

ADDRESSING SOCIAL ELEMENTS OF WILDFIRE: RISK, RESPONSE,  
AND RECOVERY IN HIGHLAND VILLAGE, TX

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Representatives of the City of Highland Village expressed concern over the risk of wildfires for their community. Anthropology provides many tools for and examples of disaster assessment of preparedness, response, recovery, and mitigation. These tools combined with Geographic Information Systems (GIS) can provide a holistic, cultural ecological look at how such a disaster may take place in the city.

The project's methods included a detailed survey of preparedness steps which was analyzed using SPSS and also imported into ArcGIS for spatial analysis, and semi-formal, in-depth interviews with residents of the community regarding preparedness, response, and recovery. Residents fell into a middle category of preparedness, with the majority of participants considering or implementing a few recommended preparedness steps. Interview participants expressed respect for and trust of the city and first-responders, as well as a willingness to volunteer their help during response and recovery stages. Finally, the American Community Survey showed that resident socioeconomic vulnerability was considerably low, and no action needed to be taken to advocate for at-risk individuals.

Overall, the City of Highland Village showed a high resiliency to disaster. A wildfire likely will not have a major impact on the community as a whole, though the city may reduce the impact even further by informing the public of their risk, clearing natural areas of dead brush, sharing preparedness and evacuation information via social media and newsletters, and planning relief stations for those who may have been impacted.

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## BODY OF WORK

### Description of Applied Thesis Project

The project assessed the concepts of vulnerability and resilience of both the residents and administration of the City of Highland Village during wildfire and identified needs suggested by citizens for improvement. Vulnerability can be defined as the potential for damage to an individual's or population's health, life, and resources (Anderson 1995). All individuals have their own vulnerabilities, but some populations face higher risk based on location, socioeconomic status, political environment, or other issues. Resilience is the ability of an individual or community to react to and recover from a disaster; it can be influenced by many different factors such as preparedness, socioeconomic status, and health (Ride and Bretherton, 2011a). This project focused on four primary research questions to assess the city's resilience: Who are the most vulnerable people in the community? How prepared is the community, and how can the city encourage better preparedness? How do the residents plan to respond during a disaster, and what can the city do to provide the best assistance? What impacts can a disaster have on the community and how will it recover?

The study used online surveys and face-to-face interviews in combination with the secondary collection of socioeconomic data from both the American Community Survey and GIS mapping in order to identify patterns in preparedness, response, recovery, and mitigation. I was able to provide the client (The City of Highland Village) with a map showing the most socioeconomically vulnerable locations of the city and an assessment of the populations at risk of wildfire. Results showed that the population overall has a relatively low vulnerability. The populations unevenly impacted by wildfire

within the city were individuals born outside the U.S. and households with five or more occupants, though even their overall vulnerability is still relatively low compared to many other areas in Dallas-Fort Worth. Statistical analysis of the preparedness survey revealed that most individuals have put some thought or effort into preparing themselves for disaster. Therefore, residents may be responsive to efforts to promote preparedness within the community. There were not enough participants to determine any spatial patterns regarding preparedness, though maps of the results were still provided to the client.

Interviews with residents indicated that a wildfire likely will not have a significant impact on the economy or community. The greatest concern regarding wildfires would be the loss of scenic, natural areas. Most participants seemed comfortable with the idea of an evacuation, and all but one noted that they would gladly return to Highland Village regardless of the state of their homes. The majority reported being willing to extend personal help and resources to the people and areas in need. Those interviewed showed trust in and reasonable expectations of city officials and first responders during both response and recovery phases of the disaster.

Results show that, overall, the city has a high resiliency to wildfire and other types of disaster. By implementing some suggestions from residents such as a preparedness program or the development and publication of an evacuation plan, the city can ensure that its population will be minimally impacted by disaster.

## Context of Work

### Defining Disaster

The word disaster evokes many images – a great storm, an explosion, shaking earth, crumbling buildings – but rarely is it defined. Colloquially, the word has been used to describe major events influencing large populations as well as minor issues affecting as few as one person. Academically, the word must be restricted to what is valuable to research and to the world. One option to define disaster is by the specific types that may be studied: natural, slow-onset, technological, and conflict (Kent 1987).

Natural disasters include events caused by natural phenomena such as earthquakes, hurricanes, tornadoes, or floods. Although they may be caused by anthropogenic means, wildfires are typically considered a force of nature and fall into this category. This field has been widely studied across many disciplines in an attempt to mitigate damage and help those who have been impacted. However, despite the amount of research, these disasters are increasing in frequency and in losses. As technology has improved, fatalities and injuries have decreased but dollar losses have continued to rise (Mileti 1999). Before 1975, damages from any natural event within the United States had never exceeded one billion dollars. Twenty-four years later, several had reached the tens of billions (Mileti 1999). Despite the vast body of research, the damages done by natural disasters still call for more understanding and action.

Slow-onset disasters also fall within the spectrum of natural occurrences. These can be described as a slow change in the environment resulting in mandatory changes for the people within. Examples include drought, deforestation, and rising sea levels. It is becoming increasingly clear that climate change is and will continue to be a major



cause of disaster (Oliver-Smith 2013). Therefore, it is important that disaster researchers and policy-makers take both the events and the impending social changes into consideration.

Technological and conflict disasters are both considered man-made.

Technological disasters are generally caused by accidents involving volatile materials such as nuclear meltdowns, facility explosions, and gas or oil leaks. The key factor is that the devastation caused by the technology used is unintentional. Conflict disaster, on the other hand, is intentional. This includes all damages to the environment and to the society caused by acts of war or violence. This type of disaster involves the use of technology to directly deal damage to a community such as bombings, terrorism, and mass shootings, but can also expand to the mental, social, and economic impacts of war on a population.

Many times disasters do not stop with one event. This combination of events, a complex disaster, involves one type of disaster causing another type (Kent 1987). One example is a natural disaster dealing enough damage to a facility to cause a meltdown, explosion, or other type of technological disaster. Another is a natural or technological disaster straining political ties and causing a rebellion or other form of conflict disaster. In the case of North Texas and Highland Village, this could involve a drought increasing the risk of wildfire. This sort of domino effect is not well-studied but can provide valuable information on disaster impacts and social change.

Unfortunately the current body of literature on disaster lacks a fully holistic perspective and requires an expansion of its definition (Dynes 2004). For instance, consider a medical disaster such as the HIV epidemic, which has caused extreme social

debilitation and change. Although this does not fall into the disaster types listed above, valuable perspectives might come from studying this from a perspective of disaster rather than of public health. A better, more comprehensive definition of the word “disaster” would find the common factor in all of the provided types: the way disasters affect people. If a tornado did not touch a single human structure, it would not be considered a disaster. Similarly, a small-category hurricane might be a simple annoyance to a well-off urban city, but catastrophic to a poor, rural village. Therefore, a holistic definition of “disaster” must include two criteria: it stops people from continuing life as they know it, and it emphasizes the current vulnerabilities of a population (Kent 1987).

#### Anthropology and GIS in Disasters

Anthropology frequently looks at vulnerability and power structures in the human condition which have been shown to factor into the social changes caused by disasters, as well as creating policies that will positively impact affected people. Anthropologists also assess behavioral changes such as health, culture, politics, and economics, social changes such as displacement, and the political economic/ecological structures of the society (Oliver-Smith 1996).

As such, this study will take a population-centered, political ecological approach to disasters. *The Journal of Political Ecology* introduces this theoretical framework in its first issue, explaining that it is a necessary melding of political economy and cultural ecology (Greenburg and Park 1994). Political economy has historically focused on how political and economic factors influence a certain society while cultural ecology has

explored exchanges between a society and the environment. Political ecology allows researchers to investigate their own ideas of how culture, politics, economics, and the environment interact within a society (Greenburg and Park 1994). For instance, Donner (2007) chose this theory when assessing statistics of tornadoes using the “POET” method, regarding the Population, Organization, Environment, and Technology of an area or event. Donner approached the “POET” method by analyzing rural and urban communities, deprivation and race, size of the tornado, warning systems, and mobile homes. Results showed that the factors that most impacted the number of deaths and injuries were rural and urban locations, length of tornado’s path, number of mobile homes in the area, and some demographic information. However, while laudable, work within the political-ecology framework is susceptible to a fundamental criticism of scope. Vayda and Walters (1999) accuse many researchers of beginning their research with a prior assumption that the political economy of an area will have the strongest impact thereby focusing less on the physical environment as a factor. Donner, e.g., never elaborates on “the environment” beyond the size of the tornado and its path, though there may be many other factors to consider such as topology, long-term weather events, and local flora. These biases and prior assumptions must be avoided.

Fortunately, when a study involves large amounts of spatial data, it is very difficult to ignore environmental factors. Geographic Information Systems (GIS) provide a way to visually represent data on a map so a researcher may assess both qualitative and quantitative information relative to its location. Historically, this technology has been used for planning, prevention, and decision-making, as it is well known for showing terrain and travel networks. However, this technology has the capability to assess and

display social factors in combination with environmental factors for an accurate representation of the political ecology of an area. This information can be extremely valuable to the disaster network.

Research and response to disasters have conventionally been divided into four areas: preparedness, response, recovery, and mitigation (Fothergill 1996). In all of these stages anthropology can use GIS technology to produce a holistic understanding of disasters. This information can then be used for more effective policy changes or direct assistance.

### Preparedness and Vulnerability

In order to be prepared for a disaster, a community needs to know what will happen to their homes and to their people. In order to educate them, a researcher must understand where their vulnerabilities lie. By locating the vulnerabilities of a community, necessary steps and educational measures may be taken to prepare the community and responders to take action. For example, anthropologists can play a role in famine early warning systems. Some research asserts that early attempts to understand, prevent, and eradicate famine were less effective due to a lack of social research (Torry 1988). An anthropologist's social knowledge in areas such as vulnerability could contribute to a more holistic and accurate prediction of the start of a famine.

There are three types of vulnerabilities: physical vulnerability such as poverty, social vulnerability such as marginalization, and psychological vulnerability such as a feeling of powerlessness (Anderson 1994). This draws ideas from another important concept in anthropology: power. To understand the vulnerabilities of a community, it is

also necessary to understand the power structures within. Specifically, who has the least power? In many societies women fall into all three categories of vulnerability and command little power. Women are often more exposed to risk due to their lower status and poverty, as well as their responsibility for the family (Fothergill 1996). In societies where this is the case, the ratio of female versus male deaths is notably high (Fothergill 1996). Other factors that impact vulnerability include cultural and ethnic background, family structure, type of home, age, disability, and comprehension and literacy of English (Hearn-Morrow 1999).

GIS is able to map relative social vulnerabilities. Costas and Nirupama (2013) assessed the area around a propane plant that exploded in 2008. Using vulnerability information from the Dissemination Areas (a Canadian census unit) within certain blast radii, the authors were able to spatially represent the areas at most risk of damage and difficult recovery. A map such as this could be used prior to a disaster to inform those at risk how to prepare in case of a wildfire and how they might mitigate the potential damage.

This identification of social vulnerabilities can be joined with a similar assessment of physical hazards. Peng et al. (2012) used GIS to display the environmental vulnerability of Changhua City, Taiwan. By assigning risk values to features such as rock strength, landslide potential, vegetation, and flood plains, the authors were able to create a comprehensive map of the environmental risks of the area. This would allow the city to create effective evacuation and relief routes that were not at risk of significant damage. If this data were combined with a map of social vulnerabilities, researchers could pinpoint areas facing high socioeconomic loss and begin efforts to mitigate

damages.

Combining qualitative and quantitative information may provide the most holistic view of vulnerability, and thus the most beneficial analysis and maps. For instance, a researcher could use census data or local knowledge of vulnerability in areas lacking a census to map the most vulnerable areas of a community and overlay a map of the environmental vulnerabilities (Hearn-Morrow 1999). This would identify populations at increased risk and areas that may be greatly impacted by a disaster. Using this information, a researcher or advocate could create programs to inform the populations of their risk and to prepare the community and first responders on the immediate needs of the area.

## Response

Amid his pioneering entry into anthropology's involvement in disaster studies, Oliver-Smith states that "in general, anthropology has added significant breadth and ethnographic solidity to a field that, until recently, focused almost entirely on immediate response and organizational adjustments in first-world contexts" (1996:305). In other words, anthropology has moved into other stages and contexts of disaster, abandoning the previous body of research on immediate response and adjustment. Anthropological sources on the first response to disasters seem to be sparse despite the fact that vulnerabilities and power structures can impact the way residents respond to disaster and authority. Anthropologists can contribute their methods and body of knowledge to improve the way that first responders interact with victims of a disaster.

Bureaucracy is embedded within the international relief network. The main

agents in relief are the host governments, the donor governments, the Inter-Governmental Organizations (IGO, such as the UN), and the Non-Governmental Organizations (NGO). The local chapter of the Red Cross frequently becomes the first to respond while the other organizations must interact to get a proper relief fund set up (Kent 1987). NGOs work closest to the community but tend to have fewer resources and less political power while those with more resources and potential impact tend to be the furthest away (Kent 1987). This power structure leaves those requiring aid as the least powerful. Anthropologists can provide valuable research on the structural limits of the relief network.

Within anthropology, evacuation is a well-researched kind of response. When a debilitating disaster impacts a community, it is not rare for residents to be taken from their homes and placed into a shelter, new community, or refugee camp. Evacuations are often voluntary but in some cases may be forced upon the residents. Tobin and Whiteford (2001) assessed the impact of different evacuation strategies on human health after the eruption of a volcano. They found that those who had been evacuated to and remained in shelters, though having poorer health than a control population, had better health than those who had returned to their homes at the foot of the volcano.

GIS is a key, frequently-used tool during immediate response. A popular tactic of incorporating GIS into response is a decision support system. This is a system that analyzes certain values given by the user and provides maps, graphs, and charts to aid the user in making a decision (Abbas et al. 2009). In one example, authors created a series of sample maps of the most flood-prone areas, road networks, populations, hospitals, and routes between relief camps and headquarters. By inputting specific

information, these detailed maps may be used to decide where and when to provide relief (Abbas et al. 2009). Some academics, however, argue that these support systems are currently inefficient due to technological constraints and lack of user knowledge (Zanger and Smith 2003). In these cases, the more technological uses of GIS may be better set aside for the creation of basic and easy to understand maps. In either case, GIS is still able to provide maps to assist in making the best decisions.

### Recovery and Resilience

After the immediate destruction caused by disaster, communities are often left wondering how they will be able to rebuild or maintain their normal lives. They are often considered to be in need of whatever help can be made available to them.

Anthropologists, however, are not quick to define a disaster-struck community as victims in desperate need of help. Instead, they allow the community to define their own needs and recognize the many problems that may arise when providing assistance. One such problem, the biases of outside relief workers, is illustrated by the 1984-1985 famine of Sudan. During this time, an abundance of relief workers had come from across the world to feed the hungry, but the country's situation failed to improve. Later research showed that the main causes of death had been medical issues – not starvation. The relief workers had traveled to the area with their own biases, determined the community's problems for them, and overshadowed the real issues at hand, preventing them from being addressed properly (de Waal 1989).

This sort of top-down approach has been prevalent throughout the relief network, reflecting inequalities in both vulnerability and power. Oliver-Smith claims that a



“debilitating dependency syndrome” (1996:308) and a “disaster-boom economy” (1996:312) frequently arise as a result of the aid-giving practices. Aid can contribute to war, serve political functions, and cause internal conflict (Macrae 1998). It can also exacerbate and continue the problems it sought to solve. Another famine situation found problems when both the community and responders contributed to a cycle of poverty and hunger. As the local culture traded food in times of surplus, as per the custom, aid workers provided them with less nutritious food that was perceived as higher quality and did not fit the local customs. Aid workers were also found to favor urban areas, women and children were found to suffer most, and cultural values were found to change as a result of the aid (Shipton 1990). These examples do not mean that assistance is unwarranted. Instead, it means that the focus of the aid must be on the indigenously expressed needs of the community.

The anthropological perspective illustrates a resilient community of autonomous individuals who can successfully handle and adapt to disaster with minimal aid from outside sources (Oliver-Smith 1996). Aid workers cannot understand a crisis and define the needs of the community without consulting those who were impacted. Community resilience is not only the ability to recover from a disaster, but the ability to move forward and grow, using lessons from the experience to create something better (Ride and Bretherton 2011a). A healthy and resilient community will be able to repair the damage, assist its residents, and implement steps that will prevent or lessen the impact of another disaster. On the other hand, a community with low resilience may find that the damage will fester and make major negative social, political, and economic impacts on their community. One example of a resilient community is that of the sovereign country

of the Solomon Islands, which has long been prone to cyclones, rain, and flooding. When hit by a tsunami, the community banded together to help others find high ground while designating community leaders to speak with the incoming aid organizations. However, this outgoing nature began to wane as the aid organizations took charge and ignored the community's wishes (Ride and Bretherton 2011b). This resilience must be assessed and understood before organizations give unwanted and unneeded help to a community.

Health is an important element in the resilience of a community (Tobin and Whiteford 2002). Disease and illness may come from several sources: the disaster itself (volcanic ash or infected water), poor living conditions, or mental trauma. For example, a community recently impacted by fire may show an increased incidence of post-traumatic stress disorder (PTSD) and depression (Maida et al. 1989). Mental illness such as this may decrease motivation and productivity in an otherwise resilient community. In another community dealing with famine, a high incidence of HIV/AIDS and hunger had a severe impact on resiliency (Mazzeo 2011). Those who were sick or hungry were unable to work as frequently or as much land as they previously could, leading to a decrease in production, labor, and income. This maintained a cycle of poverty and lack of surplus. In both of these cases, some form of assistance would be needed in the community to fully recover from disaster.

GIS can also be used to study agency in disaster response. A combination of GIS and agent-based modeling can be used to study actions of individuals in real-time. One very basic model observed decision-making, energy, and the spread of information. Agents who heard about food stations would decide whether or not it was worth the

travel or if it was beneficial to tell others. This information was used to determine the best placements of food stations (Crooks and Wise 2013). Of course, a model such as this could be expanded to give individuals more agency, more cognitive behavior, and more social information.

## Mitigation

Mitigation is often practiced after a disaster has taken place to prevent future loss and damage. However, mitigation is and should be considered long before a disaster occurs. For instance, by evaluating vulnerability and altering the structures affecting that vulnerability, a community can be made less at risk of disaster (Oliver-Smith 2013). Unfortunately, social change is difficult and often not of value to policy-makers, so the issues will be challenging to approach (Oliver-Smith 2013). This has become evident in several mitigative strategies and reactions to disaster. The mitigation methods of destroying low-income housing adopted after Hurricane Katrina have evicted the poor from their homes and prevented them from being able to return (Adams et al. 2009). Amid the clean-up, Louisiana Congressman Richard Baker stated “We finally cleaned up public housing in New Orleans. We couldn't do it, but God did” (Quigley 2005 as cited in Adams et al. 2009). This is not the first instance of mistreatment of people during disaster. When presenting fictitious examples of how one can mitigate disaster, Mileti (1999) described a mass exodus of the poor as a prerequisite of creating a disaster-resistant utopia in Miami.

Evicting the poor is not a solution. Removing vulnerable populations from problem areas will only create large pockets of vulnerability elsewhere and risk more

damage. Although anthropologists often debate the value of development, it seems to be the best way to mitigate the social vulnerabilities of a population if done from a similar approach as recovery. Development efforts often lack recognition of current power structures and the role organizations play in those structures or may enter into an area with the preconceived notions that the community is incompetent or needing help (Crewe and Harrison 1998). Taking a bottom-up approach to development and mitigation will prevent both the preconceived notions and the ignorance of power structures. One example deals with the power structures and vulnerabilities of women. A home-building effort after a recent disaster allowed women to exclusively design their new homes. The women and their husbands were made to sign a contract declaring joint ownership of the house, unlike the social norm of the husband owning the property. The women involved reported improved confidence, happiness, and relationships with their husbands and family (Bari 1998). These women became less vulnerable and more resilient in case of another disaster.

While social vulnerability is certainly a major factor, environmental mitigation is also important. When planning any part of a city from new neighborhoods to shopping centers, mitigation should take place at all stages. New and expanding cities should be built to resist disasters, and structures should be maintained to prevent unnecessary damage and loss. Although mitigation strategies should be followed at all times, the post-disaster scenario provides the opportunity to rebuild in a way that can withstand the next disaster. Perhaps the most effective means of mitigating disaster is to simply not rebuild in the most disaster-prone areas (Pidot 2013). Though it is impossible to relocate entire cities, there is value in planning cities around certain danger zones. GIS

has played an important role in land use planning. For instance, a geospatial analysis can clearly locate and display current and historic flood zones, landslide potentials, and areas prone to amplification of earthquakes and liquefaction of ground materials (Giardino et al. 2012). All of these can be used to zone areas and prevent building of structures on unstable or dangerous grounds. Combining this planning with improvement of social vulnerabilities can successfully lessen the impact of any disaster.

To sum, disasters can cause a lot of pain to a lot of people. It is important to understand the impacts of these phenomena on populations and do our best to prevent loss and improve situations. Anthropology and GIS provide strong perspectives to evaluate vulnerability, which has been shown to be a major factor in all stages of a disaster. Anthropologists are well equipped to understand the vulnerabilities and power structures of a society to prepare the community and responders for disaster, and GIS provides the tools to visualize and act on that knowledge. This information can be transferred to the immediate response for the optimal help and evacuation amid the disaster. They acknowledge the agency and knowledge of a community to empower them to recover more fully with minimal help. Finally, they understand the need to improve these vulnerabilities while not changing or ignoring the community's own values. GIS can assist in all of these stages by analyzing and displaying a combination of social and environmental vulnerabilities to assist researchers and policy-makers in their decisions. Furthermore, the use of GIS combined with knowledge, research, and tools from anthropology can create analyses and maps that will be invaluable to the academic and applied disaster community.

This project provides contrasts with both the locations and the demographic

settings of the above research examples which focused heavily on disempowered and socioeconomically disadvantaged populations. 85% of Highland Village's population of almost 18,000 holds a college degree, the average household income is \$159,169, and the average home value is \$277,291. Nonetheless, this research can still be valuable in answering some important academic questions in addition to the value it provides the city. How can we identify and assess the vulnerabilities in populations often assumed to be invulnerable? Are there pockets of vulnerability that exist? For future research, how do populations such as Highland Village compare to disadvantaged populations in areas such as individual preparedness, expectations of disaster response, and methods of recovery? Finally, is there anything we can take from a study such as this that can be applied to and help other, more vulnerable populations be less impacted by disaster?

## Project Design

### Social Vulnerability Mapping

This first stage of research was done to provide a context for the more detailed procedures to follow. With vulnerability being a major anthropological focus in disaster studies, it was important to understand this setting before proceeding with in-depth research. To visualize the vulnerabilities in Highland Village, I created a map in ArcGIS using socioeconomic data obtained from the Census Bureau's 2013 American Community Survey and mapping elements (such as the city boundary) obtained from the client.

Following the recommendations of Hearn-Morrow (1999) and the availability of information from the census, I obtained demographic data including age, nationality,

ethnicity, household size, gender, language, transportation, income, housing type, and disability at the block group level. The populations considered vulnerable and mapped were individuals over age 65, individuals not born in the U.S., minority individuals, households with five or more occupants, households headed by a female (including those living alone), households that speak limited English, households with no vehicle available, families who had an income below the poverty level within the last twelve months, homes that were rented, and households with one or more people with a disability. All of these were mapped individually and also combined into one map. For the purposes of this project, each vulnerability was given an equal weight when calculating overall vulnerability. However, it is understood that the relative importance and strength of these factors will differ depending on the stage, location, and type of disaster. These maps will be presented in the results section of this paper.

On their own, these vulnerability maps provide the client a snapshot of the areas that may need some extra help during a disaster. Using this information, first responders will be able to know where, for instance, greater concentrations of elderly or disabled residents may be during an evacuation. When vulnerability maps are combined with physical hazards such as flood plains or the wildland urban interface, the city can determine where more assistance may be needed. Additionally, this map served as a basis for several other maps for the client as a way to identify patterns between spatial location, vulnerability, and the variable in question.

#### Community Assessment Survey (N=33/17,993)

The second portion of this phase involved a survey of resident preparedness.

This survey was created and shared online using Google Forms and was divided into five sections based on content. The first section of the survey, titled 'Knowledge of Disasters,' assessed what types of disasters a participant felt at risk of as well as his or her ability to be alerted to new and changing events. The second section, 'Preparedness in the Home,' determined the participant's preparedness based on the recommended actions published by FEMA and the Red Cross. The third section, 'Personal Vulnerability,' focused on socioeconomic information to ascertain individual vulnerability as well as to identify social patterns in preparedness. The fourth and fifth sections, 'Community Mapping' and 'Interview Selection' allowed the participants to optionally provide their addresses to be used for spatial analyses or to volunteer to participate in the interview stage of this project. The information gathered from this survey was used in all subsequent stages and included selection of interview participants, statistical analysis, and mapping.

The survey was promoted to the population via the city's website. A short description of the project and link to the survey were posted on the fire department's webpage and Facebook page. This encouraged very few responses, so the methods expanded to distributing business cards to individuals throughout the community, resulting in 33 responses and reflecting the city's demographics. The demographics of the participants break down as follows: 67.6% female, 32.4% male, 94% white, and 54% earning a household income between \$100,000 and \$149,999 with at least one participant in all other income range. The average age of participants is 48 and ranges from 28 to 72. Much of this is in line with the most recent census data for the city, with a median income of \$126,359 a percentage of 90% white ethnicity, and an average age of



41. The percentage of males to females may provide a slight bias toward women, but as the questions mostly address the household, it will likely not have a major impact. Unfortunately, due to low participation, the statistical relevance of the results posed a problem. Assuming a confidence level of 95%, the worst-case margin of error (confidence interval) was around 17.04. Despite this large margin, these results still provide interesting patterns that may need to be looked into further.

#### In-depth Interviews Assessing Resident Risk, Response, and Recovery (N=5)

The second and key anthropological component of data collection involved in-depth interviews with a variety of individuals to develop an overall assessment of the impact a disaster would have on the community and to answer questions brought up by the previous stage and the interests of the client. These interviews were all semi-formal and semi-structured with a template of base questions and the opportunity to ask follow-up or personal questions. All were recorded and transcribed.

The project focused on interviewing community members and aimed to select a sample of five residents of Highland Village. These interviews assessed individual risk and preparedness, evacuation and response strategies, and plans for recovery if impacted by the disaster. Participants were also asked to explain expectations of the city during all stages of disaster and to recommend strategies the city could implement to improve community resilience. If a participant was a resident of a Homeowners Association (HOA), he or she was asked a few additional questions on their HOA and how it may help before, during, and after a disaster.

Participants were able to volunteer for interviews through the survey and were

selected to maintain diversity and to ensure that a variety of opinions and suggestions could be represented. The selection process involved ensuring a reasonably accurate spread of demographic data while also selecting individuals with responses or traits that could contribute a unique perspective to the project. Examples of these unique perspectives included one participant with a disability and another who was renting her home. Unfortunately, despite the range of opinions represented, demographic diversity was restricted by the number of volunteers. For example, at the time of participant selection, no minorities had participated in the survey, and only one male had volunteered to participate. However, participants exhibited a fairly wide range in age, income, and household size.

#### Data Analysis and Preparation of Variables

After data collection was completed, information recovered was analyzed for significant information and patterns. I used SPSS to analyze the survey responses and perform statistical tests such as the Chi<sup>2</sup> test, t-test, and ANOVA test. Responses to some questions were assigned a value on a scale and were averaged together to determine an overall preparedness ranking. This and other preparedness responses were tested against each other and the demographic variables to identify statistically significant correlations. The results of these tests were used to create a series of charts that were presented to the client. This information will allow the city to identify the populations most in need of disaster education and implement programs to promote preparedness.

The participants who volunteered an address to locate in the mapping project

were imported into ArcGIS as points in the map. These points contained all the data from the survey. Each variable was tested and symbolized to identify patterns in location, vulnerability, or vicinity to the wildland urban interface (WUI), A WUI is the interchange between wildland and development and is the area most likely at risk to be damaged by a wildfire.

Interview transcriptions were coded by hand with codes reflecting important research questions and patterns discovered through the data collection process. Main themes included “Knowledge of Wildfires,” “Preparedness,” “Evacuation,” “Expectations,” “Suggestions,” and “Impacts.” Emergent themes were “Nature and Scenery,” “Children,” “Tornadoes,” and “Social Media.” These codes allowed for easy location of information and identification of patterns in the interviews and were used to provide a write-up to the clients. This write-up provided the general assessment of disaster resiliency of the community, a summary of responses, and recommendations to improve the city’s ability to cope with disaster.

### Description of Deliverables and Results

The clients received a full written report analyzing the results of the project as well as supplemental visual information including a book of charts and a book of maps. The report presented a snapshot of the community’s position in the major stages of disaster with a main focus on wildfires as well as provided suggestions for the city to implement to increase resilience. The information was divided into simple categories including awareness of disasters, mitigation, preparedness, response, and recovery and impact.

The study found that individuals in the community were well-informed of any weather-related disasters that may impact them. This is understandable, as the area is constantly threatened by thunderstorms, hail, high winds, tornadoes, and the recent disaster-level flooding throughout the Dallas/Fort Worth metropolitan area. Residents have been conditioned to be aware of tornados, as these present the major disaster risk in the area. One interview participant ranked her vulnerability to disasters exceptionally high (8/10) despite having very low social vulnerability and well-above-average preparedness. She explained that tornados were the cause of her concern: *“I think it’s kind of an all or nothing. I mean, if it comes your way, there’s not much you’re going to be able to do about it. It’s not like you can prepare so that it will miss you, you know. You can’t prepare in that way, you can only prepare for the aftermath and to stay safe.”* Some interview participants used tornados as their frame of reference when discussing disaster scenarios or discussed what they had done during former tornado scares.

While discussed less frequently than weather-related disasters, many participants were aware of technological disasters they may be at risk of including train wrecks, chemical spills, plane crashes, or terrorism. Wildfire, however, was not highly regarded as a threat to the area.

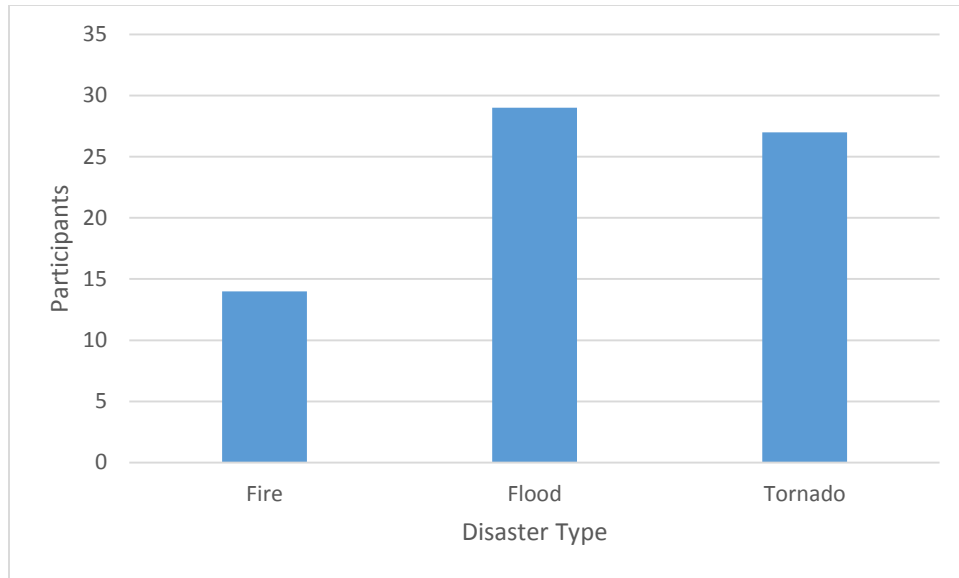


Figure 1: Community assessment of disaster risk

One question in the survey asked participants to free-list the disaster types that may impact them in Highland Village. Figure 1 above shows the frequency of the most common responses, flood and tornado, compared to fire. Most participants used the vague term “fire” without specifying house fire or wildfire. Only one participant listed “wildfire” specifically.

Most interview participants were not aware that wildfire can be a threat to the city. One participant discussed her experience with wildfires, saying “Well, I grew up in California. ...so as far as wildfires, what comes to mind are either fires in the foothills or in the mountains of California. ...I don’t really think of wildfires as in suburban areas just by definition.” This seemed to be a trend, as other participants from areas that experience frequent wildfires such as west Texas expressed similar ideas. On the other hand, the one participant who came from an area which has a comparatively low risk of wildfires, was the only interview participant who mentioned wildfires and their risks before being prompted to do so.

The residents' opinions on wildfires is in direct opposition to the City of Highland Village's concern and needs to be addressed. With residents not understanding their risk of wildfire, they may not be accurately prepared in case it may occur or may not understand their risk or danger during an actual event. Residents who lack the understanding of their risks are more vulnerable to those disasters.

It is important that people be alerted to the risks of wildfires so that they are not caught off-guard. One participant explained that we need to approach disasters, not as an "if" scenario, but a "when." With the recurring drought in North Texas, many dry wildland areas may catch fire and spread to nearby homes. These people need to know that a wildfire could reach them. The City of Highland Village should use their social media presence or the announcements that are sent with the water bill (both of these were mentioned frequently by interview participants) to remind residents that wildfire is a threat and to provide a map of the areas that may be impacted.

Regarding mitigation, there is likely not much the city can do to decrease risk in the area aside from following federal requirements such as flood plain restrictions and maintenance of building codes. The city is very socioeconomically advantaged and has low diversity, so there is not much social advocacy that can be done. There are very few, if any, high-risk individuals in the community. The common vulnerabilities of the area are social, such as those over 65, those with large families, female-headed households, and minorities. While the limitations of these factors will need to be understood in a disaster scenario, the populations do not seem to face any other disadvantages within the community.

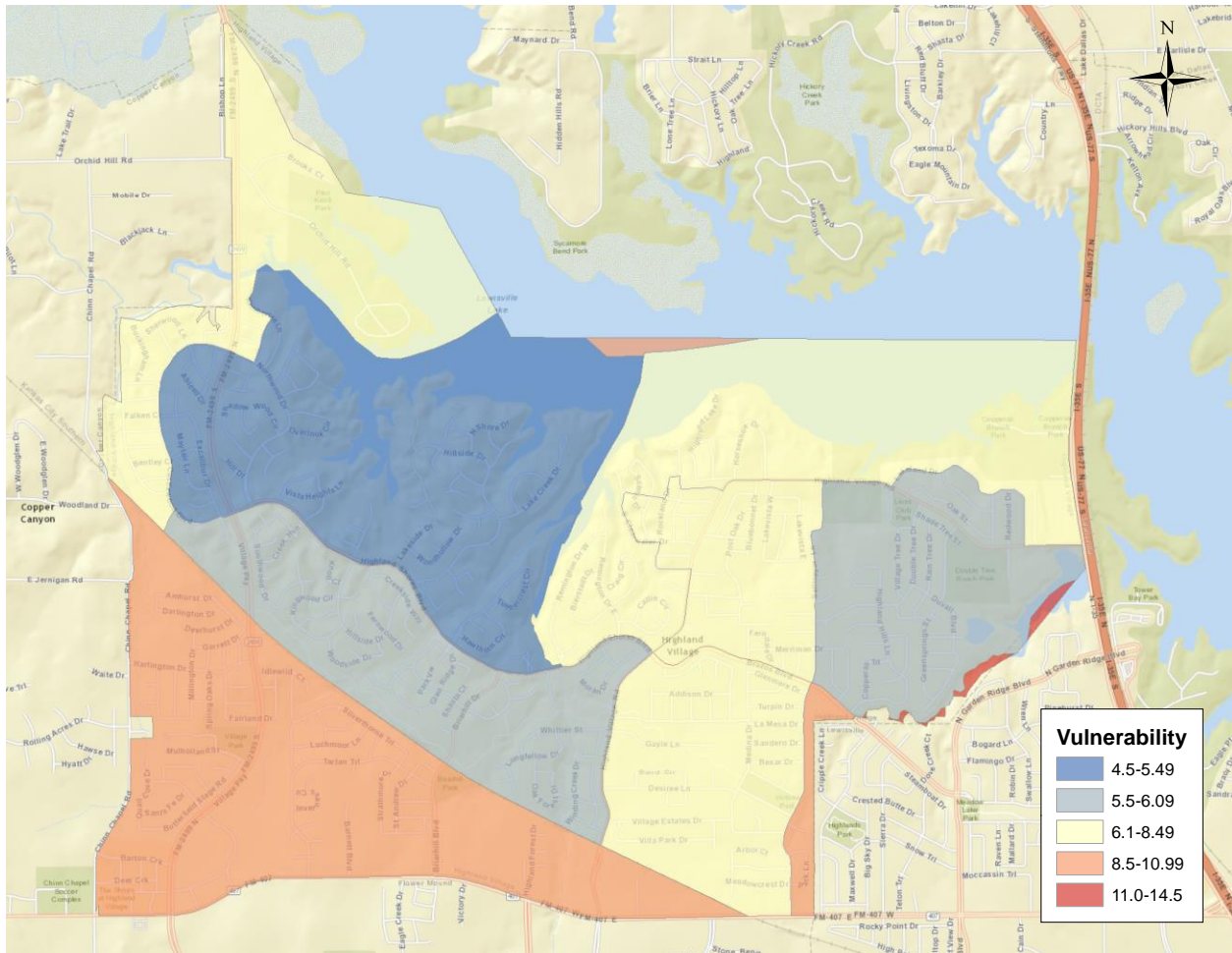


Figure 2: Vulnerability map of Highland Village block groups

Figure 2 above shows the breakdown of overall vulnerability, which was calculated using a combination of census data, in Highland Village by census block group. Three of the four most vulnerable block groups are slivers of larger ones that are mostly in other cities, so it is very possible that the higher vulnerability populations do not live within Highland Village borders. Even so, the most vulnerable block group in the area has a vulnerability of around 14.3 out of a theoretical maximum of 100. A score of 100 would be given to a block group where every individual experienced every tested vulnerability while a score of 0 would be given to a group where no individual expressed any of the vulnerabilities. The city is extremely low on that scale, which is a strong sign

of high resilience. I presented this map to the client, as well as a similar breakdown of each factor that went into the calculation of vulnerability, in a book of maps.

The study did find that a few vulnerable groups have a disproportionately higher than average presence in wildfire risk areas. Those born in a foreign country represent 8.5% of the population in wildfire risk zones while only being 7.3% of the city's population. A similar case is found in households with five or more people, representing 12% of the wildfire risk population compared to 10% of the city's population. This is not necessarily negative, as the wildfire risk zones are found around green spaces such as parks, creeks, and other natural areas. It is possible that these two populations simply disproportionately enjoy the natural scenery.

In fact, natural scenery seems to be a major drawing point of Highland Village. One interview question provided participants with a map of the WUI in Highland Village and asked what in those areas they would miss the most. The assumptive response to the question was community centers or retail outlets, but the overwhelming response was scenic streets, natural areas, and walking trails. In the case of Highland Village, the areas most prone to wildfire damage are extremely important to the residents to keep in their current state.

One participant who lives within the WUI selected his home due to the lot, which has a large forested area and is located next to a drainage creek. He expressed concern at the amount of dried brush and leaves that may serve as an ignition or spreading source throughout the larger natural areas maintained by his HOA. While it is unreasonable to suggest the city or volunteers take responsibility for all wild areas, those areas that are part of landscaping or public parks may benefit from efforts to



remove dead and dried foliage. It will also help to encourage residents on forested properties to remove their own leaves, as well. This effort can preserve the life of and remove the threat of anthropogenic sources of ignition in the most frequented wild areas.

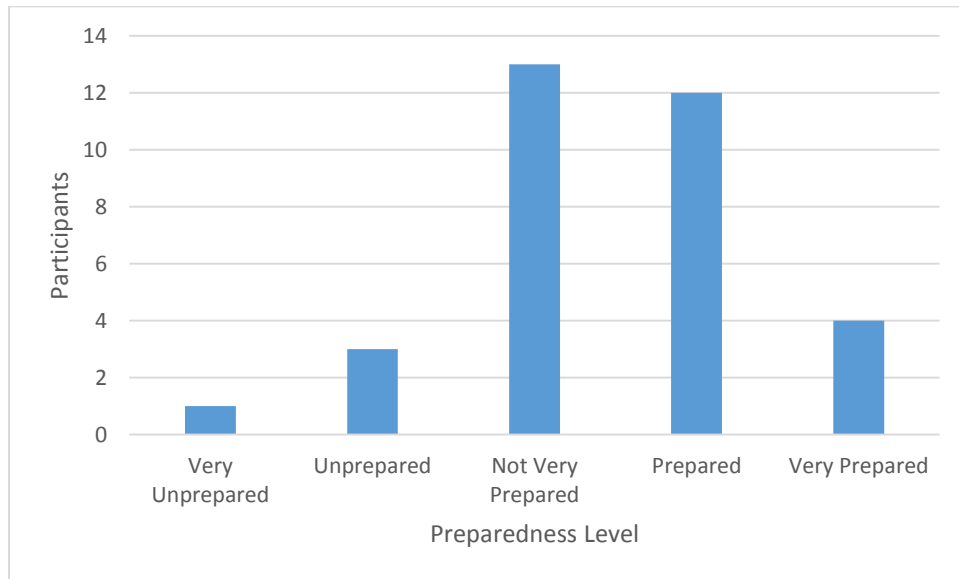


Figure 3: Participant preparedness levels

The preparedness survey yielded very positive results that indicate that the community may respond positively to education efforts. As Figure 3 shows, very few participants fell into “Unprepared” categories, meaning that most have at least considered preparedness efforts or have taken a few steps toward preparing their households. The overall preparedness level was calculated using the average of the scores of these preparedness steps. The most common steps taken were those that did not require actual effort, such as keeping updated on emergencies through sirens, phones, news, and the emergency broadcast system, discussing disasters with the family, having an escape plan, and knowing basic first aid. Other steps such as having a battery-operated radio, creating a list of emergency contacts that can be easily

accessed, storing important documents in a water/fire proof container, or building an emergency kit were taken much less frequently.

The survey also showed that no demographic data is meaningfully correlated with preparedness level, though in some cases it may be with certain preparedness steps. For instance, there was a significant difference between males and females and their knowledge of turning off the utilities to their home. The preparedness steps were frequently correlated with each other, as well. Figure 4 offers one example of these relationships. If a respondent answered in agreement to one statement, they were significantly more likely to answer in the affirmative to other statements, as well (this correlation is within 95% confidence).

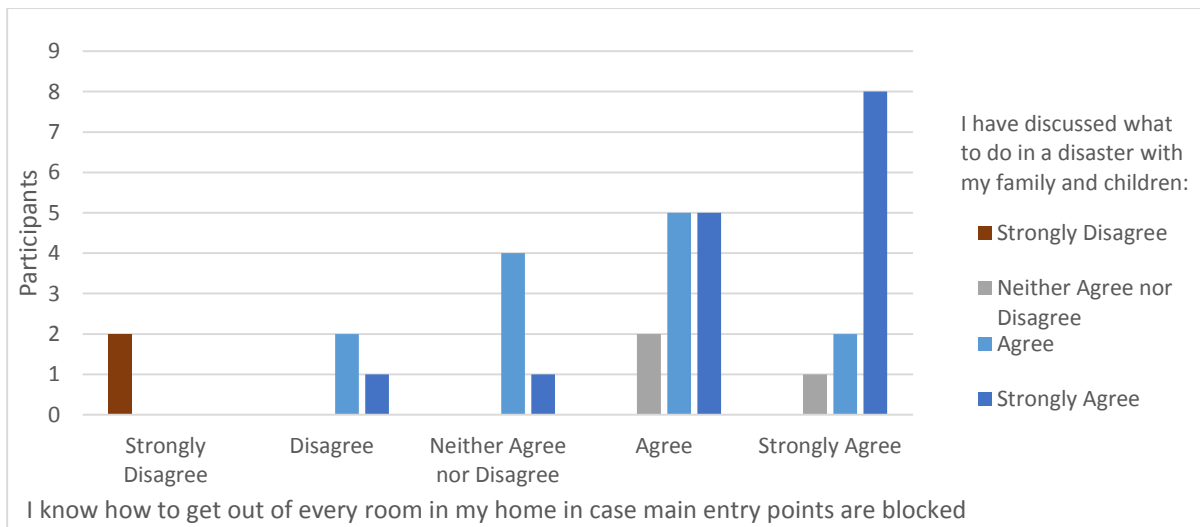


Figure 4: Relationship between discussion and escape plans

This may indicate that implementing one step may involve or encourage taking other steps, as well. Charts of all of these correlations and a detailed look into the knowledge of insurance policies were provided to the client as a supplemental item to the report.

Unfortunately, even fewer participants volunteered their addresses for their survey results to be mapped. This prevented the determination of any spatial patterns

that differentiated from the statistical correlations due to the limited number and large spread of the participants' locations. However, maps of responses by census block were still provided to the client in the map book also containing vulnerability information. Figure 5 below shows the average level of preparedness of the participants within each census block. None of the groups were found to be unprepared, while the prepared groups seem to fall in line with those that were in the middle of the vulnerability ranking seen in Figure 2.

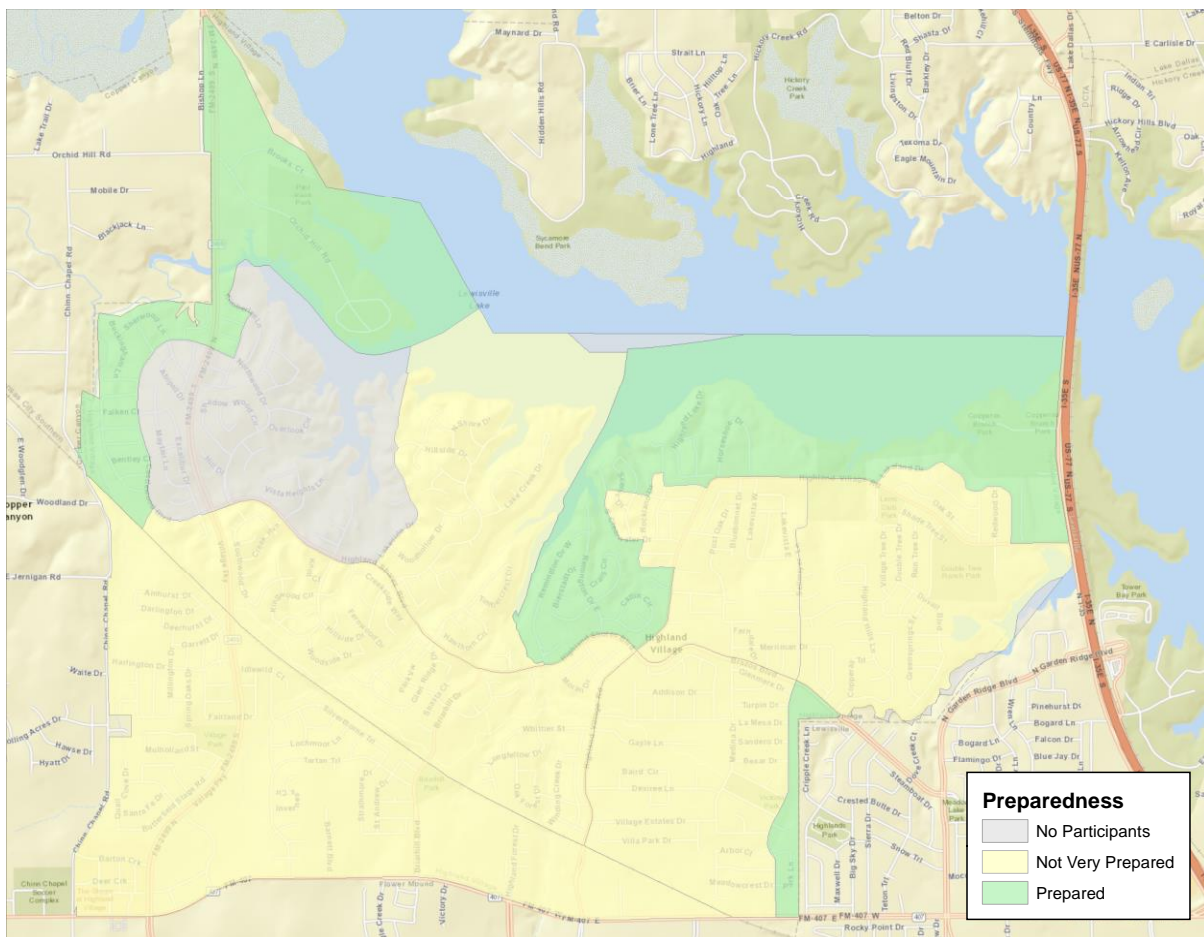


Figure 5: Map of participant preparedness by block group

Interview participants varied in their level of preparedness, from one admitting that he had taken no steps to prepare his household to another describing the tornado

shelter that she had built into her home and the items she stored in it. Most, while describing what they had done, decided that they should do or would like to do more. The vast majority of participants discussed in detail how they would take care of their children and pets, in one case even down to the special blend of dog food she would need to pack for her dog. It is possible that caring for someone or something that won't be able to take action during a disaster may encourage a person to take some steps toward preparedness.

Respondents suggested many ways for the city to promote preparedness in the community. Interview respondents discussed learning the methods that they had taken through television and radio programs, social media posts, military, work, volunteer training, and information sent home from schools or other children's programs. The city could again take advantage of their social media presence and the bulletin sent in the water bill to educate residents on the recommended steps to prepare for disaster or advertise preparedness classes. One participant described a kit that she received from Denton County that contained several recommended items for disaster preparedness. The city may also consider investing in something similar to hand out to residents.

Based on responses to interview questions, the community's response to a disaster will likely be smooth, although it is important to note that a person's actions during an emotionally charged situation will differ greatly from their ideas during an interview in a coffee house. Participants showed a high regard for city officials and first responders. One participant noted, *"I think that there's a network here in Highland Village of law enforcement and adept city leadership to pull together people to help those who are unable to help themselves"* and described a recent event where the city

and community joined together to sandbag a bridge to prevent flooding. Other participants frequently mentioned their respect for the fire and police departments of the city.

In the case of immediate disasters such as tornados, many of those not impacted may be willing to help with immediate relief and search-and-rescue operations. All but one participant said that they would be happy to find a way to help the community in any way possible. For disasters such as wildfires that come with advanced warning, participants showed a willingness to follow directions. If an evacuation order were issued, again all but one participant agreed that they would leave during a recommended evacuation, with the other saying he would decide based on his own determination of risk. None of the participants seemed concerned by the thought of looters. I asked one participant specifically if she was worried about looters, and she responded *“No, it’s just stuff. It can be replaced. I’d more worry about a tornado or fire ruining, you know, sentimental items.”* This may be a luxury that economically advantaged individuals will have over those with low incomes. When income is low, it is much more difficult to replace things that may be looted or damaged.

Another advantage that residents will experience over those with low income is ease of finding temporary housing. No participants in the project expressed concern that they would need to stay in a shelter. Many had family or friends that would be willing to take them in, and most expressed no concern at the thought of spending several days in a hotel. While setting up shelters will be important for those who may not have the option, many residents of Highland Village will be able to live comfortably during the time they are away from their homes.

Residents interviewed had very reasonable expectations of the city and first responders during disaster response. Most focused on dissemination of information and how the city could inform the community of the evacuation order and manage those who were leaving. Many participants mentioned social media and the city's reverse 911 system, which calls residents to alert them of possible danger, as a way to provide instructions to the community. One participant also noted that some people do not volunteer or follow information such as this, so it will also be important to have officials or volunteers go door-to-door in the evacuation zone. Other expected responsibilities of first responders will be directing traffic, blockading the evacuation areas, and protecting empty homes.

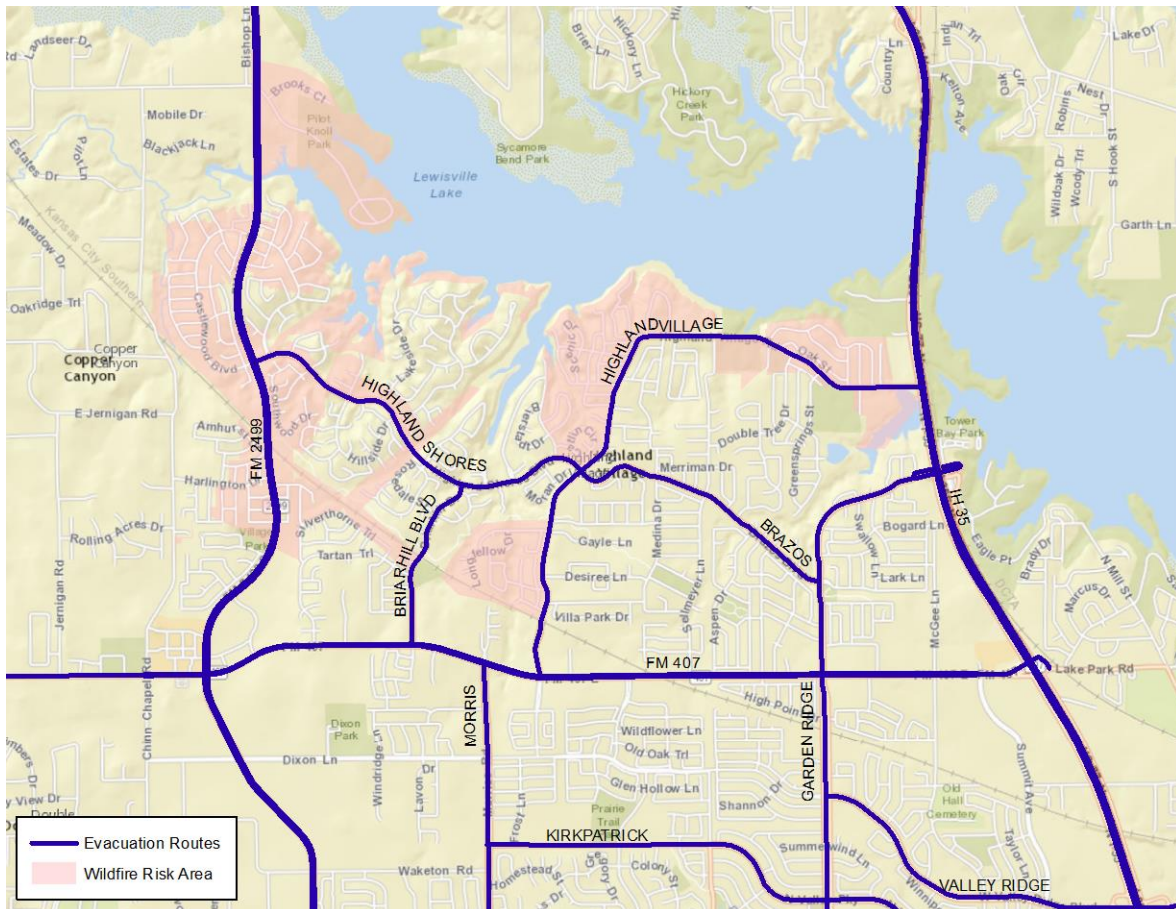


Figure 6: Map of potential evacuation routes and wildfire risk

A few interview participants expressed concern that they did not know the evacuation routes for the city. It would be beneficial for officials to plan the evacuation routes ahead of time and provide it for those who are interested in preparing themselves in advance. Figure 6 above shows major roads in the city that can be used for evacuation purposes. The major arteries to get out of the city are I-35E and FM 2499 for north-south, and FM 407 for east-west. Since Highland Village is relatively small, the city can advise residents to determine in advance where they will evacuate to and plan the best route from their home. This map also shows the WUI, or the areas at risk of wildfire. Areas in and nearby this zone will likely be those that are evacuated, and roads that pass through these areas may need to be closed. Residents should stay informed of updates during a disaster with evacuation potential to know if they are advised to leave and what routes should be avoided.

Another interview participant, herself in a wheelchair, worried about how an evacuation may impact those with a disability. She has taken every step to prepare herself for personal disaster, including informing the fire department of her situation, but she is not sure that there is the same ability for community disasters. There are many people who would not be able to follow evacuation orders without some form of assistance. To help these people, the city could allow those who are handicapped to volunteer their information to create a database of those who will need help evacuating. Alternatively, the city could open a phone line during an evacuation for individuals with a disability to call for assistance.

Recovery after a disaster should also proceed smoothly and will likely see a brief disaster boom economy. Highland Village's shopping centers and many gathering

areas are all located in a similar area on FM 407 outside any predictable danger areas like the WUI or flood plains. However, if a tornado were to touch down in this area, the city would likely see negative results. The Shops at Highland Village, for instance, draw visitors from across the metropolitan area as well as provide a meeting place for residents. The loss of this center would have a major negative impact on the city.

Wildfires, on the other hand, will have the most impact on residential areas and will likely not directly affect the economy or major community centers. Based on both surveys and interviews, the majority of participants were relatively confident that their homes were be covered by their insurance policies for the disasters that are typical for the area. All but one participant planned on rebuilding or repurchasing in Highland Village. This means that the city will see an influx of insurance and relief money being used to rebuild or rehabilitate damaged homes, as well as to purchase new furnishings. This could provide a stimulus to smaller local businesses in addition to larger established ones. However, it will be important to convey to these businesses that the influx will only be temporary and that they should not adjust to the new income. This will prevent the economic downfall that often happens in situations such as these.

Again, residents were reasonable in their expectations of city officials and first responders. Visibility was an important factor for interview participants, and knowing that the city was available to help in whatever way they could. Primarily participants were interested in the city providing information stations either at the city hall, a community center, or throughout impacted neighborhoods. These stations would optimally function like a job fair for disaster information. It would provide a meeting place for separated family members, serve as a distribution center for emergency



supplies like food, water, and blankets, and offer access to FEMA or Red Cross representatives, insurance agents and information, local businesses that can help during rebuilding, and any other resources a disaster-impacted community may need. Ultimately, after the disaster, the city should be the solid foundation “to bring families together, neighbors together, and the city back together.”

### Discussion and Personal Reflection

To me, anthropology offers toolboxes of methods and ideas that can be accessed for any situation. From data collection and analysis to theoretical perspectives, this toolbox allows an anthropologist to create and follow through with projects that address problems in a holistic manner.

The first toolbox contains anthropological theory, which determines the angle from which a project will be approached and the way it will be designed. For this project, I took a political ecological perspective. Because research has constantly shown that political and economic factors play a role in disaster resiliency, this approach made sense and allowed me to focus my study on those socioeconomic factors. This directed a large portion of my research which focused on the relationships between socioeconomic status, risk of disaster, and preparedness. Political ecology also encourages the inclusion of the relationships between humans and the environment. I originally focused on basic location information in GIS and wildfire risk patterns as the environmental portion of this research. However, through interviews I was also able to identify another pattern of residents’ interest in nature. That allowed me to provide a

brief explanation of how socioeconomic factors and interest in nature and scenery may interplay with the physical threat of disasters.

The second toolbox contains a wide variety of methods. Anthropology combines both qualitative and quantitative research to provide a complete analysis of a situation. Using what I have learned, I was able to use data collection and a survey analysis to produce a reasonable assessment of risk and preparedness in the city of Highland Village. The information gathered from these steps presented a set of ideas and patterns that could be expanded upon with further research. The qualitative portion of the study, interviews, allowed me to further delve into the patterns identified in the survey as well as to address questions that are better answered with explanation. Anthropologists thrive on speaking with people and identifying patterns both within that person's ideas and among other people. Even beyond the tools to speak and identify, anthropology teaches simple tricks for better interview practices. Awkward silences, for example, can yield better data. It is human nature to fill the gaps in conversation, and by opening that gap, my participants revealed information they likely would not have done otherwise.

Anthropology has also provided a unique perspective for me to apply with GIS. For most organizations and applications aside from geographic analyses, maps are meant to show things. Where are the empty houses that are in my price range? What route should I take to get to work most efficiently? Where are the lowest income neighborhoods in my city? Anthropology, on the other hand, has allowed me to develop analyses and maps with research questions and anthropological theory in mind. My maps tell stories and raise questions. Houses in my price range are near the most

efficient traffic routes while the lowest income neighborhoods are far from major roads. Perhaps there is a correlation between income and ease of travel. Perhaps my city developed these neighborhoods on major roads to cater to commuting workers with similar incomes. GIS is an excellent way to visualize the answers to anthropological questions.

One problem that I experienced was that I felt unprepared for recruitment of participants. Even with help from the client, I was not able to find enough participants to make the survey research statistically representative. My goals for this research were probably set too high, as most people are not thrilled to spend any amount of time on a student's project. However, I did grow to respect the growing power of social media and the ease of snowball sampling. One participant who was very enthusiastic about my project asked how my survey had been going. When she learned of my troubles recruiting, she asked for a couple of the business cards I had been distributing. She shared the link on her own social media profile, and over the next few days my number of participants almost doubled. There is a reason for online viral marketing and social media campaigns – it produces results. People are much more likely to follow trends or participate in something a friend or relative is enthusiastic about, and social media provides an excellent platform for many people to view and share. If I had followed this methodology from the start, I likely would have gotten much closer to my goal. However, this does present a risk of bias. Snowball sampling comes with its own problems of reaching like-minded people to those initially recruited. There also comes a problem with social media, as it may leave out the very old, the very poor, cord-cutters, or those who do not interact online.

Anthropology has provided an excellent platform to develop research questions, design projects, and analyze results. Every aspect of this project used methods and ideas learned from the field of anthropology to provide holistic answers to its key questions. Despite some problems associated with recruitment and data collection, I believe the results of this study will be of benefit to the City of Highland Village and its residents.

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