With the creation of the NFIP, Congress sought to "transfer the costs of private property flood losses from the taxpayers to floodplain property owners through flood insurance premiums" and "guide development away from flood hazard areas" (FEMA, 2005, p. 2-3). As seen in Figure 2, participation in the NFIP grew slowly at first. Participation in the NFIP is dependent on community action: Participating communities must adopt and enforce flood damage prevention ordinances or court orders that meet FEMA's minimum requirements for regulating floodplain development. It was assumed that communities, motivated by the

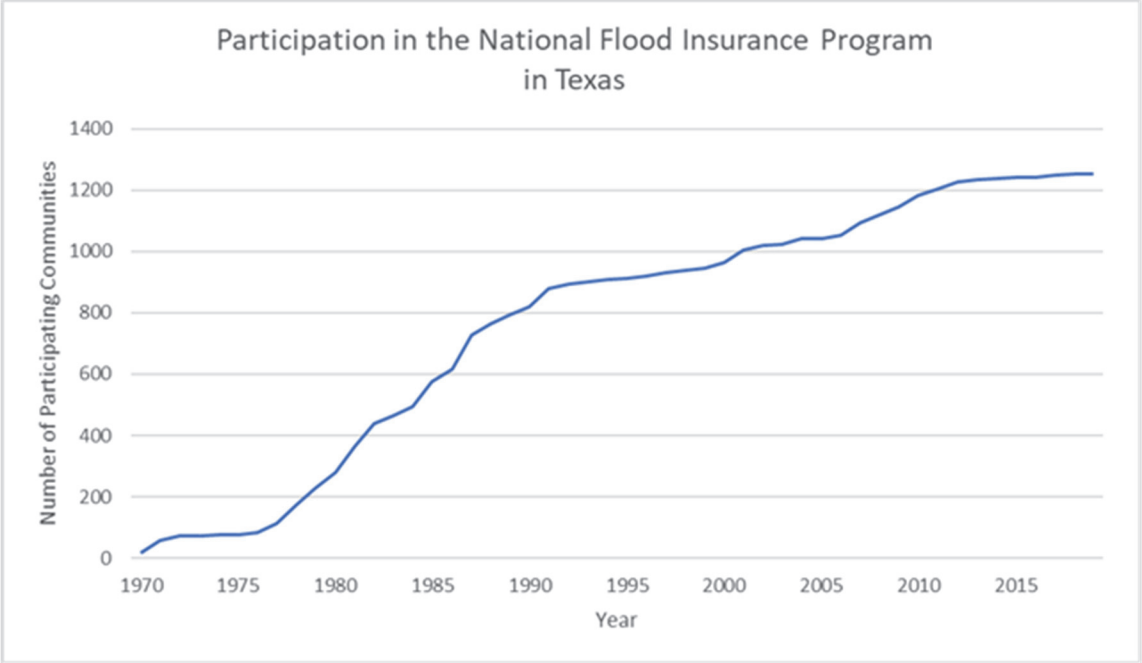

Figure 2. Participation in the National Flood Insurance Program in Texas

Data Source: FEMA *Community Information System*

necessity of flood insurance for their residents, would voluntarily adopt the necessary regulations to participate. It was also assumed that people who lived or owned businesses in flood-prone areas would purchase flood insurance once they learned it was available through the federal government. The Federal Flood Insurance Administration in the Department of Housing and Urban Development (HUD) was the federal entity with authority over the NFIP at the time and the agency was tasked with identifying and mapping flood-prone communities. Alternatively, a community could identify themselves as flood-prone. "Between 1968 and 1973 few communities acted to enter the program and even fewer were identified by HUD as being in flood-prone areas, and relatively few persons purchased insurance. This lack of action, coupled with the disastrous effects of Tropical Storm Agnes, led Congress to enact more coercive legislation" (Moore & Cantrell, 1976, p. 485). In 1973, Congress passed the Flood Disaster Protection Act. The Act "prohibited most types of Federal assistance for acquisition or construction of buildings in the

floodplain of non-participating communities" and "required that buildings located in identified flood hazard areas have flood insurance coverage as a condition of receiving federal financial assistance or loans from federally insured or regulated lenders" (FEMA, 2005, p. 2-4). Participation increased dramatically in the decade after the passage of the Flood Disaster Protection Act. Nationwide, NFIP participation increased further following the passage of stricter mandatory flood insurance purchase requirements in the National Flood Insurance Reform Act of 1994 and the initiation of a flood insurance advertising campaign in the 2000s.

In 1999, the Texas Legislature passed House Bill 1018. The bill required that the governing body of each municipality and county adopt the necessary ordinances or court orders to be eligible to participate in the NFIP no later than January 1, 2001. The bill did not require cities and counties to enroll in the NFIP. Though there has not been a thorough investigation, it is generally believed that all or most of the remaining non-participating communities are likely out of compliance with this law. In 2006, the Texas Floodplain Management Association published a *White Paper on Floodplain Management in Texas* in which they recommended to the Legislature to, "improve the enforcement of HB 1018… that requires flood-prone Texas Counties and Municipalities to meet NFIP requirements" by allocating additional state funding to the NFIP State Coordinating Agency to conduct outreach, training, and assistance (p. 5). The TWDB, the current State Coordinating Agency for the NFIP, conducts such outreach, training, and assistance to both participating and non-participating communities; however, the agency is not regulatory in nature and does not have enforcement authority if non-compliance is found. Some states, such as Iowa, have passed stricter legislation requiring that, "all communities with FEMA identified Special Flood Hazard Areas (SFHA) within their political boundaries must participate in the NFIP" (House File 759, 2009). Roy Sedwick, Director of the Texas Floodplain Management

Association, told State Impact in an interview that, “his group tried to get a law passed that would mandate communities [in Texas] to participate in the flood insurance program, but were unsuccessful” (Buchele, 2013).

2.2 Flood Risk Factors

A community’s flood risk has a logical effect on NFIP participation. Petak and Atkinsson (1982) assert “The primary impediment to the adoption and enforcement of effective natural hazards regulatory policy has to do with the ‘willingness’ rather than the ‘capacity’ of governmental law-making bodies to act” (p. 489). It stands to reason that the more flood-prone a community is, the greater the motivation that community has to participate in the program and protect their residents and their local economy from the damage floods can inflict through flood insurance coverage and federal disaster assistance. As previously stated, participation in the NFIP is dependent on community action. Previous studies evaluating factors which influence whether a community takes action on a specific issue have noted that, “influences on community response derive from the specific issue in question. Of particular significance is the extent of local perception of the severity of a problem or a worthiness of an issue for public attention” (Luloff and Wilkinson, 1979, pp. 141-142). Early studies of factors affecting local community action investigated a variety of subjects and government programs. Hawley (1963) studied and established the effect of the age of housing and extent of housing dilapidation on community participation in a federal urban renewal program. Crenson (1971) asked the question, “Why do some cities attack particular problems while others ignore them?” and investigated community action on the issue of air pollution in response to local levels of such pollution (p. 227). More recently, Zwald, et al. (2016) investigated the impact of residents’ perceived importance of physical activity on whether a municipality adopted land use policies that support active living.

These are only a few examples of the many studies that establish a relationship between the severity or perceived severity of an issue and a local community's decision to act on the issue.

Specifically, two studies have investigated participation in the NFIP and their research forms the foundation for many of the variables used in this research. First, Moore and Cantrell (1976) studied 93 flood-prone non-participating communities in New York. Building off their research, Luloff and Wilkinson (1979) studied 2,483 flood-prone communities (participating and non-participating) in Pennsylvania.

Flood Experience

The research by Moore and Cantrell (1976) and Luloff and Wilkinson (1979) investigated whether flood experience, or history with flooding, was an important variable for determining community participation in the NFIP. Moore and Cantrell (1976) measured history of flooding by measuring the "actual cash advances made by the Federal Disaster Assistance Administration for public sector damages resulting from Tropical Storm Agnes which occurred in June 1972" and the researchers noted "It is difficult to obtain data for the independent variable, flooding, by city and village boundary. Most flood damage data are aggregated at the state or, at best, the county level" (p. 493). The researchers also acknowledged that, "while public sector damages are but one aspect of community damages, these data do allow us to make a rough approximation of experience with flooding" (p. 493). Moore and Cantrell (1976) concluded that recent experience with flooding was a significant predictor of program participation. Luloff and Wilkinson (1979) sought to further demonstrate the correlation between flood experience and NFIP program participation, stating, "For obvious reasons, community response to the flood insurance program should be related to the salience of the problem of flooding in the community" (p. 142). Their results supported this conclusion to the level of 0.1% significance (Luloff and Wilkinson, 1979).

There is a lack of research on factors influencing NFIP participation since the research of Moore, Cantrell, Luloff and Wilkinson. More recent studies have focused on community actions to reduce risks of flood and other natural hazards with a broader array of methods. In 1998, Burby and May demonstrated the varying levels of local government commitment to solving environmental problems under coercive and co-operative planning mandates, using interviews, surveys, and secondary data from Florida and New South Wales, Australia. They also investigated the impact of previous natural disasters, measured as the number of catastrophic events in the preceding 20 years, on the effectiveness of hazard and environmental planning. The researchers concluded, "The commitment of elected officials to the goals of the mandates we studied tended to be lower when plans had not been prepared or were of low quality, when various interest groups made few demands for governmental action, and when risks had not become self-evident through the occurrence of a natural disaster" (Burby & May, 1998, p. 95). The researchers found previous natural disasters to have a significant impact on the commitment among elected officials to solve a problem. This is particularly important in the context of this research because participation in the NFIP is dependent on local commitment to take action. The research of Burby and May in 1998 contributes to the general body of research supporting the idea that history of past hazards has a positive effect on the way local governments plan, mitigate, and respond to such hazards.

Brody, et al (2009) examined local flood mitigation policies in Florida from 1999 to 2005. Although their study examined NFIP-participating communities, their research advances scholarship on flood risk's relationship with community action. The researchers concluded, "Hazard events can act as triggers to the policy system and become catalysts for adaptation" (Brody, et al., 2009, p. 914). In 2010, Brody, et al. investigated "why flood mitigation techniques

are implemented at the local level," defining flood mitigation techniques broadly as both structural and non-structural solutions (p. 167). "Structural approaches are generally based on engineering interventions to control floods or protecting human settlements by building seawalls, levees, channel and revetments. In contrast, non-structural approaches are based on adjustment of human activities and communities to mitigate flood damage with measures such as directing land use away from hazardous areas, communicating mitigation information, protecting sensitive areas, and insurance schemes to distribute risk" (Brody, et al., 2010, p. 169). Participation in the NFIP is considered a non-structural flood risk reduction strategy. The researchers measured flood history or flood hazard experience with two variables: "a jurisdiction-experienced damaging flood event in the most recent year and the total dollar amount of insurance claims (in millions of dollars) under the NFIP over the 5-year period preceding the survey," concluding that amount of insurance claims was "a significant predictor of non-structural mitigation strategies where $p<.05$" (p. 175). While their study differs from this research because they surveyed NFIP-participating communities, it is relevant to this research as a justification for including flood experience as a variable for predicting community action to reduce flood risk. It is important to note that damages in the amount of insurance claims or disaster assistance provided to local governments cannot be used in this study because of the nature of the selected research group. Only participating communities can access such funds and this study involves non-participating communities.

Brody et al. (2010) noted conflicting past research on the issue of flood risk predicting community action, stating, "Godschalk et al. (1989) found storm history a positive influence on mitigation activities, but recent storm damage a negative predictor. Similarly, Burby et al. (1997)

noted in their empirical study that the previous occurrence of a natural disaster did not have a strong effect on the number of mitigation techniques adopted by communities" (p. 174).

Flood Susceptibility

While experience with flood risk can be a good predictor of flood susceptibility in future, it does not paint the entire picture. By definition, FEMA's Special Flood Hazard Area, or 100-year floodplain, is the area that has a 1% or greater chance of flooding in any given year. Because the models used to map floodplains are built on statistical probability, this means that simply because flooding has not occurred in the past, does not mean that flooding will never occur in that location. Similarly, it is possible to have multiple 100-year, or even 500-year, storms in a short time span. Such was the case with Hurricane Harvey, bringing Washington Post headlines such as, "Houston is experiencing its third '500-year' flood in 3 years. How is that possible?" (Ingraham, 2017). Past studies in the natural hazards field have relied on flood experience to measure flood risk and have not measured flood susceptibility. This research proposed to use both flood experience and flood susceptibility to measure flood risk. Details regarding how this variable will be measured will be covered in Chapter 3.

2.3 Institutional Capacity

Previous studies regarding community decisions to participate in federal programs or implement flood mitigation activities have found a community's ability to implement change to be an important predictor. Moore and Cantrell (1976) studied New York communities' participation in the NFIP and analyzed the impact of the variable structural differentiation, defined as the degree of complexity of a community's organizational structure. The researchers asserted that "communities having a high level of differentiation are likely to take action because they tend to have organizations specifically related to a given decision are and these

organizations are likely to have large, professional staffs to deal with specialized policy issues" (Moore and Cantrell, 1976, p. 488). To measure structural differentiation, the researchers used the seven-item Guttman scale, which includes measures of whether or not a local community has local planning entities or has participated in past federal government programs. Moore and Cantrell (1976) concluded that structural differentiation is "at the core of a community's capacity to respond to outside demands and, more generally, to take action regarding community well being" (p. 505). Luloff and Wilkinson (1979) also studied structural differentiation and NFIP participation; however, the variable was measured differently as "the number of groups and services represented in the community from a list of 11" (p. 143). Examples of the 11 groups and services include Chamber of Commerce, United Way organization and a local daily newspaper. The researchers used the rating based on these 11 factors to represent how complex the local community is, and therefore, how able that community would be to take action in joining the NFIP, which requires local staff and expertise. As expected, participating communities were found to have more highly differentiated structures.

Institutional capacity has also been referred to in previous research as staff capacity. In 1998, Burby and May measured staff capacity as a combination of three sub-variables: local budget, technical expertise, and authority to enforce regulations. The researchers stated, "Our findings suggest that an important way to improve the quality of plans is to enhance the capacity of local planning agencies" and "in both Florida and New South Wales, plans tend to be of higher quality when the capacity of the planning agency (budget, staff expertise, authority) is also higher" (Burby and May, 1998, p. 111).

Institutional capacity has also been termed adaptive capacity in previous studies. Posey (2009) sought to test the relationship between socio-economic status and adaptive capacity

across the United States. His research added complexity to the body of research on this variable, by noting, “In referring to the ‘adaptive capacity of a community,’ it is possible for there to be at least two different meanings. First, the term might refer to the adaptive capacity of individuals living in a community… Alternatively, the term ‘adaptive capacity of a community’ might refer to the capacity of leaders to effect collective action” (Posey, 2009, p. 483). Instead of investigating whether institutional capacity had an impact on whether communities acted to implement change in their community (such as enrolling in the NFIP), Posey saw the community’s participation the NFIP’s Community Rating System (CRS) as evidence that the community was adaptive to change. Posey (2009) measured the adaptive capacity variable by whether or not the community participated in the CRS program in order to test the relationship between adaptive capacity and socio-economic status at the municipal level. This provides further proof the strong relationship between institutional capacity and the propensity for local action, such as enrolling in the NFIP or its related program, the CRS.

2.4. Type of Community

Rural vs Urban

Consoer and Milman (2018) found that past research on local-level engagement with flood mitigation and flood risk reduction activities have largely ignored an important variable: whether a community is rural or urban. The authors cite that, “Seventy-two percent of the land area is classified as rural (Economic Research Service, 2015) and 19% of the population resides in rural areas” (Consoer and Milman, 2018, p. 141). However, very few studies have explicitly examined whether the distinction between urban and rural communities can be a predictor of community action on natural hazards. Frazier, et al. (2013) is one exception. The authors

demonstrated that rural areas were less likely to implement flood mitigation activities and were more likely to focus on emergency response and recovery needs.

Rural areas are important to study because they are likely to have challenges implementing flood mitigation activities, including participation in the NFIP, due to their older, less affluent, and less educated populations, more limited financial and human resources, and weaker relationships with state and federal agencies (Consoer and Milman, 2018). Consoer and Milman (2018) conducted 30 interviews with municipal officials representing 27 municipalities from four western counties in Massachusetts, asking questions regarding flood mitigation decision-making processes and implementation. The results of the study showed, "Rather than anticipatory mitigation, rural communities generally 'just go from crisis to crisis' (Interviewee#24, 10/8/2014)," taking "reactionary actions that occur in the aftermath of a flooding event" (p. 148). Though the distinction between urban and rural communities is undeniably related to another variable, institutional capacity, this study asserts that one does not wholly encompass the other and, therefore, that measuring both variables separately will be worthwhile. Consoer and Milman (2018) discuss the relationship between rural communities, which happen to often be smaller communities, and institutional capacity, noting "capacity constraints also limit the degree to which flood mitigation occurs. In smaller municipalities, overloaded voluntary officials often do not have the time or the ability to focus on flood mitigation… In contrast, larger municipalities have greater abilities to engage in flood mitigation because of their larger and paid staffs, often including public works departments with engineers and planning departments with expertise in zoning and land use regulations" (p. 145). The TWDB's 2018 *State Flood Assessment* provided further support for this idea, finding that, "rural

communities are the most likely to not have local funding for these [flood mitigation] activities" (p. 35).

Municipality vs County

Past researchers in this field have not investigated whether there is a link between NFIP participation or other community actions taken to reduce hazards and the type of community (municipality or county). This research seeks to describe whether the non-participating communities in Texas are municipalities or counties. It is important to note that, for NFIP participation, a county is only responsible for regulating development within the unincorporated areas of the county. County governments in Texas are unique and many county officials complain that their form of government is weak, and without specific floodplain management and land use authority given to them by the legislature, they "express their concerns about the effects of their limited ability to prevent some of the more negative effects of development and state the need for these limitations to be addressed through legislative action" (CAPCOG, 2009, p. 1).

2.5 Floodplain Map Status

As stated in Chapter 1, FEMA is responsible for generating floodplain maps (FIRMs). These maps are essential to a community's participation in the NFIP because they define for the community where their areas of high risk are, thus dictating where the community must enforce floodplain management regulations. Additionally, without FIRMs, communities cannot participate in the Regular Phase of the NFIP. They can only participate in the Emergency Phase of the program, which offers limited amounts of insurance coverage to residents. Figure 1 shows that large areas of Texas have old or outdated FIRMs. The TWDB's *State Flood Assessment* notes that, "Only 20 percent of survey respondents describe their FIRMs as recently updated.

The remaining described their maps as old, outdated, incomplete, or insufficient" (p. 18). Section 60.3(a) of the 44 Code of Federal Regulations requires un-mapped communities to, "require permits for all proposed construction or other development in the community… so that it may determine whether such construction or other development is proposed within flood-prone areas." Anecdotally, it is known that this is a significant burden for local communities and acts as a deterrent for communities without FIRMs to participate in the NFIP. When Moore and Cantrell (1976) and Luloff and Wilkinson (1979) studied participation while the NFIP was still in its infancy, they described that a community could either wait for the federal government to produce a map identifying them as flood-prone (provide them with a flood map) or they could identify themselves as flood-prone (joining the NFIP in the Emergency Phase and permitting all development as described in 44 CFR 60.3(a)). Moore and Cantrell (1976) chose to only study communities that had been identified has flood-prone by the federal government. Luloff and Wilkinson studied all communities, finding that only 33.3 percent of communities identified themselves as flood-prone. "The rest, 66.7 percent, waited for the federal government to send them a map and thereby implicitly threaten the community with sanctions" (Luloff and Wilkinson, 1979, p. 144). As of January 2018, there are 70 Texas communities in the Emergency Phase of the program, less than 6% of the total number of participating communities in the state (FEMA, 2019).

In 1966, the Task Force on Federal Flood Control Policy wrote a report titled, *A Unified National Program for Managing Flood Losses*, in which the authors discuss the importance of and need for floodplain mapping for administration of NFIP participation. The task force recommended that, for floodplain mapping, "priority should be given to those areas in greatest need" (Goddard, et al., 1966, p. 22). Marsalek, et al. (2000) presented a history of the evolution

of floodplain mapping since the inception of the NFIP. The researchers described the struggle of communities without maps or without detailed maps by saying, “the lack of flood elevation information presents a serious challenge for proper administration of local ordinances” (p. 171).

2.6 History of participation in the NFIP

Any participating community may choose to withdraw from the NFIP by sending notice to FEMA that they have repealed their flood damage prevention ordinances or court orders required for NFIP participation (44 CFR Section 59.24). If a community fails to enforce the NFIP minimum requirements set out in the community’s adopted ordinance or court order, FEMA can place the community on probation. If the community fails to remedy their non-compliance and program deficiencies, FEMA can suspend the community from the NFIP. “Suspension means the community is no longer in the NFIP. It is subject to the sanctions for non-participation” and is considered a non-participating community (FEMA, 2005, p. 2-14). This research does not attempt to make a judgement regarding whether previously suspended or withdrawn communities are better or worse candidates for NFIP-participation outreach; however, this study does seek to describe the NFIP-status of Texas’ non-participating communities. Previous studies related to NFIP participation by Moore and Cantrell (1976) and Luloff and Wilkinson (1979) were executed early in the program’s infancy and therefore, it is likely that there were not many, if any, communities suspended or withdrawn at the time of their study.

2.7 Summary of Conceptual Framework

This chapter explored the available scholarly literature and government documents regarding the characteristics of communities that do not participate in the NFIP. These characteristics will be used in this study to describe non-participating communities and a select

number of the characteristics will be used to determine which communities are the best candidates for NFIP-participation outreach efforts. The following table (Table 2.1) summarizes the conceptual framework and links each category to the corresponding literature.

Table 2. Conceptual Framework Table

Title: The National Flood Insurance Program in Texas: An Assessment of Non-Participating Communities Purpose: The purpose of this research is to describe the characteristics of Texas communities that do not participate in the NFIP. The secondary aim is to identify which communities are the best candidates for enrollment outreach efforts.	
Category	Supporting Literature
1. Flood Risk Factors 1.1 Flood experience 1.2 Flood susceptibility	Petak and Atkinsson (1982); Luloff and Wilkinson (1979); Hawley (1963); Crenson (1971); Zwald, et al (2016); Moore and Cantrell (1976); Burby and May (1998); Brody, et al. (2009); Brody, et al. (2010)
2. Institutional Capacity	Moore and Cantrell (1976); Luloff and Wilkinson (1979); and Burby and May (1998); Posey (2009)
3. Type of Community 3.1 Rural vs Urban 3.2 Municipality vs County	Consoer and Milman (2018); Frazier, et al. (2013); TWDB (2019); and CAPCOG (2009)
4. Floodplain Map Status	TWDB (2019); 44 CFR § 60.3; Moore and Cantrell (1976); Luloff and Wilkinson (1979); Goddard, et al. (1966); Marsalek, et al (2000)
5. History of participation in the NFIP	44 CFR § 59; FEMA (2005); FEMA (2011)

Chapter 3. Methodology

3.1 Chapter Purpose

This chapter discusses descriptive research and addresses some of the strengths and weaknesses of the research method. This chapter also discusses the methods of data collection and analysis used to assess non-participating NFIP communities in Texas. Data for this study were available in various forms and were gathered from publicly-available databases.

3.2 Descriptive Research

Descriptive research is used to describe a situation, phenomena, subject, or characteristics (Dulock, 1993). Shields and Rangarajan (2013) observe that it is intended to answer questions of who, what, when, and where and is often used when not much is known about a particular topic or subject. This is appropriate for this research because there has never been an assessment of non-participating NFIP communities in Texas. The principal limitation of descriptive research is that it is not a type of research that seeks to answer the question of why; unlike experimental research, descriptive research cannot establish cause and effect (Dulock, 1993). Descriptive research can, using descriptive statistics of qualitative or quantitative data, show patterns and establish frequencies and correlations (Dulock, 1993). This research uses qualitative and quantitative data to analyze and describe non-participating NFIP communities in Texas.

3.3 Document Analysis

This research used document analysis for its data collection. “Document analysis is a systematic procedure for reviewing or evaluating documents—both printed and electronic (computer-based and Internet-transmitted) material.” (Bowen, 2009, p.27). All the data in this research was electronic. Data collection and analysis methods are described further in the following sections.

3.4 Geographic Information System (GIS) Software

This research used ArcGIS, a GIS software program, in two ways: (1) to perform spatial analysis in order to measure flood susceptibility, and (2) to display the final results in map format (see Figures 4.3 and 5.1).

3.5 Data Collection

The data used in this research was free and publicly-available for download from various government agencies websites. Most of the data used was in tabular format, either excel or csv files. The spatial datasets collected were in GIS shapefile format. The first data collection effort required was to identify which communities in Texas do or do not participate in the NFIP. A list of participating and non-participating communities was obtained from FEMA's online NFIP *Community Information System.*

The following Operationalization Table (Table 3.1) presents the categories described in Chapter 2, Literature Review, and describes how each variable is measured in this study.

Table 3.1 Operationalization Table

Title: The National Flood Insurance Program in Texas: An Assessment of Non-Participating Communities **Purpose**: The purpose of this research is to describe the characteristics of Texas communities that do not participate in the NFIP. The secondary aim is to identify which communities are the best candidates for enrollment outreach efforts.	
Category	Coding
1. Flood Risk Factors 1.1 Flood experience 1.2 Flood susceptibility	How many federal disaster declarations has the community been included in? What is the area of floodplain (in sq. miles) within the community's jurisdiction?
2. Institutional Capacity	What is the population of municipality or county?
3. Type of Community 3.1 Rural vs Urban 3.2 Municipality vs County	Is the community rural or urban? Is the community a municipality or county?
4. Floodplain Map Status	Does the community have a floodplain map? Yes/No If yes, is the map: Paper or Digital FIRM

5. History of participation in the NFIP	Has the community ever participated in the NFIP? Suspended, Withdrawn, Never Participated

Flood Risk Factors

Previous researchers have established that flood risk is related to community action on NFIP participation. As discussed in the literature review chapter, flood risk can be broken into two sub-variables: flood experience and flood susceptibility.

In previous studies, researchers used damages in the amount of insurance claims or disaster assistance measured in dollars provided to local governments as a variable to measure flood experience; however, this is not a viable way to measure flood risk in this study because of the nature of the selected research group. Only participating communities can access such funds and this study involves non-participating communities. This research used FEMA Disaster Declarations Summary, Open Government Dataset (excel file) to measure flood experience, calculated as the number of federal disaster declarations related to flooding since 1953. This data is aggregated at the county level.

Various spatial datasets, in GIS shapefile format, were gathered in order to measure flood susceptibility. FEMA makes the National Flood Hazard Layer (NFHL), which is a geospatial database that contains current effective floodplain map data, available on their website for download. This research used the NFHL for Texas. The database contains various layers, such as information on the location of levees, and cross-sectional base flood elevation data. Only one layer was of interest to this research, the layer with polygons of mapped floodplains. The floodplain layer is separated into polygons for 100-year floodplain (both coastal and riverine type floodplains), 500-year floodplain, and area of minimal flood hazard. Since NFIP regulations are based on the 100-year floodplain, this research involved selecting only the 100-year

floodplain polygons and creating a new layer from the selection. It is important to note that this layer contains only digitized floodplain maps. Communities with paper floodplain maps that have not yet been digitized are not represented in this dataset. The Texas Natural Resources Information System (TNRIS) is a state agency, housed within the TWDB. TNRIS generates a dataset containing the most up to date boundaries of political jurisdictions in Texas. The dataset is derived from various sources, including: The Texas Department of Transportation, local governments, and the Texas Parks and Wildlife Department. The dataset contains political boundary jurisdictions (cities and counties) as polygons as well as a layer representing cities as points (centroids). All geospatial datasets collected were then analyzed using the ArcGIS software, as described further in Section 3.5.

Institutional Capacity

This research used population estimates for Texas Counties and Cities from 2010-2017, provided online by the U.S. Census Bureau to measure institutional capacity.

Type of Community

Type of community can be further broken down into two subcategories: municipality or county, and rural or urban. Information about whether a community is a municipality or county is captured in FEMA's *Community Information System* which is also used in this study for determining NFIP participation. Deciding whether a community is rural or urban is a more subjective task. There are various definitions for rural and urban. This research uses the U.S. Office of Management and Budget's designation of counties as metropolitan (urban) or non-metropolitan (rural).

Floodplain Map Status

Floodplain map status is a variable with two sub-questions: Does the community have a floodplain map? If so, is the map in paper or digital form? FEMA's *Community Information System*, as well as the flood susceptibility data collected in this study were used to inform the floodplain map status variable.

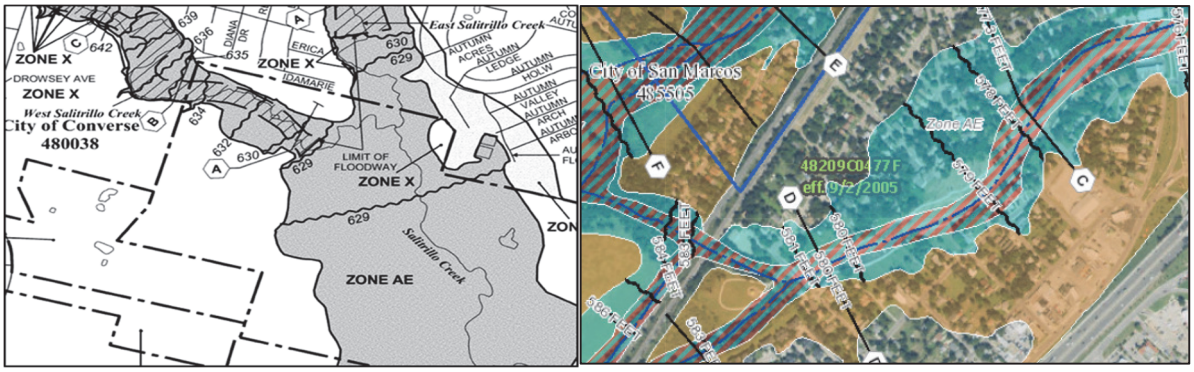

Figure 3.1 Paper Floodplain Map (left) and Digital Floodplain Map (right)

Source: FEMA Map Service Center

History of Participation in the NFIP

Information about whether a community has ever been suspended or has withdrawn from the NFIP is captured in FEMA's *Community Information System*.

3.6 Data Analysis

A significant part of the work involved in this research was dedicated to incorporating the information from various sources into one dataset. Various data sources list municipality and county names in various ways. For example, the *Community Information System* file was organized by municipality or county name in all capital letters, in the following format: "LAWN, TOWN OF." The TNRIS political boundary later, had the municipality or county name with the first letter capitalized, such as "Lawn." OMB Urban-Rural designations are based on county

boundaries, so this research involved determining which county each municipality was primarily located in.

Spatial analysis tools were used in ArcGIS to generate the flood susceptibility variable. Before spatial analyses could be run, the 100-year floodplain (NFHL) and TNRIS community boundary layers were projected to NAD 1983 UTM Zone 14N, which is a Transverse Mercator projection used frequently in Texas. Then, the TNRIS community boundary layers were joined with excel files indicating whether the community was participating or non-participating. The join was based on the common field of municipality or county name. The result was two layers with the political boundaries, one of Texas cities and one of Texas counties, each with a new attribute table field indicating whether the municipality or county was participating or not. With this participation information incorporated into GIS, the polygons for cities and counties that do not participate in the NFIP were able to be selected and two new layers with non-participating community boundaries were created. Next, the 100-year floodplain layer was intersected with the newly-created non-participating community boundary layers. This resulted in layers with only the floodplain polygons within non-participating municipality and county boundaries. In these new layers, a new attribute field was added and the geometry of the area of the floodplain (in square miles) was calculated. Since there can be multiple floodplain polygons inside of a participating community, the summarize function was used to aggregate the sum of the area of all floodplain polygons with each non-participating community. The results for non-participating cities was joined with the TNRIS layer that represents cities as points instead of polygons in order to display the data more attractively. Lastly, the excel file with information regarding communities with paper floodplain maps was joined with the layer of cities represented as points and county boundaries as polygons in order to display which communities have unknown risk

due to their floodplain maps being in paper format. The map showing the results is presented in the following chapter as Figure 4.3.

3.7 Summary

This chapter discussed descriptive research in general, then presented the methods of data collection and analysis for this study. Electronic document analysis, along with GIS programs, were used in this research to collect and generate data to describe non-participating NFIP communities in Texas.

Chapter 4. Results

The purpose of this chapter is to summarize the results of the data collected, in order to: (1) describe the communities that do not participate in the NFIP in Texas and (2) identify communities that are the best candidates for NFIP-participation outreach.

4.1 Flood Risk Factors

In this study, flood risk factors are separated into two sub-variables: flood experience and flood susceptibility. Both variables show that most non-participating communities are at risk of flooding.

Flood experience

This study determined the number of flooding-related federal disaster declarations since 1953 per non-participating community. Federal disaster declarations are not refined the community level, they are declared on a county-wide basis. Surprisingly, it was found that every county in this study had been included in at least one federally declared disaster. The average number of disaster declarations per non-participating community was 3.06.

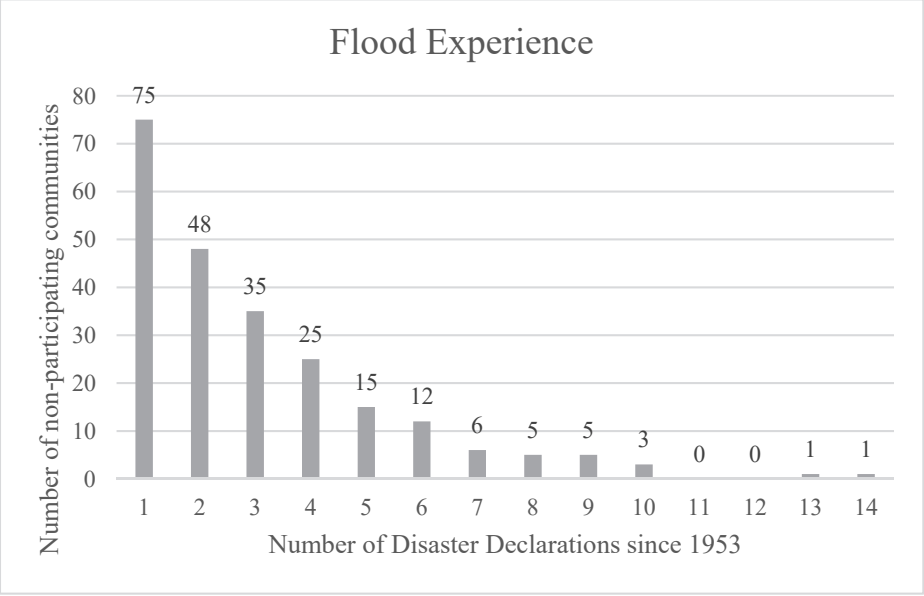

Figure 4.1

Flood susceptibility

Flood susceptibility could only be calculated for those 113 non-participating communities with digital floodplain maps. It was not possible to compute flood susceptibility for communities with paper maps or unmapped communities (118 communities). Results indicate that there are 22 non-participating communities with digital floodplain maps, but that have no floodplains within their boundaries. FIRMs are created by FEMA so, according to FEMA, these 22 communities are not at risk of experiencing a 100-year flood. Out of the 35 non-participating counties in this study, only two counties have been digitally mapped by FEMA. Compared to the 89 non-participating municipalities with digitally-mapped floodplain within their jurisdiction, these two counties had significantly more floodplain in their jurisdiction. The large amount of floodplain within the digitally mapped counties skews the average number of square miles of floodplain for all non-participating communities, which was calculated as 2.34. The median paints a more realistic picture, at a value of 0.06, pointing to the finding that most communities have small amounts of floodplain within their boundaries. The distribution of the data is shown in Figure 4.2. The location and relative flood susceptibility of the non-participating communities is shown in Figure 4.3.

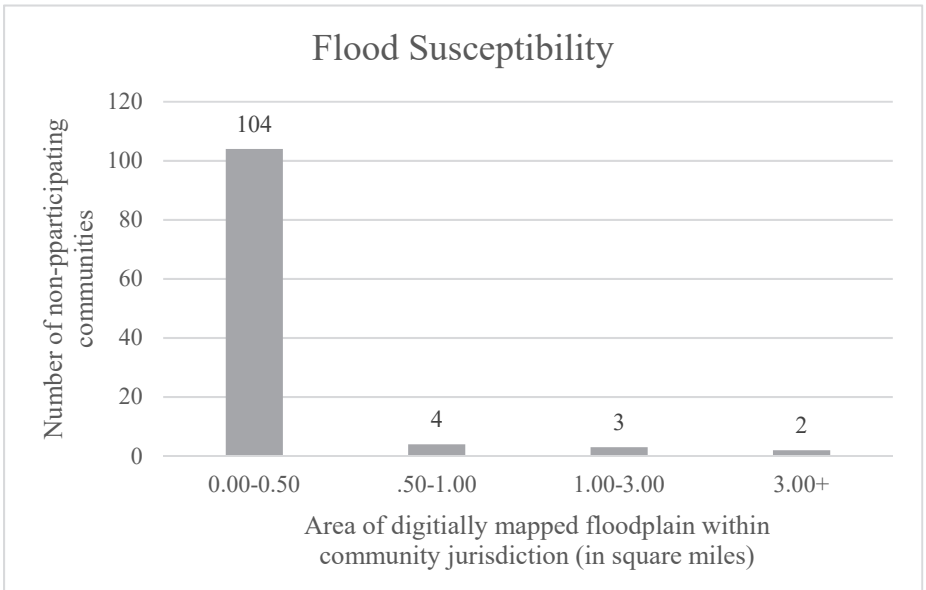

Figure 4.2

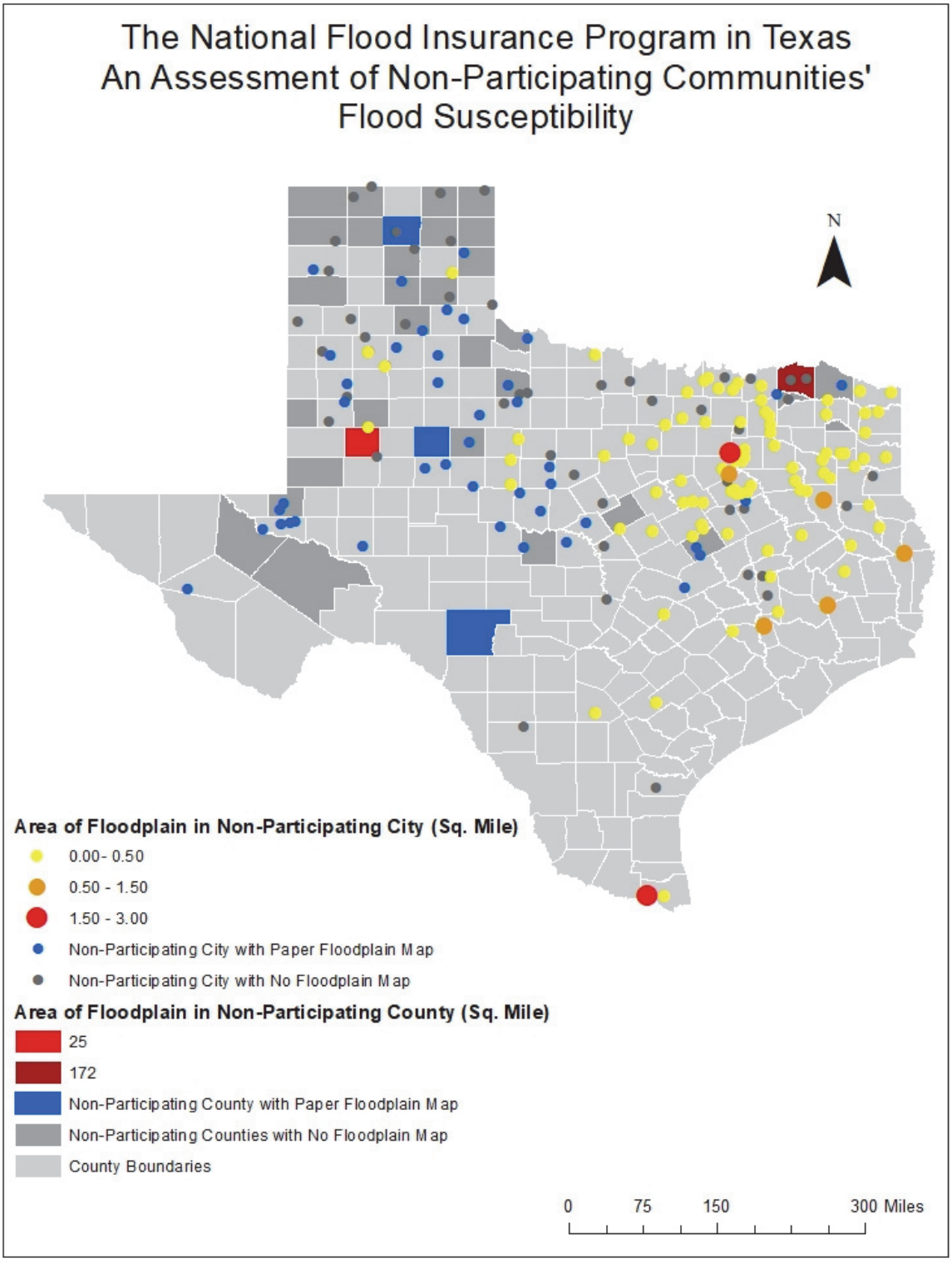
The National Flood Insurance Program in Texas
An Assessment of Non-Participating Communities' Flood Susceptibility
N
Area of Floodplain in Non-Participating City (Sq. Mile)
0.00- 0.50
0.50 - 1.50
1.50 - 3.00
Non-Participating City with Paper Floodplain Map
Non-Participating City with No Floodplain Map
Area of Floodplain in Non-Participating County (Sq. Mile)
25
172
Non-Participating County with Paper Floodplain Map
Non-Participating Counties with No Floodplain Map
County Boundaries
0
75
150
300 Miles

Figure 4.3

4.2. Institutional Capacity

Population was used in this study to measure institutional capacity. The average population of non-participating communities is 2,081. Population size was found to vary significantly between cities and counties. Non-participating municipalities have an average population of 698 and non-participating counties have an average population of 9,828. The distribution of the data for all non-participating communities is shown in the chart below.

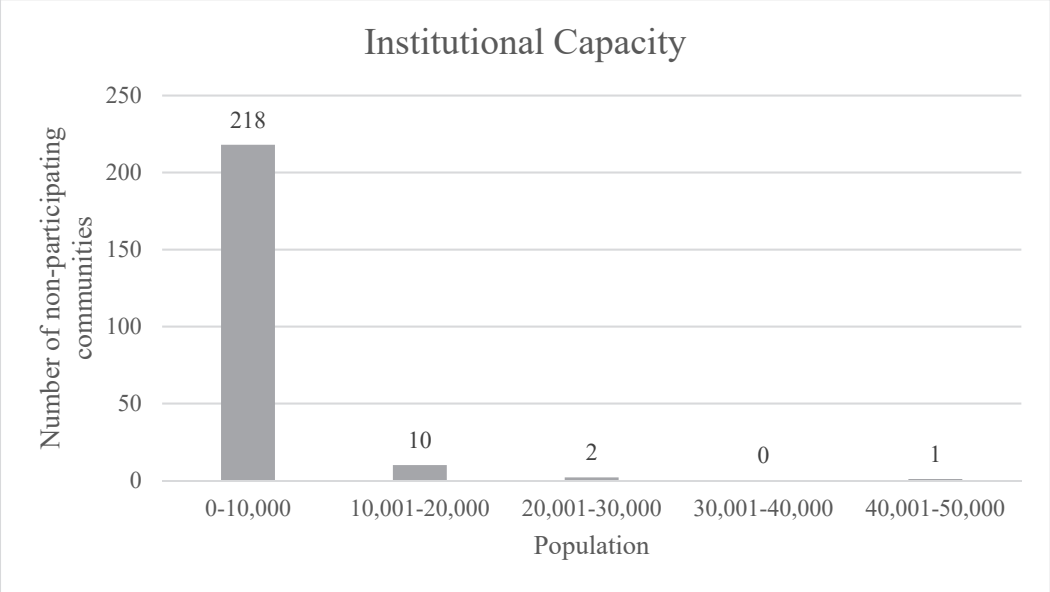

Figure 4.4

4.3 Type of Community

In this study, type of community is broken into two sub-variables: rural vs urban and municipality vs county. A majority (67.1%) of the non-participating communities are designated as rural by the U.S. Office of Management and Budget. A larger majority (84.8%) are municipalities.

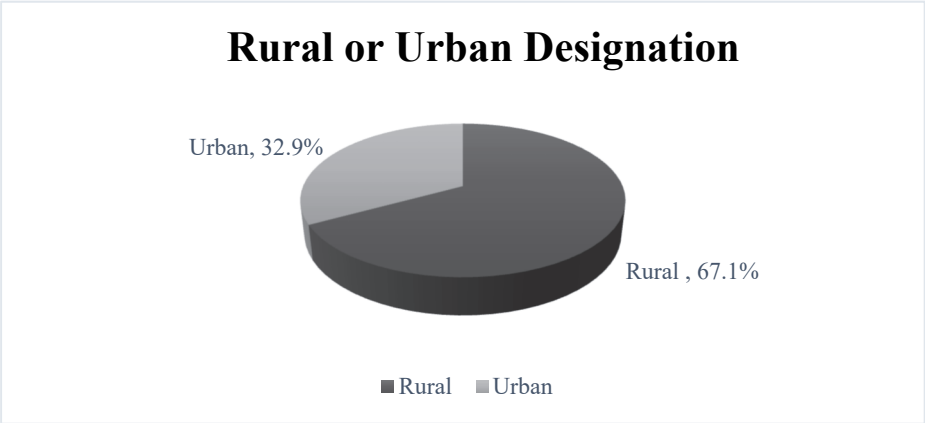

Figure 4.5

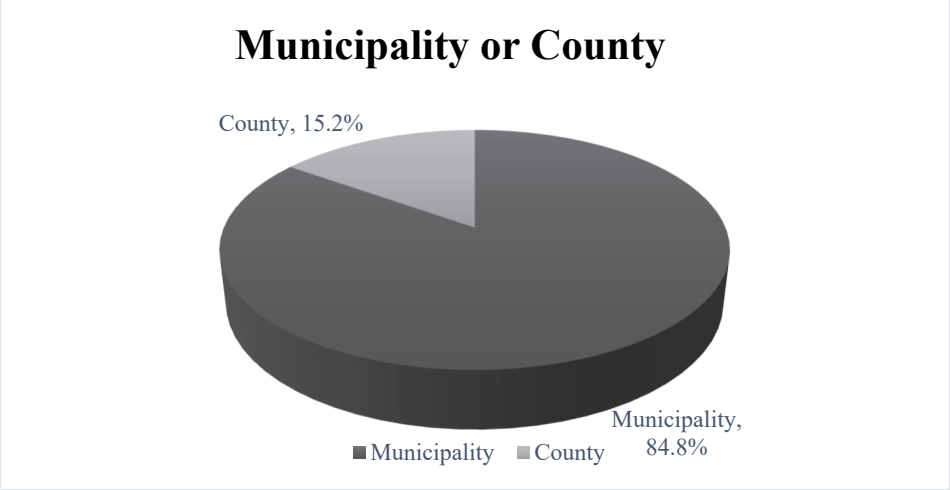

Figure 4.6

4.4 Floodplain Map Status

FEMA is responsible for providing floodplain maps to communities. Older floodplain maps are in paper format and newer ones are digitized. Some communities have never been mapped by FEMA and are only able to enroll in the Emergency Phase of the NFIP (28.1%). A majority of non-participating communities, 71.9%, have been mapped by FEMA. The spatial distribution of floodplain map status can be seen in Figure 4.3 and the distribution of the data is presented in Figure 4.7.

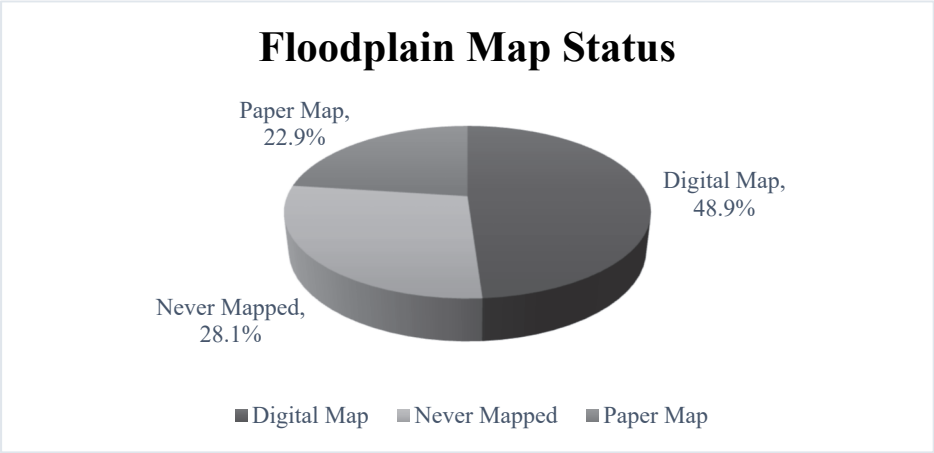

Figure 4.7

4.5 History of Participation in the NFIP

This study found that community suspension or withdrawal from the NFIP is rare (2.2% and 0.4% of all non-participating communities, respectively). The overwhelming majority (97.4%) of non-participating communities have never participated in the NFIP before.

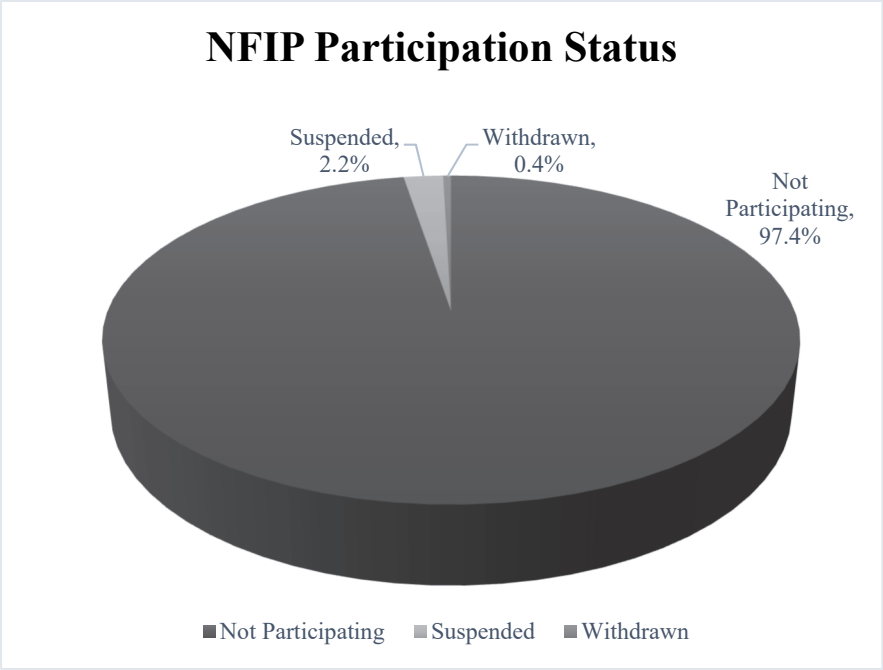

Figure 4.8

4.6 Communities to Target for NFIP Outreach

There are two variables in this study that clearly correspond with whether or not a community is a good candidate for NFIP-participation outreach. The first is flood risk: The NFIP is designed to protect communities from flood risk so NFIP-participation efforts should be focused towards communities with high risk. The second is institutional capacity: This variable relates to a community's ability to take on a new regulatory function, such as the NFIP. Outreach efforts should be focused towards communities with high institutional capacity. The other variables, such as type of community, floodplain map status, and history of NFIP participation are variables that describe the communities but were not used in the ranking system because they are categorical variables, not numerical variables, and assigning numerical values to these categorical variables would be subjective.

In order to normalize the two sub-variables of flood risk and the variable of institutional capacity into a scale of 0 to 1, the following equation was used to produce scores based on each variable:

$$x_{new} = \frac{x - x_{min}}{x_{max} - x_{min}}$$

Then, the scores of the individual variables were summed to create a total score (from 0 to 4). The score for flood susceptibility, as measured by the total floodplain area within a jurisdiction, was given twice as much weight as the other two variables. The reasoning behind this is because the variables of flood experience (disaster declarations) and institutional capacity (population) have significant limitations; whereas, the flood susceptibility has relatively few. Further, because of the significant population differences between municipalities and counties, which will be

discussed further in the following chapter, the scores for municipalities and counties were calculated separately. The results of the top 20 municipalities and the top 5 counties to target for NFIP outreach are included in the final chapter.

Chapter 5. Conclusion

The purpose of this descriptive research study was to describe the characteristics of Texas communities that do not participate in the NFIP and to identify which communities are the best candidates for NFIP-participation outreach efforts. There are numerous sanctions placed on non-participating communities, including that federally-subsidized flood insurance and disaster assistance are not available to residents in non-participating communities. These sanctions serve as burdens to the local economy and citizens in the event of a flood. This study collected data from publicly-available databases and generated new spatial data using ArcGIS software to describe non-participating NFIP communities. Based on the data collected, a scoring system was created, and each non-participating community was given a score (from 0 to 4) indicating how suitable the community is for participation outreach efforts. Tables containing information on the top 20 municipalities and top 5 counties selected for targeted NFIP enrollment outreach are presented in Table 5.1 and Table 5.2. This chapter will also discuss the limitations of this research and provide suggestions for future research.

This research was limited by the availability of data. The institutional capacity variable was measured as the population of the community. As discussed in the literature review chapter, previous studies have used more complex methods to determine institutional capacity which likely are better indicators of the local community's ability to take on a new program such as the NFIP. Total annual local budget was another way this study considered measuring this variable; however, the data for all 231 non-participating communities could not be collected from publicly available websites. This variable also presents problems when comparing municipalities and counties. Counties have significantly higher populations than municipalities because the county population numbers include all the municipalities within a county. For this reason, municipalities

and counties were scored separately as to reduce the bias towards counties. The top candidates for NFIP-participation outreach efforts are presented in the following tables. The locations of these top 25 communities are mapped in Figure 5.1.

Table 5.1 Top 20 Municipalities to Target to NFIP Participation Outreach

Municipality Name	County	No. Disaster Declarat-ions since 1953	Rural or Urban	Status: Not-Participating (N), Suspended (S), or Withdrawn (W)	Map Status: Digital (D), Paper (P), Never Mapped (N)	Total Flood-plain Area (in square miles) Or Un-known (U)	Popul-ation	Score (0-4)
RANGERVILLE, TOWN OF	CAMERON COUNTY	10	Urban	N	D	2.42	289	2.72
NORTH CLEVELAND, CITY OF	LIBERTY COUNTY	13	Urban	N	D	1.38	277	2.09
COMBINE, CITY OF	KAUFMAN COUNTY	1	Urban	N	D	1.64	2177	1.60
PINE ISLAND, CITY OF	WALLER COUNTY	8	Urban	N	D	0.94	1094	1.44
BROWNDELL, TOWN OF	JASPER COUNTY	9	Rural	S	D	0.72	198	1.23
HALLSVILLE, CITY OF	HARRISON COUNTY	7	Rural	N	D	0.29	4243	1.19
PERRYTON, CITY OF	OCHILTREE COUNTY	2	Rural	N	N	U	8683	1.08
PETRONILA, CITY OF	NUECES COUNTY	14	Urban	N	P	U	113	1.01
GALLATIN, CITY OF	CHEROKEE COUNTY	5	Rural	N	D	0.73	435	0.96
ANNETTA NORTH, TOWN OF	PARKER COUNTY	7	Urban	N	D	0.49	546	0.93
PROVIDENCE VILLAGE, TOWN OF	DENTON COUNTY	2	Urban	N	D	0.00	7127	0.90
TODD MISSION, CITY OF	GRIMES COUNTY	9	Rural	N	D	0.30	116	0.87
SEVEN OAKS, CITY OF	POLK COUNTY	10	Rural	N	D	0.20	124	0.87
INDIAN LAKE, TOWN OF	CAMERON COUNTY	10	Urban	S	D	0.03	828	0.81

FRANKSTON, CITY OF	ANDERSON COUNTY	7	Rural	W	D	0.23	1189	0.78
BEDIAS, CITY OF	GRIMES COUNTY	9	Rural	N	D	0.05	466	0.71
WEBBERVILLE, VILLAGE OF	TRAVIS COUNTY	8	Urban	N	D	0.14	448	0.70
KERMIT, CITY OF	WINKLER COUNTY	1	Rural	N	P	U	6072	0.70
CHRISTINE, CITY OF	ATASCOSA COUNTY	5	Urban	N	D	0.40	415	0.69
COOL, TOWN OF	PARKER COUNTY	7	Urban	N	D	0.24	180	0.68
IOLA, CITY OF	GRIMES COUNTY	9	Rural	N	D	0.00	424	0.66
WINONA, CITY OF	SMITH COUNTY	6	Urban	N	D	0.25	601	0.66
LEONA, CITY OF	LEON COUNTY	6	Rural	N	D	0.30	181	0.65
ANDERSON, CITY OF	GRIMES COUNTY	9	Rural	N	D	0.00	232	0.64
DOUGLASSVILLE, TOWN OF	CASS COUNTY	6	Rural	N	D	0.26	223	0.62

Table 5.2 Top 5 Counties to Target to NFIP Participation Outreach

County Name	No. Disaster Declarations since 1953	Rural or Urban	Status: Not-Participating (N), Suspended (S), or Withdrawn (W)	Map Status: Digital (D), Paper (P), Never Mapped (N)	Total Flood-plain Area (in square miles) Or Un-known (U)	Population	Score (0-4)
LAMAR COUNTY	4	Rural	N	D	172	49,587	3.75
RED RIVER COUNTY	5	Rural	N	N	U	12,229	1.23
FALLS COUNTY	3	Urban	N	N	U	17,437	0.84
DAWSON COUNTY	2	Rural	N	D	25	12,813	0.78
DELTA COUNTY	3	Rural	N	N	U	5,298	0.59

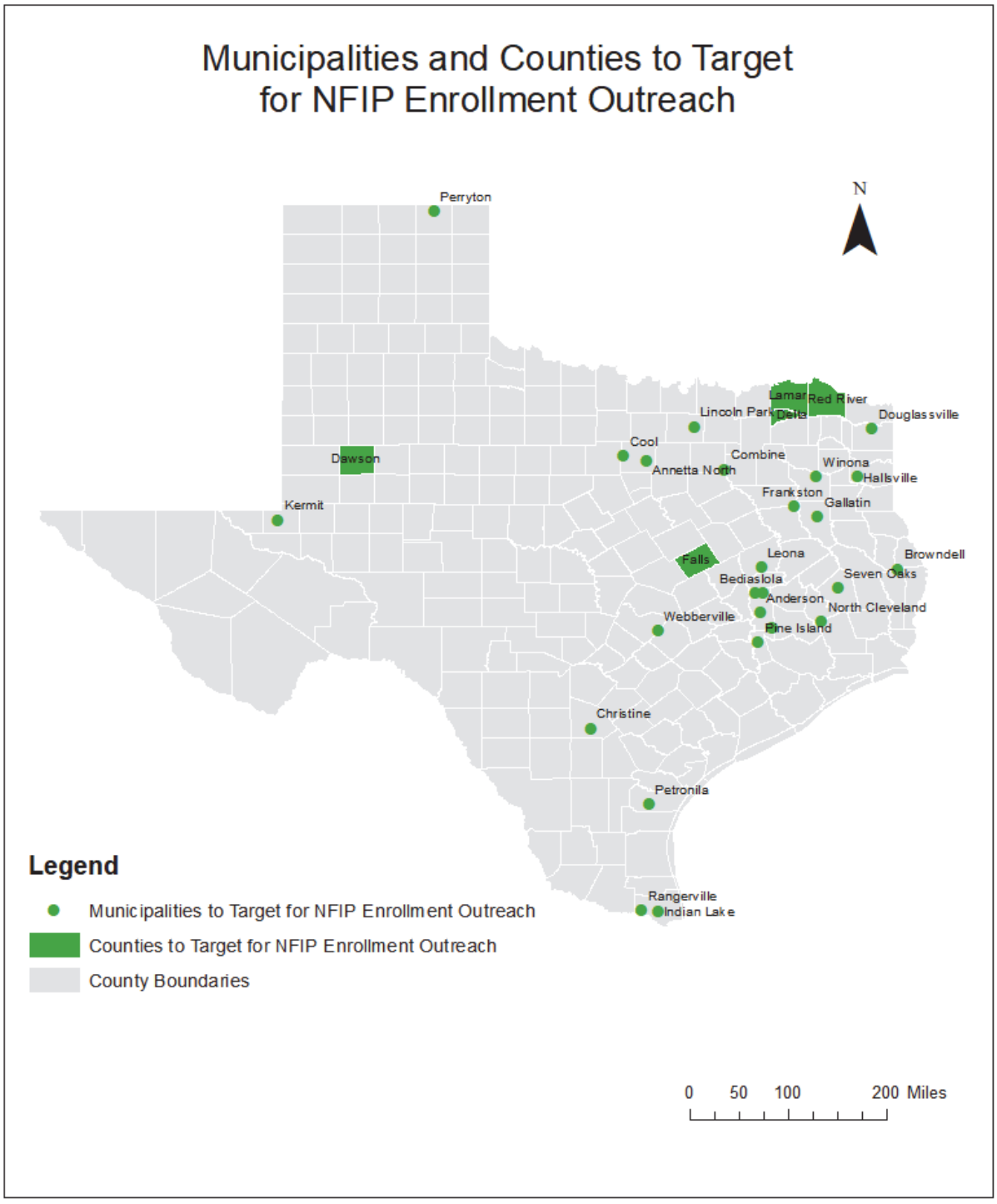
Municipalities and Counties to Target for NFIP Enrollment Outreach
N
Perryton
Lamar
Red River
Delta
Lincoln Park
Douglassville
Cool
Dawson
Combine
Annetta North
Winona
Hallsville
Frankston
Gallatin
Kermit
Falls
Leona
Browndell
Bedias
Iola
Seven Oaks
Anderson
North Cleveland
Webberville
Pine Island
Christine
Petronila
Rangerville
Indian Lake
Legend
Municipalities to Target for NFIP Enrollment Outreach
Counties to Target for NFIP Enrollment Outreach
County Boundaries
0
50
100
200 Miles

Figure 5.1

Another limitation of this study related to data availability is that the flood experience variable (number of disaster declarations) is aggregated to the county level. This is a limitation for the municipalities in this study because it is possible that the part of the county that was flooded in an event severe enough to receive a federal disaster declaration was not within the limits of the municipality. Lastly, the flood susceptibility variable could only be measured for those communities with digital floodplain maps (48.9%).

If NFIP-enrollment outreach efforts are focused towards the communities identified in this study, future research could examine in which communities outreach efforts were successful. It would be of interest to see if the communities with the highest scores in this study were the communities that agreed to join the program, or if not, whether other factors influenced a community's decision to join the NFIP. Future researchers could also consider gathering the same data collected in this study for all participating communities in Texas. With this information, researchers could draw comparisons between participating and non-participating communities in Texas.

This research described non-participating NFIP communities and selected the best 25 communities to target for NFIP enrollment outreach. NFIP participation protects local economies and local citizens from the financial strain of recovering from flood events and increasing NFIP participation in Texas, the underlying goal of this study, will create a more resilient Texas.

References

44 CFR § 59.1

44 CFR § 60.3

Brody, S.D.; Kang, J.E.; & Bernhardt, S. (2010) Identifying factors influencing flood mitigation at the local level in Texas and Florida: the role of organizational capacity, *Natural Hazards,* 52(1), pp. 167-184.

Brody, S. D.; Zahran, S.; Highfield,W. E.; Bernhard, S. P.; & Vedlitz, A. (2009) Policy Learning for Flood Mitigation: A Longitudinal Assessment of the Community Rating System in Florida. *Risk Analysis*. 29(6), pp. 912-929.

Buchele, M. (2013) Many Texas Communities Follow 'Minimum Standards' Or Less When Regulating Floodplains. *State Impact*. Retrieved from: https://stateimpact.npr.org/texas/2013/11/12/in-regulating-floodplains-many-texas-communities-follow-minimum-standards-or-less/

Burby, R. J. & May, P. J. (1998) Intergovernmental Environmental Planning: Addressing the Commitment Conundrum. *Journal of Environmental Planning & Management*. 41(1), pp. 95-111.

Consoer, M. & Milman, A. (2018) Opportunities, constraints, and choices for flood mitigation in rural areas: perspectives of municipalities in Massachusetts. *Journal of Flood Risk Management*. 11(2), pp. 141-151.

Crenson, M. A. (1971) *The Un-Politics of Air Pollution: A Study of Non-Decisionmaking in the Cities*. Baltimore: Johns Hopkins Press.

Dulock, H. L. (1993) Research Design: Descriptive Research. *Journal of Pediatric Oncology Nursing*. 10(4): 154-157.

Federal Emergency Management Agency (FEMA). (2005) *National Flood Insurance Program (NFIP) Floodplain Management Requirements: A Study Guide and Desk Reference for Local Officials (FEMA 480).* Washington, DC: US Government Printing Office.

Federal Emergency Management Agency (FEMA). (2011) *National Flood Insurance Program (NFIP) Community Enrollment and Eligibility Handbook (FEMA 553).* Washington, DC: US Government Printing Office.

Federal Emergency Management Agency (FEMA). (2019) *Community Information System*

Federal Emergency Management Agency, "*Disaster Declarations by State/Tribal Government*," Retrieved from: https://www.fema.gov/disasters/state-tribal-government

Goddard, J.E., Hand, I., Hertzler, R.A., Krutilla, J.V., Langbein, W.B., Schussheim, MJ., Steele, H.A., and White, G.F. (1966) *A Unified National Program for Managing Flood Losses, (A Report by the Task Force on Federal Flood Control Policy),* U.S. Government Printing Office, Washington, DC.

Hawley, A. H. (1963) Community Power and Urban Renewal Success. *American Journal of Sociology.* 68(4), 422-431.

Horn, D. P & Brown, J. T. (2018) *Introduction to the National Flood Insurance Program (NFIP)* (7-5700, R44593). Congressional Research Service

House File 759 (2009) 83rd Iowa Congress

Jones, S. A. (2018, October 10) 18 months after 2017 flood, FEMA says some who got assistance may be ineligible. *Ozark County Times*. Retrieved from http://www.ozarkcountytimes.com/news-local-news/18-months-after-2017-flood-fema-says-some-who-got-assistance-may-be-ineligible

Luloff, A. E. & Wilkinson, K. P. (1979). Participation in the National Flood Insurance Program: A Study of Community Activeness. *Rural Sociology*, 44(1), pp. 137-152

Marsalek, J., Watt, W. E., Zeman, E., & Sieker, F. (2000). *Flood Issues in Contemporary Water Management* (Vol. 71, NATO Science Series). Kluwer Academic.

Mittler, E., Morgan, L., Shapiro, M., & Grill, K.Y., (2006) *State roles and responsibilities in the National Flood Insurance Program,* American Institutes for Research, Washington, D.C.

Moore, D. E. & Cantrell, R. I. (1976*)* Community Response to External Demands: An Analysis of Participation in the Federal Flood Insurance Program*. Rural Sociology*, 41(4), pp. 484-508

Petak, W. J. & Atkisson, A. A. (1982) *Natural hazard risk assessment and public policy: anticipating the unexpected.* New York: Springer-Verlag.

Posey, J. (2009) The determinants of vulnerability and adaptive capacity at the municipal level: Evidence from floodplain management programs in the United States. *Global Environmental Change*. 19(4), pp. 482-493.

Shao, W. & Xian, S. (2017) After Harvey, many Texans will think differently about hurricane risks. *The Conversation*. Retrieved from: https://theconversation.com/after-harvey-many-texans-will-think-differently-about-hurricane-risks-83262

Shields, P. & Rangarajan, N. (2013) *A Playbook for Research Methods: Integrating Conceptual Frameworks and Project Management*. Stillwater, OK: New Forums Press.

Texas Floodplain Management Association (TFMA). (2006) *WHITE PAPER: FLOODPLAIN MANAGEMENT IN TEXAS.*

Texas Water Development Board (TWDB). (2019) *State Flood Assessment: Report to the*

86th Texas Legislature. Austin, Tx

Texas Water Development Board (TWDB). (2015) *Quick Guide: Floodplain Management in Texas.* Austin, Tx

United States Census Bureau. (2010) *2010 Census: Population of Texas Cities, Arranged in Descending Order.* Retrieved from: https://www.tsl.texas.gov/ref/abouttx/popcity32010.html

Zwald, M.; Eyler, A.; Goins, K. V.; & Lemon, S. C. (2016) Multilevel Analysis of Municipal Officials' Participation in Land Use Policies Supportive of Active Living: City and Individual Factors. *American Journal of Health Promotion*. 30(4), pp. 287-290.

Appendix 1

Data for Non-Participating Municipalities

Municipality Name	County Located In	No. Disaster Declarations since 1953	Urban or Rural	Status: Not-Participating (N), Suspended (S), or Withdrawn (W)	Map Status: Digital (D), Paper (P), Never Mapped (N)	Total Flood-plain Area (in square miles) Or Un-known (U)	Population	Score
RANGERVILLE, TOWN OF	CAMERON COUNTY	10	Urban	N	D	2.42	289	2.72
NORTH CLEVELAND, CITY OF	LIBERTY COUNTY	13	Urban	N	D	1.38	277	2.09
COMBINE, CITY OF	KAUFMAN COUNTY	1	Urban	N	D	1.64	2,177	1.60
PINE ISLAND, CITY OF	WALLER COUNTY	8	Urban	N	D	0.94	1,094	1.44
BROWNDELL, TOWN OF	JASPER COUNTY	9	Rural	S	D	0.72	198	1.23
HALLSVILLE, CITY OF	HARRISON COUNTY	7	Rural	N	D	0.29	4,243	1.19
PERRYTON, CITY OF	OCHILTREE COUNTY	2	Rural	N	N	U	8,683	1.08
PETRONILA, CITY OF	NUECES COUNTY	14	Urban	N	P	U	113	1.01
GALLATIN, CITY OF	CHEROKEE COUNTY	5	Rural	N	D	0.73	435	0.96
ANNETTA NORTH, TOWN OF	PARKER COUNTY	7	Urban	N	D	0.49	546	0.93

PROVIDENCE VILLAGE, TOWN OF	DENTON COUNTY	2	Urban	N	D	0.00	7,127	0.90
TODD MISSION, CITY OF	GRIMES COUNTY	9	Rural	N	D	0.30	116	0.87
SEVEN OAKS, CITY OF	POLK COUNTY	10	Rural	N	D	0.20	124	0.87
INDIAN LAKE, TOWN OF	CAMERON COUNTY	10	Urban	S	D	0.03	828	0.81
FRANKSTON, CITY OF	ANDERSON COUNTY	7	Rural	W	D	0.23	1,189	0.78
BEDIAS, CITY OF	GRIMES COUNTY	9	Rural	N	D	0.05	466	0.71
WEBBERVILLE, VILLAGE OF	TRAVIS COUNTY	8	Urban	N	D	0.14	448	0.70
KERMIT, CITY OF	WINKLER COUNTY	1	Rural	N	P	U	6,072	0.70
CHRISTINE, CITY OF	ATASCOSA COUNTY	5	Urban	N	D	0.40	415	0.69
COOL, TOWN OF	PARKER COUNTY	7	Urban	N	D	0.24	180	0.68
IOLA, CITY OF	GRIMES COUNTY	9	Rural	N	D	0.00	424	0.66
WINONA, CITY OF	SMITH COUNTY	6	Urban	N	D	0.25	601	0.66
LEONA, CITY OF	LEON COUNTY	6	Rural	N	D	0.30	181	0.65
ANDERSON, CITY OF	GRIMES COUNTY	9	Rural	N	D	0.00	232	0.64
DOUGLASSVILLE, TOWN OF	CASS COUNTY	6	Rural	N	D	0.26	223	0.62
WHITESBORO, CITY OF	GRAYSON COUNTY	2	Urban	N	D	0.08	4,008	0.60
INDUSTRY, CITY OF	AUSTIN COUNTY	8	Urban	N	D	0.03	326	0.60
NEW CHAPEL HILL, CITY OF	SMITH COUNTY	6	Urban	N	D	0.16	627	0.59
LATEXO, CITY OF	HOUSTON COUNTY	8	Rural	N	D	0.01	315	0.58

SCOTTSVILLE, CITY OF	HARRISON COUNTY	7	Rural	N	D	0.09	366	0.58
NORDHEIM, CITY OF	DEWITT COUNTY	8	Rural	N	D	0.00	307	0.57
AVINGER, TOWN OF	CASS COUNTY	6	Rural	N	D	0.17	429	0.57
RIESEL, CITY OF	MCLENNAN COUNTY	3	Urban	N	D	0.31	1,024	0.53
GARRISON, CITY OF	NACOGDOCHES COUNTY	6	Rural	N	D	0.04	878	0.52
ARP, CITY OF	SMITH COUNTY	6	Urban	N	D	0.01	1,004	0.51
RETREAT, CITY OF	NAVARRO COUNTY	3	Rural	N	D	0.37	379	0.50
CROSS PLAINS, TOWN OF	CALLAHAN COUNTY	6	Urban	N	P	U	983	0.50
ALMA, TOWN OF	ELLIS COUNTY	1	Urban	N	D	0.52	378	0.47
GOODLOW, CITY OF	NAVARRO COUNTY	3	Rural	N	D	0.36	196	0.47
BIG SANDY, TOWN OF	UPSHUR COUNTY	5	Urban	N	D	0.01	1,384	0.47
LAKEPORT, CITY OF	GREGG COUNTY	5	Urban	N	D	0.05	984	0.46
CUSHING, TOWN OF	NACOGDOCHES COUNTY	6	Rural	N	D	0.00	612	0.45
CHIRENO, CITY OF	NACOGDOCHES COUNTY	6	Rural	N	D	0.03	388	0.45
RED LICK, CITY OF	BOWIE COUNTY	4	Urban	N	D	0.09	1,016	0.42
DE KALB, CITY OF	BOWIE COUNTY	4	Urban	N	D	0.00	1,,630	0.42
HALLSBURG, CITY OF	MCLENNAN COUNTY	3	Urban	N	D	0.25	467	0.42
MARIETTA, TOWN OF	CASS COUNTY	6	Rural	N	D	0.02	130	0.42

EAST MOUNTAIN, CITY OF	UPSHUR COUNTY	5	Urban	N	D	0.01	824	0.41
BURKE, CITY OF	ANGELINA COUNTY	5	Rural	N	D	0.02	734	0.40
CUNEY, CITY OF	CHEROKEE COUNTY	5	Rural	N	D	0.10	140	0.40
PUTNAM, TOWN OF	CALLAHAN COUNTY	6	Urban	N	P	U	95	0.39
BELLS, TOWN OF	GRAYSON COUNTY	2	Urban	N	D	0.17	1,488	0.38
COOPER, CITY OF	DELTA COUNTY	3	Rural	N	N	U	1,968	0.38
EAST TAWAKONI, CITY OF	RAINS COUNTY	3	Rural	N	D	0.13	937	0.37
THORNDALE, CITY OF	MILAM COUNTY	5	Rural	N	P	U	508	0.36
UNION GROVE, CITY OF	UPSHUR COUNTY	5	Urban	N	D	0.01	375	0.36
ANGUS, CITY OF	NAVARRO COUNTY	3	Rural	N	D	0.19	417	0.35
KURTEN, TOWN OF	BRAZOS COUNTY	5	Urban	N	D	0.00	403	0.35
SANTA ANNA, TOWN OF	COLEMAN COUNTY	4	Rural	N	P	U	1,044	0.35
PENELOPE, TOWN OF	HILL COUNTY	4	Rural	N	D	0.11	202	0.34
LUEDERS, CITY OF	JONES COUNTY	5	Urban	N	D	0.00	332	0.34
ANNONA, TOWN OF	RED RIVER COUNTY	5	Rural	N	P	U	295	0.34
CARBON, TOWN OF	EASTLAND COUNTY	5	Rural	N	N	U	271	0.34
OAK VALLEY, CITY OF	NAVARRO COUNTY	3	Rural	N	D	0.17	382	0.34
COVINGTON, CITY OF	HILL COUNTY	4	Rural	N	D	0.09	272	0.33

JARRELL, CITY OF	WILLIAMSON COUNTY	3	Urban	N	D	0.00	1,541	0.33
NEWARK, CITY OF	WISE COUNTY	3	Urban	N	D	0.04	1,161	0.32
ALVORD, CITY OF	WISE COUNTY	3	Urban	N	D	0.00	1,462	0.32
EDGEWOOD, CITY OF	VAN ZANDT COUNTY	2	Rural	N	D	0.08	1,486	0.32
EDOM, CITY OF	VAN ZANDT COUNTY	2	Rural	N	D	0.23	391	0.31
ROSEBUD, CITY OF	FALLS COUNTY	3	Urban	N	P	U	1,376	0.31
AQUILLA, CITY OF	HILL COUNTY	4	Rural	N	D	0.08	110	0.30
CARL'S CORNER, CITY OF (need to run GIS)	HILL COUNTY	4	Rural	N	D	0.06	182	0.30
DODD CITY, CITY OF	FANNIN COUNTY	4	Rural	N	D	0.03	377	0.30
GOLDTHWAITHE, CITY OF	MILLS COUNTY	2	Rural	N	N	U	1,861	0.29
EUREKA, CITY OF	NAVARRO COUNTY	3	Rural	N	D	0.12	295	0.29
GORDON, CITY OF	PALO PINTO COUNTY	4	Rural	N	D	0.00	478	0.28
GUSTINE, TOWN OF	COMANCHE COUNTY	4	Rural	N	N	U	457	0.28
EVANT, CITY OF	CORYELL COUNTY	4	Urban	N	D	0.00	402	0.28
SOUTH MOUNTAIN, CITY OF	CORYELL COUNTY	4	Urban	N	D	0.01	361	0.28
VALLEY VIEW, CITY OF	COOKE COUNTY	1	Rural	N	D	0.23	792	0.28
ABBOTT, CITY OF	HILL COUNTY	4	Rural	N	D	0.01	363	0.27

MORGAN, CITY OF	BOSQUE COUNTY	4	Rural	N	D	0.01	347	0.27
MOORE STATION, CITY OF	HENDERSON COUNTY	4	Rural	N	D	0.02	203	0.27
LOCKNEY, CITY OF	FLOYD COUNTY	2	Rural	N	P	U	1,669	0.27
RICHLAND SPRINGS, CITY OF	SAN SABA COUNTY	4	Rural	N	P	U	310	0.26
RAVENNA, CITY OF	FANNIN COUNTY	4	Rural	N	D	0.00	216	0.25
THORNTON, TOWN OF	LIMESTONE COUNTY	3	Rural	N	D	0.05	528	0.25
BYNUM,CITY OF	HILL COUNTY	4	Rural	N	D	0.00	201	0.25
PECAN GAP, CITY OF	FANNIN COUNTY	4	Rural	N	P	U	201	0.25
ROUND MOUNTAIN, TOWN OF	BLANCO COUNTY	4	Rural	N	P	U	176	0.25
BECKVILLE, CITY OF	PANOLA COUNTY	3	Rural	N	N	U	826	0.25
NOVICE, CITY OF	COLEMAN COUNTY	4	Rural	N	P	U	132	0.24
HALE CENTER, CITY OF	HALE COUNTY	1	Rural	N	D	0.00	2,099	0.24
ROSSER, CITY OF	KAUFMAN COUNTY	1	Urban	N	D	0.24	375	0.24
LOTT, CITY OF	FALLS COUNTY	3	Urban	N	P	U	745	0.24
STRATFORD, CITY OF	SHERMAN COUNTY	1	Rural	N	N	U	2,077	0.24
TOCO, CITY OF	LAMAR COUNTY	4	Rural	N	D	0.00	74	0.24
SUN VALLEY, CITY OF	LAMAR COUNTY	4	Rural	N	D	0.00	70	0.24
BIG WELLS, CITY OF	DIMMIT COUNTY	3	Rural	N	N	U	720	0.23

NAVARRO, CITY OF	NAVARRO COUNTY	3	Rural	N	D	0.07	209	0.23
MUNDAY, CITY OF	KNOX COUNTY	2	Rural	N	N	U	1,289	0.22
GOLINDA, CITY OF	MCLENNAN COUNTY	3	Urban	N	D	0.00	577	0.22
NEVADA, CITY OF	COLLIN COUNTY	2	Urban	N	D	0.01	1,,148	0.22
HEBRON, CITY OF	DENTON COUNTY	2	Urban	S	D	0.11	417	0.21
IMPACT, TOWN OF	TAYLOR COUNTY	3	Urban	N	D	0.07	30	0.21
LAWN, TOWN OF	TAYLOR COUNTY	3	Urban	N	D	0.02	320	0.21
STINNETT, CITY OF	HUTCHINSON COUNTY	1	Rural	N	N	U	1,813	0.21
O'DONNELL, CITY OF	DAWSON COUNTY	2	Rural	N	D	0.04	824	0.21
BOVINA, CITY OF	PARMER COUNTY	1	Rural	N	N	U	1,807	0.21
TOM BEAN, CITY OF	GRAYSON COUNTY	2	Urban	N	D	0.00	1,076	0.20
MUSTANG, TOWN OF	NAVARRO COUNTY	3	Rural	N	D	0.05	23	0.20
ROCHESTER, TOWN OF	HASKELL COUNTY	3	Rural	N	N	U	314	0.19
BLACKWELL, TOWN OF	NOLAN COUNTY	3	Rural	N	P	U	311	0.19
COUPLAND, CITY OF	WILLIAMSON COUNTY	3	Urban	N	P	U	309	0.19
GARY, TOWN OF	PANOLA COUNTY	3	Rural	N	P	U	303	0.19
TEHUACANA, TOWN OF	LIMESTONE COUNTY	3	Rural	N	D	0.00	282	0.18
SUDAN, CITY OF	LAMB COUNTY	2	Rural	N	N	U	912	0.18
STREETMAN, CITY OF	NAVARRO COUNTY	3	Rural	N	P	U	243	0.18
LOMETA, CITY OF	LAMPASAS COUNTY	2	Urban	N	N	U	843	0.17

WEINERT, CITY OF	HASKELL COUNTY	3	Rural	N	N	U	168	0.17
EMHOUSE, TOWN OF	NAVARRO COUNTY	3	Rural	N	D	0.00	140	0.17
KIRVIN, TOWN OF	FREESTONE COUNTY	3	Rural	N	N	U	129	0.17
WOLFE CITY, CITY OF	HUNT COUNTY	1	Urban	N	D	0.00	1,442	0.17
WINFIELD, CITY OF	TITUS COUNTY	2	Rural	N	D	0.03	532	0.16
OAK GROVE, TOWN OF	KAUFMAN COUNTY	1	Urban	N	D	0.11	638	0.16
TALCO, CITY OF	TITUS COUNTY	2	Rural	N	D	0.03	507	0.16
AMHERST, CITY OF	LAMB COUNTY	2	Rural	N	P	U	682	0.15
ROBY, CITY OF	FISHER COUNTY	2	Rural	N	P	U	626	0.15
MATADOR, CITY OF	MOTLEY COUNTY	2	Rural	N	P	U	622	0.15
MEADOW, TOWN OF	TERRY COUNTY	2	Rural	N	P	U	586	0.14
CAMPBELL, TOWN OF	HUNT COUNTY	1	Urban	N	D	0.09	606	0.14
SADLER, CITY OF	GRAYSON COUNTY	2	Urban	N	D	0.03	368	0.14
CASHION, CITY OF	WICHITA COUNTY	2	Urban	N	D	0.03	350	0.14
LINCOLN PARK, CITY OF	DENTON COUNTY	2	Urban	N	D	0.00	521	0.13
CLAUDE, CITY OF	ARMSTRONG COUNTY	1	Urban	N	P	U	1,187	0.13
KNOLLWOOD, CITY OF	GRAYSON COUNTY	2	Urban	N	D	0.00	489	0.13
PETERSBURG, CITY OF	HALE COUNTY	1	Rural	N	D	0.00	1,137	0.13

DORCHESTER, TOWN OF	GRAYSON COUNTY	2	Urban	N	D	0.04	93	0.12
LONE OAK, CITY OF	HUNT COUNTY	1	Urban	N	D	0.05	645	0.12
WINK, CITY OF	WINKLER COUNTY	1	Rural	N	P	U	1,006	0.11
MORAN, CITY OF	SHACKELFORD COUNTY	2	Rural	N	N	U	265	0.10
VEGA, CITY OF	OLDHAM COUNTY	1	Urban	N	N	U	923	0.10
BENJAMIN, CITY OF	KNOX COUNTY	2	Rural	N	P	U	256	0.10
ACKERLY, CITY OF	DAWSON COUNTY	2	Rural	N	N	U	227	0.10
GARRETT, CITY OF	ELLIS COUNTY	1	Urban	N	D	0.01	847	0.10
WELLMAN, CITY OF	TERRY COUNTY	2	Rural	N	P	U	206	0.10
GOREE, CITY OF	KNOX COUNTY	2	Rural	N	N	U	203	0.10
MOBILE CITY, CITY OF	ROCKWALL COUNTY	2	Urban	N	D	0.00	203	0.10
ASPERMONT, TOWN OF	STONEWALL COUNTY	1	Rural	N	P	U	855	0.10
MULLIN, CITY OF	MILLS COUNTY	2	Rural	N	P	U	178	0.09
RANKIN, CITY OF	UPTON COUNTY	1	Rural	N	P	U	844	0.09
MELVIN, TOWN OF	MCCULLOCH COUNTY	2	Rural	N	P	U	168	0.09
DODSON, TOWN OF	COLLINGSWORTH COUNTY	2	Rural	N	N	U	108	0.09
MCLEAN, CITY OF	GRAY COUNTY	1	Rural	N	D	0.00	771	0.09
CORRAL CITY, TOWN OF	DENTON COUNTY	2	Urban	N	D	0.00	45	0.08
CHILLICOTHE, CITY OF	HARDEMAN COUNTY	1	Rural	N	P	U	686	0.08

SILVERTON, CITY OF	BRISCOE COUNTY	1	Rural	N	N	U	680	0.08
MIAMI, CITY OF	ROBERTS COUNTY	1	Rural	N	N	U	602	0.07
LORAINE, TOWN OF	MITCHELL COUNTY	1	Rural	N	P	U	582	0.06
POST OAK BEND, CITY OF	KAUFMAN COUNTY	1	Urban	N	D	0.00	541	0.06
THORNTONVILLE, CITY OF	WARD COUNTY	1	Rural	N	P	U	528	0.06
WICKETT, CITY OF	WARD COUNTY	1	Rural	S	P	U	524	0.06
SMYER, TOWN OF	HOCKLEY COUNTY	1	Rural	N	P	U	477	0.05
FOLLETT, CITY OF	LIPSCOMB COUNTY	1	Rural	N	N	U	466	0.05
SKELLYTOWN, TOWN OF	CARSON COUNTY	1	Urban	N	N	U	458	0.05
ROPESVILLE, CITY OF	HOCKLEY COUNTY	1	Rural	N	N	U	428	0.05
GRAYS PRAIRIE, CITY OF	KAUFMAN COUNTY	1	Urban	N	D	0.01	347	0.04
WINDTHORST, CITY OF	CLAY COUNTY	1	Urban	N	N	U	389	0.04
QUITAQUE, CITY OF	BRISCOE COUNTY	1	Rural	N	P	U	382	0.04
BARSTOW, CITY OF	WARD COUNTY	1	Rural	N	P	U	370	0.04
CHANNING, CITY OF	HARTLEY COUNTY	1	Rural	N	N	U	348	0.04
BELLEVUE, CITY OF	CLAY COUNTY	1	Urban	N	N	U	347	0.04
TEXHOMA, TOWN OF	SHERMAN COUNTY	1	Rural	N	D	0.00	336	0.04
NAZARETH, CITY OF	CASTRO COUNTY	1	Rural	N	P	U	304	0.03

HEDLEY, CITY OF	DONLEY COUNTY	1	Rural	N	N	U	297	0.03
PAINT ROCK, TOWN OF	CONCHO COUNTY	1	Rural	N	P	U	293	0.03
DICKENS, CITY OF	DICKENS COUNTY	1	Rural	N	P	U	257	0.03
WESTBROOK, CITY OF	MITCHELL COUNTY	1	Rural	N	P	U	249	0.03
ADRIAN, CITY OF	OLDHAM COUNTY	1	Urban	N	P	U	171	0.02
SANFORD, TOWN OF	HUTCHINSON COUNTY	1	Rural	N	P	U	159	0.02
NEYLANDVILLE, TOWN OF	HUNT COUNTY	1	Urban	N	D	0.01	93	0.02
ESTELLINE, CITY OF	HALL COUNTY	1	Rural	N	P	U	133	0.01
VALENTINE, TOWN OF	JEFF DAVIS COUNTY	1	Rural	S	P	U	127	0.01
PYOTE, TOWN OF	WARD COUNTY	1	Rural	N	P	U	122	0.01
EDMONSON, CITY OF	HALE COUNTY	1	Rural	N	D	0.00	105	0.01
MOBEETIE, CITY OF	WHEELER COUNTY	1	Rural	N	P	U	102	0.01
LAKEVIEW, TOWN OF	HALL COUNTY	1	Rural	N	P	U	99	0.01

Appendix 2

Data for Non-Participating Counties

County Name	No. Disaster Declarations since 1953	Urban or Rural	Status: Not-Participating (N), Suspended (S), or Withdrawn (W)	Map Status: Digital (D), Paper (P), Never Mapped (N)	Total Flood-plain Area (in square miles) Or Un-known (U)	Population	
LAMAR COUNTY	4	Rural	N	D	172	49,587	3.75
RED RIVER COUNTY	5	Rural	N	N	172.00	12,229	1.23
FALLS COUNTY	3	Urban	N	N	U	17,437	0.84
DAWSON COUNTY	2	Rural	N	D	U	12,813	0.78
DELTA COUNTY	3	Rural	N	N	25.00	5,298	0.59
EDWARDS COUNTY	3	Rural	N	P	U	1,953	0.52
CAMP COUNTY	2	Rural	N	N	U	12,855	0.49
OCHILTREE COUNTY	2	Rural	N	N	U	10,073	0.44
MOORE COUNTY	1	Rural	N	N	U	22,097	0.43
HUTCHINSON COUNTY	1	Rural	N	P	U	21,375	0.42
HAMILTON COUNTY	2	Rural	N	N	U	8,422	0.40
MCCULLOCH COUNTY	2	Rural	N	N	U	7,957	0.39

DEAF SMITH COUNTY	1	Rural	N	N	U	18,836	0.37
LYNN COUNTY	2	Urban	N	N	U	5,859	0.35
ANDREWS COUNTY	1	Rural	N	N	U	17,722	0.35
SCURRY COUNTY	1	Rural	N	P	U	17,050	0.33
FISHER COUNTY	2	Rural	N	N	U	3,880	0.31
KNOX COUNTY	2	Rural	N	N	U	3,710	0.31
PECOS COUNTY	1	Rural	N	N	U	15,634	0.30
REEVES COUNTY	1	Rural	N	N	U	15,281	0.29
COTTLE COUNTY	2	Rural	N	N	U	1,387	0.26
YOAKUM COUNTY	1	Rural	N	N	U	8,568	0.16
WINKLER COUNTY	1	Rural	N	N	U	7,574	0.14
DALLAM COUNTY	1	Rural	N	N	U	7,208	0.13
CARSON COUNTY	1	Urban	N	N	U	6,032	0.10
HARTLEY COUNTY	1	Rural	N	N	U	5,691	0.10
WHEELER COUNTY	1	Rural	N	N	U	5,358	0.09
HEMPHILL COUNTY	1	Rural	N	N	U	4,024	0.06
HARDEMAN COUNTY	1	Rural	N	N	U	3,994	0.06
LIPSCOMB COUNTY	1	Rural	N	N	U	3,378	0.05
DONLEY COUNTY	1	Rural	N	N	U	3,311	0.05

SHERMAN COUNTY	1	Rural	N	N	U	3,067	0.04
ARMSTRONG COUNTY	1	Urban	N	N	U	1,879	0.02
BRISCOE COUNTY	1	Rural	N	N	U	1,528	0.01
ROBERTS COUNTY	1	Rural	N	N	U	938	0.00