Differential Vulnerability and Environmental Justice: A Preliminary Report on the 2013 Boulder Floods

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I. Introduction: Research Question and Major Findings

Since dubbed a "1000-year rain event" by media and experts alike, from September 9th through 13th of 2013 Boulder and Colorado's Front Range experienced a series of destructive floods. Though floods may physically behave according to climatic and ecologic factors beyond human control, throughout society's development multiple institutions and systems have been established that create differential vulnerability to environmental disasters among populations. Differential vulnerability is often apparent in the locations where populations reside, the resilience of a given population's property, and disproportionate access to recovery resources, among other variables. Using the framework of differential vulnerability, this research project investigates the Boulder flood of 2013 through the lens of environmental justice, the activist and academic movement seeking to understand and influence systematic cultural, political, and economic processes by which populations are either disproportionately burdened or benefitted by their environments.

Our research questions are: Was differential vulnerability exhibited in the Boulder floods, and if so, how was this differential vulnerability an example of environmental injustice? What types of solutions exist to decrease people's vulnerability to floods like this one? To the end of clarifying an answer, a review of relevant literature on the topics of environmental hazards, vulnerability, racism, the role of the state and economy, climate change, and Boulder's flood history was conducted, and the question framed along the geographic concepts of spatialities, spatialization, and scale. This report will proceed to analyze events of September 2013 in the light of the existing literature along with multiple interviews with survivors of the flood and agents of flood relief organizations, spatial data, news articles, and historic archives. Ultimately, this report will communicate that in fact differential vulnerability was not a glaring issue in

Boulder with regard to race or ethnicity, but was exhibited to some extent in the recovery process through other spatial, income, and related inequalities, including: trailer home residents, immigrants, residents of mountain towns, low-income residents, and the homeless. Relatedly, this report will communicate how past mitigation efforts have been generally successful in protecting residents and facilitating recovery, especially within the Boulder Creek floodplain.

II. Methodology

To conduct our research, we analyzed scholarly articles, news articles, and archival information. In addition, we interviewed flood survivors as well as organizations in Boulder that work directly with flood relief. The purpose of these interviews was to obtain an understanding of who in Boulder was most impacted by the flood, who is having a difficult time recovering, how they were impacted, how they are recovering, and where these people are located. Interviews lasted 30-60 minutes and were carried out either in person, by phone, or by email. In total, we expected to interview 25-50 people; however, because of difficulty contacting organizations and flood survivors, we did not meet this sample size. Organizations doing flood relief work were found both online and through personal connections. Flood survivors were also found via personal connections. We defined a flood survivor as someone who was evacuated and/or displaced from his or her home, sustained damage to his or her home, or observed flooding first-hand. Our research was planned and conducted between September 9th and December 15th, 2013. The Institutional Review Board approved our research with exempt status.

III. Literature Reviews

(1) Geographic Perspective on Environmental Justice

1.1 Introduction

In order to better examine the differential vulnerability exhibited during the 2013 Boulder flood, it is important to understand the geographic processes that produced the spaces of inequality in which these vulnerabilities were exhibited. A more nuanced understanding of the intertwined nature of historical and geographic processes in which these spaces of inequality are produced will lead to a more complete picture of the vulnerabilities exhibited during the flood and recovery process as well as more effective solutions to reduce vulnerabilities to future flooding events. In order to reduce people's vulnerability to future flooding in Boulder, it is necessary to emphasize betterment rather than recreating the familiar during the reconstruction process. To do this, it is crucial that the processes behind racialization and spatialization that enabled these instances of differential vulnerability in the first place are identified so that more effective solutions targeting root causes can be implemented at different scales.

1.2 Spatialities

Spatiality is the "relation between social space and society;"[1] each social dimension has its own spatiality. These spatialities exist simultaneously, forming layers of spatiality that are impossible to isolate from one another. The landscapes created by this layering, according to Delaney, "are formed when race-centered ideologies combine with other ideological elements– such as those centered on public-private, ownership, sexuality, citizenship, democracy, or crime– and with other axes of power to produce the richly textured, highly variegated, and power-laden spatialities of everyday life."[2] In order to optimize our understanding of the inequalities that shaped the differential vulnerability experienced in the Boulder flood, it is important to analyze

1 Soja 1989 as cited by Laura Pulido, "Rethinking Environmental Racism: White Privilege and Urban Development in Southern California," *Annals of the Association of American Geographers* 90, no. 1 (March 2000): 12–40: 17. doi:10.1111/0004-5608.00182.

2 David Delaney, "The Space That Race Makes," *The Professional Geographer* 54, no. 1 (February 2002): 7.

how these vulnerabilities exist within the intersection of spatialities in Boulder. Understanding the complexity of these overlapping spatialities provides more holistic and effective approaches to reducing vulnerability in future flood events. Simply targeting one issue without situating it in its political, economic, racial, and social context will result in only partial solutions.

1.3 Spatial Inequality

Since 1996, geographers have been analyzing how spaces of inequality are generated.[3] In particular, geographers such as Laura Pulido emphasize the need to determine the ways in which various factors like race and class intersect and are in relation with each other as social processes.[4] Looking at the intersection of factors will allow us to more accurately determine what differential vulnerabilities were exhibited during the Boulder flood and how they came about. This includes situating these vulnerabilities, as Holifield would advocate,[5] in broader social structures and political and economic systems. Hurricane Katrina offers an excellent case study of how a variety of factors, situated in larger systems, intersected to create adverse effects on certain populations. Further, in flooding and other disaster events, research shows existing political, economic, and social trends are often accelerated.[6] One example, provided by Kates, documents how the poor, those most severely impacted by hurricane Katrina, came to reside in the spaces in the city in New Orleans that were most devastated by the flooding. He notes that, over time with each new flooding event, wealthier people were able to move to the expanding suburbs, away from hazardous areas in the city, leaving the poor to occupy the city.[7] If the city

3 Ryan Holifield, Michael Porter, and Gordon Walker, "Spaces of Environmental Justice- Frameworks for Critical Engagement," in *Spaces of Environmental Justice,* ed. Ryan Holifield, Michael Porter, and Gordon Walker (Oxford, UK. Wiley-Blackwell, 2010): 2.

4 Laura Pulido, Steve Sidawi, and Robert O. Vos, "An Archaeology of Environmental Racism in Los Angeles," *Urban Geography* 17, no. 5 (July 1, 1996): 420.

5 Holifield, Porter, and Walker, "Spaces of Environmental Justice…", 3.

6 R. W. Kates et al., "Reconstruction of New Orleans after Hurricane Katrina: A Research Perspective," *Proceedings of the National Academy of Sciences* 103, no. 40 (October 3, 2006): 14653.

7 Ibid., 14654.

of Boulder is to reduce the vulnerability of its people to future flooding events, it is necessary to understand what historical and geographic processes created these spaces of inequality. Once these processes are understood, we can begin to take more effective preemptive actions.

To aid our analysis of the processes that create spaces of inequality, Holifield suggests using additional dimensions to understand space, including temporal and non-linear elements.[8] Since research limited to a specific point in time cannot answer the question of how spatial inequality occurs, Szasz highlights two ways in which current research addresses the time dimension: 1. Analysis of the demographics of an area from when a hazardous facility [or other environmental hazard] was sited to the present and 2. Local histories that provide insight on the intersection of different historical and geographic process.[9] Using both these qualitative and quantitative approaches will help us better determine the differential vulnerability exhibited in the Boulder flood.

1.4 Racialization

While the lack of substantive discussion within geography about racism is frequently noted, those geographers that do address issues of race tend to agree that the world is entirely racialized. Like space, Kobayashi argues that race is also a social process and needs to be seen as a historically constructed concept that can be strategically implemented.[10] When seen as a process, the creation of racial spaces is often referred to as racialization. Thus, racialization is "the process by which racialized groups are identified, given stereotypical characteristics, and coerced into specific living conditions, often involving social/spatial segregation and always constituting racialized places. It is one of the most enduring and fundamental means of

8 Holifield, Porter, and Walker, "Spaces of Environmental Justice…", 9.
9 A. Szasz and M. Meuser, "Unintended, Inexorable: The Production of Environmental Inequalities in Santa Clara County, California," *American Behavioral Scientist* 43, no. 4 (January 1, 2000): 603.
10 Audrey Kobayashi, "The Construction of Geographical Knowledge: Racialization, Spatialization," *The Handbook of Cultural Geography* 103, no. 40 (October 3, 2006): 552.

organizing society."[11] As will be expanded on below in the Findings section, this organization of society through the creation of racialized places did have an impact the various ways different groups of people experienced vulnerability in the 2013 flood outside of the City of Boulder, but racialization of space was not found to be a significant determinant of marginalization within the city in this preliminary research. The analysis of racialization in Boulder is most important for understanding the ways immigrant communities experienced increased vulnerability both during the flood itself and the recovery process outside of the City of Boulder. This analysis will be made more complex by the fact that the same group of people, in this case the immigrant population, can simultaneously be racialized differently in different contexts.[12]

1.5 Whiteness

One aspect of both racialization and spatialization which is particularly relevant to Boulder is whiteness, as, demographically and in terms of social characterization, Boulder is a predominantly white city. While the racialization of Boulder may not be as apparent as in other cities, whiteness penetrates all aspects of the city and is most profound in its silence. According to Kobayashi, "Whiteness works at its most powerful level when it is hegemonic, creating landscapes in which people of colour do not even figure."[13] When this happens, the spatialities through which whiteness is maintained are regarded as natural or neutral.[14] Once whiteness is naturalized, the best way to uncover the work of white normativity is to find and challenge the "spaces of silence." In the case of Boulder, this takes the form of identifying the historical and current processes that maintain Boulder as a predominantly white town. Identifying these

11 Audrey Kobayashi and Linda Peake, "Racism Out of Place: Thoughts on Whiteness and an Antiracist Geography in the New Millennium," *Annals of the Association of American Geographers* 90, no. 2 (June 2000): 393.
12 Ibid., 398.
13 Kobayashi, "The Construction of Geographical Knowledge…", 550.
14 Delaney, "The Space that Race Makes", 11.

processes will help alleviate some of the vulnerabilities experienced by people in Boulder that these white spatialities magnify.

1.6 Scale

According to Kurtz, both geography and process-oriented environmental justice research have largely overlooked the issues of scale when addressing spatial inequalities.[15] Scale as a concept can be used to shed additional insight on both racialization and environmental justice frameworks. In regards to racialization, scale is of upmost importance because racial identities[16] and racist acts[17] are constructed differently at different scales. Taken one step further, different axes of inequality exist at different scales.[18] For example, an individual with a low income is being acted upon by large-scale political and economic systems that may limit the economic opportunities available to the individual. At the same time, their low income may affect them locally as they seek to find housing, especially in places like Boulder where relatively few low income housing options are available. Therefore, analyzing the ways in which unjust distributions, in this case differential vulnerability to flooding events in Boulder, simultaneously operate at different scales allows us to link local material conditions with larger social forces such as economic and political systems.[19] Actions to effectively reduce vulnerabilities to flooding events in Boulder will thus have to operate on multiple scales.

In addition to shedding light on the complexities of spatial inequalities, it is important to acknowledge the different ways in which arguments can be manipulated and framed at different scales. Since injustice exists at different levels, it is possible for actors to strategically promote

15 Hilda E. Kurtz, "The Politics of Environmental Justice as the Politics of Scale: St. James Parish, Louisiana, and the Shintech Siting Controversy," in *Geographies of Power,* ed. Andrew Herod and Melissa W. Wright (Oxford, UK. Blackwell Publishers Ltd), 253.
16 Delaney, "The Space that Race Makes", 7.
17 Pulido, "Rethinking Environmental Racism…", 15.
18 Kurtz, "The Politics of Environmental Justice…", 251.
19 Ibid., 271.

their cause by selecting which scales of inequality they would like to address. Thus, scale is an instrument of power that can be strategically employed to maintain or challenge power relations.[20] Therefore, to best understand how differential vulnerability was exhibited in the 2013 Boulder flood, it is important to analyze the event and its impacts at multiple scales and be aware that the scales at which we determine differential vulnerabilities can limit our understanding of the impacts of the flood.

1.7 Conclusion

Examining the differential vulnerability exhibited in the September 2013 floods in light of the historical and geographical processes of racialization and spatialization at work within Boulder provides an enhanced understanding of why different groups were more vulnerable in this flooding event than others. This process-based understanding, along with an awareness of ways in which vulnerability is amplified at different scales, will help us identify solutions to decrease vulnerability to flooding events in Boulder's future. To better understand these processes, we will analyze, at multiple scales, the roles the state, economy, racism, climate change, natural hazards, and vulnerability played in creating spaces of inequality in Boulder as these spaces allow differential vulnerability to occur. We will begin by discussing hazards and vulnerability and situating the Boulder floods within the greater natural hazards literature.

(2) Differential Vulnerability as a Product of Natural Hazards and Mitigation

Natural hazards and disasters affect some populations more than others, and this forms a big part of environmental justice research. These affected populations could include people of different classes, genders, ages, ethnicities, and disabilities, to name a few. In analyzing a natural disaster as a potential issue of environmental injustice, key questions must be asked: How is

20 Ibid.

mitigation rolled out? How did the disaster affect people at various scales? What systems were in place before the disaster? What respective roles do technology and the state play in the disaster, before, during and after? In examining the 2013 Boulder floods, these questions point us towards a preliminary determination as to whether the floods created an issue of environmental injustice.

When examining hazards from an environmental justice point of view, the scale at which this examination is taking place can largely affect the information that is gathered. One approach that incorporates scale, suggested by James K. Boyce, is that of private versus public goods and bads. Boyce states that "vulnerability to natural and technological disasters is to a large extent a public bad," and "measures to reduce vulnerability are to a large extent public goods."[21] He defines public good in its purest form as "a good which when provided to one is provided to all (non-excludability), and whose consumption by one does not diminish its availability to others (non-rivalness)."[22] A public bad, then, would be the opposite of this. Private goods and bads are measured with respect to individuals, rather than large populations. Boyce argues that disaster mitigation is an impure public good because, while mitigation benefits more than one person, it does not benefit a whole population. In fact, many measures to reduce disaster effects are not purely public or private, but are somewhere in between. As such, the problem of allocating scarce resources among competing parties arises. Boyce identifies two common solutions to this problem, and terms them the wealth-based approach and the rights-based approach.

The wealth-based approach is "founded on willingness to pay, which is conditioned, as always, by ability to pay."[23] In other words, those who pay out more money get more help in the mitigation process. This means, not surprisingly, that people of lower income are

21 James K. Boyce, "Let Them Eat Risk? Wealth, Rights and Disaster Vulnerability," *Disasters* 24, no. 3 (2000): 254–261, doi:10.1111/1467-7717.00146.
22 Ibid.
23 Ibid.

disproportionately affected by disasters, both because they often live in the most vulnerable areas,[24] [25] and because they are unable to afford mitigation. Supporters of the wealth-based approach favor such actions as locating dirty industries in less developed countries.[26] The rights-based approach, by contrast, emphasizes defining "liability on the same basis [for everyone], with the right to a safe environment held equally by all"[27] Thus, rather than mitigation only being available to those who can afford it, it is recognized as a necessary function, and is made available to everyone who needs it, regardless of income level. Though it is an imperfect system, largely because disaster-risk mitigation is an impure public good, it is preferable to the wealth-based approach and is becoming more commonplace in today's society.

Ben Wisner and Henry Luce stress the importance of not over-generalizing vulnerability. They state that "quite often it is not the system of production or habitation per se that is vulnerable to environmental hazards, but persons or households within those systems who lack the resources to mobilize the defenses such systems may already have against hazards or who do not possess the resources or bureaucratic access to recover their livelihoods or rebuild following a disaster."[28] The reason for looking at the people within the systems, rather than the systems more broadly, is that not everyone even within a certain system is affected in the same way. Thus, making an over-generalization about the system, rather than the people within that system, misses the variation within the system that affects individuals' ability to recover from a disaster, such as income, resident or legal status, level of insurance, type and quality of housing, and the availability of alternate housing and monetary aid to help in the recovery process, to name a few.

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24 Ben Wisner and Henry R. Luce, "Disaster Vulnerability: Scale, Power and Daily Life," *GeoJournal* 30, no. 2 (June 1, 1993): 127–140, doi:10.1007/BF00808129.

25 Burrell Montz, "Emerging Issues and Challenges: Natural Hazards," *Journal of Contemporary Water Research & Education* 142, no. 1 (2009): 42–45, doi:10.1111/j.1936-704X.2009.00051.x.

26 Boyce, "Let Them Eat Risk?".

27 Ibid.

28 Wisner and Luce, "Disaster Vulnerability."

Furthermore, marginalized populations are affected by and, indeed, affect the patterns of natural disasters. Wisner and Luce identify five axes of difference through which people are often subjected to marginalization: class, gender, age, ethnicity, and disability. According to Wisner and Luce, many marginalized people will do whatever they can to make ends meet. Because of this, and the problems with mitigation practices described above, when a disaster comes, marginalized people stay marginalized, and many become more so.[29] [30]

Advances in technology have brought innovation to the types of mitigation used in both recovery from, and prevention of, natural disasters, and it is important to consider these technological developments as they relate to hazards and mitigation. Montz has identified several ways in which technology has helped mitigation efforts. "It is through the use of such technologies that the tracking of physical systems that generate extreme events has improved, and predictions and warnings have become more accurate."[31] In addition to better tracking, improved communication results in information being dispersed to the public in a more effective and timely manner, meaning that more people will get the message to evacuate, for example, and will have the lead time to act on those orders and/or recommendations.

While technology has positive effects in this regard, there are other areas in which technology has actually been harmful. For example, Montz makes the case that "in the United States and elsewhere, there is a long history of relying on engineering solutions to mitigate disasters."[32] This engineering can lead to a false sense of security, and even compound the

29 Ibid.
30 Susan L. Cutter and Christina Finch, "Temporal and Spatial Changes in Social Vulnerability to Natural Hazards," *Proceedings of the National Academy of Sciences* 105, no. 7 (February 19, 2008): 2301–2306, doi:10.1073/pnas.0710375105.
31 Montz, "Emerging Issues and Challenges."
32 Ibid.

disaster if such structures were to not function properly.[33] Not only that, but most manmade structures are built to be useful within a certain lifespan, and when the structures reach the end of their useful lives, this can also lead to more disastrous results than the hazard would cause on its own.

While the above scenarios represent ways technological advances unintentionally alter the way natural hazards affect people, effects can sometimes be more deliberate. Wisner and Luce identify a number of ways in which states can pose hazards, often with the aid of technology. Sometimes, states deny the existence of a disaster altogether; this has historically happened with famines. Other times, mitigation improvements are made in large cities, especially where the government headquarters are located, while the rural areas see no improvement, and are often left more vulnerable. This inequality often serves to reinforce support for the party in power. Furthermore, according to Wisner and Luce, "food has often been used as a weapon."[34] This could include selective dispersion of international disaster relief during or after a famine, or even targeting specific subpopulations.

In 2005, Hurricane Katrina brought New Orleans and nearby gulf coast settlements to their knees. It is the "largest, most expensive, and third most fatal disaster in US history."[35] As one might expect, the storm, what led to it, and its aftermath follow many of the tendencies described so far. Located at the mouth of the Mississippi River, the city of New Orleans is situated in a location so hazardous that the city shouldn't even exist. On the other hand, the site is so economically perfect that it is almost inevitable that a city be located there.[36] However,

33 R. W. Kates et al., "Reconstruction of New Orleans after Hurricane Katrina: A Research Perspective," *Proceedings of the National Academy of Sciences* 103, no. 40 (October 3, 2006): 14653–14660, doi:10.1073/pnas.0605726103.

34 Wisner and Luce, "Disaster Vulnerability."

35 Case Watkins and Ronald R. Hagelman III, "Hurricane Katrina as a Lens for Assessing Socio-Spatial Change in New Orleans," *Southeastern Geographer* 51, no. 1 (2011): 110–132, doi:10.1353/sgo.2011.0009.

36 Ibid.

because of the recurring floods, mitigation efforts are as old as the settlement itself.[37] While this mitigated some of the lesser effects of flooding, it also led to some of the effects Montz described: technology lulls people into a false sense of security, and if this technology fails, the big disasters are more catastrophic. This was the case with Katrina. Kates et al. state that while the rain fell in record amounts, the winds were not catastrophic.[38] In other words, while the storm itself was certainly part of the problem, the failure of the technology is what led to such catastrophic damage.

The above description of the situation during Katrina by itself does not represent an environmental justice problem. The environmental injustice is made apparent by looking at how African Americans have fared in the longitudinal mitigation practices in New Orleans. Improved mitigation practices led to white flight, with white residents moving to safer areas – those on higher ground and away from the central part of the city – and leaving poor and minority residents behind, as most of these people could not afford to move to better areas.[39] Consequently, when Katrina made landfall, these marginalized peoples were the hardest hit. This differential vulnerability and the spatial injustice that developed over time were what made Hurricane Katrina an issue of environmental justice.

So, were the 2013 Boulder floods an issue of environmental justice? To find out, we must remember that disaster-risk mitigation is an impure public good. Though Boulder seeks to mitigate for the good of its residents, there is potential that this mitigation benefits some populations more than others. Analyzing Boulder's mitigation practices using the private versus public goods approach will help to illustrate the reality of whom the mitigation benefits. Furthermore, assessing whether mitigation is undertaken through a wealth-based or rights-based

37 Kates et al., "Reconstruction of New Orleans after Hurricane Katrina."
38 Ibid.
39 Watkins and Hagelman III, "Hurricane Katrina as a Lens for Assessing Socio-Spatial Change in New Orleans."

approach will outline quite plainly the injustices (or not) created. The Boulder floods were selectively damaging in certain areas, hitting several houses on a block, but leaving one, or else leaving entire neighborhoods untouched while obliterating others. Detailed field work–including analysis on the role technology played in warning, relief, and mitigation efforts–is needed so as to take care not to over-generalize what we know or suspect about the damage caused by the floods, and to pin down the floods as an environmental justice issue or not.

(3) Justice and Vulnerability

Natural disasters are complex phenomena that not only disrupt natural and social systems but also reveal global injustices. Given the stress disasters place on a community, disparities within the affected space are truthfully exposed. Through an exploration of the literature, it is evident that disasters disproportionately affect vulnerable populations. Although vulnerability is heavily correlated with economic status and ethnicity, it is a multifaceted classification. A society's conception of racism, sensitivity to cultural norms, geographic understanding of housing patterns, and access to educational and financial aid work to predict the effects of disaster preparedness and recovery. By adapting a nuanced view of vulnerability through evaluating different aspects of racialized processes, collective governmental bodies and majority populations can begin to understand the injustices inherent in disaster vulnerability. By means of geographic housing pressures, culturally incorporated prejudices unify differential vulnerability and environmental justice. Although natural disasters are initiated by the physical environment, the manifestations of a given disaster exemplify a country's treatment of spatial equality.

In order to understand how vulnerability relates to environmental justice, it is necessary to examine the variable range of social injustices involved in a vulnerable state. Vulnerability, or a person's "capacity to anticipate, cope with, resist, and recover from the impact of a natural

hazard,"[40] is a highly malleable classification full of influential details. Although exposure to a potential geographic hazard is involved in classifying a population as "vulnerable," social, economic, and political influences ultimately account for situational vulnerability. The details involved in vulnerability are organized into eight categories: risk perception, preparedness behavior, warning communication response, physical impacts, psychological impacts, emergency response, recovery, and reconstruction.[41] By organizing these components of vulnerability into categories, patterns begin to emerge that clearly show the variable constructions of disasters.

People respond to the risk of disaster and prepare for disasters in many different ways based on experience, access to information, and insurance feasibility. Although the "perceptions of risk were mixed within ethnic groups,"[42] most studies show that responses vary based on prior exposure to natural hazards. Interestingly, Palm showed that white males are "consistently the least concerned group about the risk to their homes."[43] In order to mitigate the impact of their perceived risk, most people attempt to prepare for disaster when a warning is issued. Information to do so, however, is mainly "disseminated in English"[44] or it is difficult to attain. In addition to language and access barriers, education on preparedness is hardly available where a small percentage of residents speak English. Populations with less access to educational resources are less inclined to purchase insurance. Sadly, these "communities may have higher risk-perception but lower preparedness levels."[45] In addition to education about insurance, areas

40 Alice Fothergill, Enrique G. M. Maestas, and JoAnne DeRouen Darlington, "Race, Ethnicity and Disasters in the United States: A Review of the Literature," *Disasters* 23, no. 2 (June 1999): 156–173.
41 Ibid., 157.
42 Ibid., 158.
43 Ibid.
44 Ibid.
45 Ibid., 169.

with high crime rates or areas deemed as high flood risk will have higher insurance premiums,[46] making insurance an unfeasible option for low or even middle income people. Despite insurance problems in the United States, other countries such as France have socialized disaster risk so that there is a standard premium regardless of location.[47] Both risk perception and preparedness preemptively change the impacts of disaster disproportionately, disadvantaging security by increasing vulnerability.

When natural disasters occur, those impacted respond and are affected differently based on ethnicity, access to affordable housing, and ability to emotionally cope with disaster. When warnings are broadcasted, ethnicity is a determinant of how information is transferred. According to Perry and Mushkates, Mexican-Americans rely on and value social networks for warning information.[48] Additionally, there is varying trust across vulnerable populations as some communities rely on mass media or authority figures. For instance, in marginalized areas with high crime rates, people are "considerably less likely to be trusting of their neighbors."[49] Because of this spectrum of communication, warning systems need to integrate multilingual and multicultural tactics into their distribution so communities are not disadvantaged because of cultural tendencies. When a disaster strikes a community, physical impacts (mortality, morbidity, injury rates, and economic losses) are directly related to safe housing.[50] In part because of the private housing market and insurance redlining practices, many ethnic groups live in old, unreinforced apartment buildings.[51] Unfortunately, this trend disproportionately increases damage and death rates among racial and ethnic minority populations. Incorporated in housing

46 G. Walker and K. Burningham, "Flood Risk, Vulnerability and Environmental Justice: Evidence and Evaluation of Inequality in a UK Context," *Critical Social Policy* 31, no. 2 (February 16, 2011): 223 & 229, doi:10.1177/0261018310396149.
47 Ibid., 229.
48 Fothergill, Maestas, and Darlington, "Race, Ethnicity and Disasters in the United States," 159.
49 Walker and Burningham, "Flood Risk, Vulnerability and Environmental Justice," 223.
50 Fothergill, Maestas, and Darlington, "Race, Ethnicity and Disasters in the United States," 161.
51 Ibid.

vulnerability are psychological reactions to disaster. Because of housing inadequacies, the stress of displacement and relocation is highest in poor and minority communities.[52] Psycho-social recovery, therefore, sets back a community's power to pursue quick recovery. Although all these factors manifest themselves in numbers after a disaster hits (deaths, housing losses, estimated damage, number of people hospitalized, etc.), many aspects require a more sensitive, humanitarian based lens to understand vulnerability beyond the statistics.

After the initial impacts of a natural disaster, differential emergency response affects a community's ability to recover and reconstruct. From current studies, emergency personnel that help in devastated areas are sometimes culturally insensitive to the populations they are trying to assist. According to Phillips and Ephraim, often "no bilingual personnel are available for [non-English speaking] populations."[53] Additionally, there seems to be a discrepancy in information as Bolton found that "English-language radio tended to have [more updated and current] information than the Spanish-language stations."[54] In terms of direct recovery, whites are continually helped first and given more resources. Even the media narratives do not accurately portray the damage in socio-economically and ethnically diverse areas[55] favoring and dramatizing the struggles in white communities. Because of these false representations, wealthy, white populations receive more aid and recover at much higher rates. Finally, food and meal preparation provided by aid organizations does not accommodate diverse cultural and dietary needs. Following the Loma Prieta earthquake in San Francisco in 1989, "Latinos became sick from the food prepared by relief workers through unfamiliar ingredients."[56] Through these small

52 Ibid., 162.
53 Ibid., 163.
54 Ibid., 164.
55 Ibid.
56 Ibid.

but significant response problems, recovery issues are additionally compounded by racialized recovery practices.

It is clear based on the literature that racial minorities in the United States have "greater difficulties recovering due to lower income, fewer savings, greater unemployment, less insurance, and less access to information."[57] Upper middle class victims are more likely to know how to work through the government system, fill out forms, and maneuver the relief system.[58] In addition to lack of recovery assistance, ethnic minorities face housing injustices. For example, Bolin states that landlords avoided "rent-control rules" by evicting tenants for late rent after an earthquake.[59] In the final stages of reconstruction, minorities face problems including rebuilding, replacing infrastructure, obtaining loans, and locating permanent housing. In one study, Aptekar shows that in the long term, communities of color were more likely to have experienced a decline in their standard of living that white communities.[60] As another comparison, New Orleans, four years after Hurricane Katrina struck, has 31% fewer residents, 46% fewer children enrolled in public schools, 22% less of its labor force, and 48% fewer state-licensed hospitals.[61] Because of these response, recovery, and reconstruction disparities, many issues of social and structural stratification are highlighted and reinforced.

In addition to affecting populations in the US, the components of vulnerability play out on a global spectrum. In the past 40 years, the frequency of "hydro-meteorological" disasters has quintupled, and "developing countries bear a disproportionate share of the adverse consequences

57 Ibid., 165.
58 Ibid.
59 Ibid.
60 Ibid., 166.
61 Christina Finch, Christopher T. Emrich, and Susan L. Cutter, "Disaster Disparities and Differential Recovery in New Orleans," *Population and Environment* 31, no. 4 (January 9, 2010): 180, doi:10.1007/s11111-009-0099-8.

of increased risk."[62] Unlike the US, many "highly exposed developing countries" cannot raise sufficient capital to replace or repair damaged assets and restore livelihoods.[63] Typically, developing countries are already exhausted financially by necessary development priorities like funding schools, infrastructure, agriculture, and health services.[64] Because of this, developing countries are stuck in the disaster-development cycle, battling the spiral of continual devastation. For instance, in the highlands of Peru, coffee production is increasingly stunted from landslides and flooding from the effects of El Niño. Instead of having the resources to mitigate these repetitive issues, farmers go into debt each year just to replant and produce a yield that will allow them to make a living. Since these populations are heavily dependent on agriculture, the devastations they face perpetuate a cycle of poverty that continually expands the wealth disparities worldwide. When "entire countries are relatively under resourced,"[65] being involved in global movements for change is nearly impossible. While examining vulnerability and resulting disparities, it is important to keep an attuned perspective of existing and potential global imbalances.

Although it is important to see how ethnicity and financial capacity impacts vulnerable groups, it is crucial to keep an inclusive and flexible framework to accommodate less obvious or consistent groups who are also marginalized by disasters. Despite the static quality of "vulnerable groupings," this "framing needs to be exercised with some caution."[66] Specifications like gender, social class, or age can also affect disaster vulnerability and recovery disparity. Recovery and response to disasters are typically accepted as a "man's work." Women, however,

62 Alex Julca, "Natural Disasters with Un-Natural Effects: Why?," *Journal of Economic Issues* 0, no. 2 (June 1, 2012): 509, doi:10.2753/JEI0021-3624460225.

63 Warner, Koko et al., *Vulnerable Countries and People: How Disasters Risk Reduction & Insurance Can Help Manage the Risks of Climate Change*, Policy Brief (United Nations University, October 2009), 4.

64 Ibid., 10.

65 Nigel Clark, Vasudha Chotray, and Roger Few, "Global Justice and Disasters: Global Justice and Disasters," *The Geographical Journal* 179, no. 2 (June 2013): 106, doi:10.1111/geoj.12005.

66 Walker and Burningham, "Flood Risk, Vulnerability and Environmental Justice," 223.

have proven to be more involved in the work of recovery yet have to deal with male-dominated services and authorities that are not always sympathetic to their needs.[67] The stress in assigned gender roles not only sets back recovery but also creates tension within personal relationships. Within these roles, women are designated with the task of fostering a returned sense of normalcy, an undefined and extremely difficult task. Another perception is that men "are simply better able to cope with post-disaster hardships."[68] Although the numbers do show that women perish at a higher rate than men in natural disasters,[69] this assumption disempowers and disadvantages women prior to any sort of catastrophic event.

In addition to gender, the middle-class is another neglected vulnerable group. In a study done of Hurricane Katrina, "recovery lagged in neighborhoods in the mid-range of social vulnerability."[70] As of 2010, only 49.3% of households have returned in the medium range of social vulnerability and high flood levels.[71] These "in-between" neighborhoods "are not poor enough to qualify for outright assistance, but are too poor to recover using their own resources."[72] Now known as the "forgotten casualties,"[73] these communities are forced to recover by themselves, delaying a return to normalcy and economic progress.

The third vulnerable group is characterized by age and consists of the elderly and children. Both classifications face an increased psychological vulnerability during disasters. Typically dependent on some type of other person's support, both children and the elderly are severely stressed by the displacement of secure connection to others. Additionally, children and

67 Ibid., 226.
68 Kathleen J. Tierney, "From the Margins to the Mainstream? Disaster Research at the Crossroads," *Annual Review of Sociology* 33 (January 1, 2007): 515, doi:10.2307/29737773.
69 Ibid., 514.
70 Finch, Emrich, and Cutter, "Disaster Disparities and Differential Recovery in New Orleans," 179.
71 Ibid., 194.
72 Ibid., 199.
73 Ibid., 194.

the elderly experience psychological stress with loss.[74] By losing people that grant them security and losing memorabilia collected over a lifetime or significant toys, there is a sense of lost identity and attachment that can be psychologically handicapping.

Despite the US's strong convictions concerning fairness and justice, disasters invite an aversive type of racism. Aversive racism is very subtle, suggesting a "pro-ingroup rather than an anti-outgroup orientation."[75] By adopting this racist stance, people avoid "overt bigotry while protecting a non prejudiced self image."[76] Aversive racists will not "discriminate in situations with strong social norms where their racism would be obvious."[77] Instead, they perpetuate the accepted racial stigmas that get imbedded into the cultural conscious. During a disaster, many of the inaccurate portrayals of ethnic groups that suggest a violent nature are opposed by violent containment. In the 1906 San Francisco earthquake, residents were allowed to shoot to kill "suspected looters," which invited violence against lower-class and minority residents.[78] In 1923, during the Great Kanto earthquake in Japan, 6,000 Koreans were killed on rumor-based assumptions that they were initiating civil violence.[79] After Hurricane Katrina, in 2005, African Americans were accused of criminal behavior. Although both whites and blacks partook in looting the neighborhoods, African Americans were solely accused of "savagery." This "racial dichotomy set back relief efforts"[80] and invited discriminatory actions and comments. US Representative Richard Baker stated, "We finally cleaned up public housing. We couldn't do it,

74 Walker and Burningham, "Flood Risk, Vulnerability and Environmental Justice," 225.
75 Kristin E. Henkel, John F. Dovidio, and Samuel L. Gaertner, "Institutional Discrimination, Individual Racism, and Hurricane Katrina," *Analyses of Social Issues & Public Policy* 6, no. 1 (December 2006): 103, doi:10.1111/j.1530-2415.2006.00106.x.
76 Ibid.
77 Ibid.
78 Tierney, "From the Margins to the Mainstream? Disaster Research at the Crossroads," 511.
79 Ibid.
80 Jason David Rivera and DeMond Shondell Miller, "Continually Neglected: Situating Natural Disasters in the African American Experience," *Journal of Black Studies* 37, no. 4 (March 1, 2007): 513, doi:10.2307/40034320.

but God did."[81] Statements like this ripple through our culture, allowing racist decisions and judgments to be informed by racialized inferences.

In addition to how differential vulnerability disproportionately affects people, the literature also addresses how differential vulnerability relates to environmental justice. In many cases, minorities are located in vulnerable areas that are subjected to industrial abandonment, hazard potential, or lack of opportunity because of the low cost of living. One key example of this is the Vanport Flood that took place in Oregon in 1948. Between 1942 and 1945, 160,000 people (15% whom were African American) came to Portland anticipating jobs in the defense industry. Because of the huge population change, federal housing projects were constructed to accommodate the large influx of people, the largest being Vanport. Vanport was located on "low-lying reclaimed swamps" that were not particularly hospitable. In May of 1948, the river in the area rose significantly. Authorities, however, assured the residents of Vanport that the building was in "no imminent danger." The next day Vanport was submerged in 15 feet of water.[82] A significant number of people died and African American refugees in the flood outnumbered whites nine to one. In addition to a disproportionate number of African Americans being affected, whites fled the area after the flood, halting development and long term recovery. Even after this catastrophic example, nothing seems to have changed much. In New Orleans, "discriminatory housing and mortgage policies and practices" placed blacks in vulnerable areas of the city.[83] Enforced by the development of government funded interstate highways, New Orleans ranks 29th out of 318 metropolitan areas facing neighborhood racial segregation.[84] Most houses in the disadvantaged, segregated community were situated on slabs located 2.5 to 4 feet

81 Ibid.
82 Ibid., 510–511.
83 Henkel, Dovidio, and Gaertner, "Institutional Discrimination, Individual Racism, and Hurricane Katrina," 108.
84 Ibid.

below sea level.[85] By these terms, disaster was designed to happen. In the United Kingdom, a study was done to examine spaces prone to flooding and social data from the census.[86] Not surprisingly, their findings concluded that "if you are highly deprived [or marginalized], you are more likely to live in a flood risk area."[87] Again and again, location, privilege, and disaster vulnerability have an indisputable correlation.

Since potential hazard sites usually have segregated qualities, the severity of "disaster" is manipulated. According to Tierney, "an event is not a disaster unless human beings and social systems are affected in negative ways."[88] In fact, Tierney goes so far as to conclude that "disasters are episodic, foreseeable manifestations of the broader forces that shape societies."[89] Through these assertions, disasters are more a reflection of social and cultural decisions rather than unforeseen events originating from ecological and atmospheric systems. Because of the social component to labeling disasters, they should be "understood as common occurrences that reflect...industrialization, urbanization, globalization, legacies of colonialism, political-economic forces, and mechanisms of control exercised over both the environment and civil society."[90] This construction, however, allows for bias and systematic racism. Tierney contends that "disaster declarations do not parallel the severity of a given disaster."[91] Rather, disasters can be "reconstructed to serve institutional interests"[92] that perpetuate the idea of the "continuity principle." This principle implies that "groups, organizations, and institutions behave in ways that are consistent with pre-disaster patterns."[93] This means that even though instances of

85 Ibid.
86 Walker and Burningham, "Flood Risk, Vulnerability and Environmental Justice," 220.
87 Ibid.
88 Tierney, "From the Margins to the Mainstream? Disaster Research at the Crossroads," 509.
89 Ibid.
90 Ibid., 518.
91 Ibid., 507.
92 Ibid.
93 Ibid., 510.

environmental justice are exposed in disasters, nothing is addressed afterwards, and much of the time, the situation gets worse.

Environmental justice's relationship to disaster vulnerability is an emerging field of study that assumes a human component to disaster. By adding a human component to the creation and politics of natural disasters, the "scope of environmental justice is radically extended."[94] Until Hurricane Katrina in 2005, flooding and other natural disasters "had not been positioned as an issue of environmental justice."[95] It is important to remember that humans have been coping with environmental variability over the course of our existence. Even in Katrina, "83% of neighborhoods experienced flood damage, irrespective of elevation or socioeconomic characteristics."[96] Now, however, there is a need to "attend to the ways in which powerful political and economic actors can take advantage of catastrophic events."[97] Since the incidence of disasters is increasing with global climate change there is a need for more disaster regulation. In order to combat the cycle of repeated attempts to physically control disasters, the public needs to widen their perspective of disasters and question the construction of the "natural" within disasters.

In order to mitigate the differential processes involved in disaster, our society needs to incorporate justice into our conception of vulnerability. By "shifting the focus away from only seeing people and communities as potentially vulnerable victims, towards them being conceived as citizens with rights to be asserted, achieved, and protected."[98] The current limited perspective present in the understanding of the "vulnerable victim" has the potential to broaden as to incorporate the fundamental freedoms of citizenship in the United States. In circumstances

94 Warner, Koko et al., *Vulnerable Countries and People: How Disasters Risk Reduction & Insurance Can Help Manage the Risks of Climate Change*, 107.
95 Walker and Burningham, "Flood Risk, Vulnerability and Environmental Justice," 217.
96 Finch, Emrich, and Cutter, "Disaster Disparities and Differential Recovery in New Orleans," 188.
97 Clark, Chotray, and Few, "Global Justice and Disasters," 112.
98 Walker and Burningham, "Flood Risk, Vulnerability and Environmental Justice," 227.

ranging from recovery aid to conceptualization of vulnerability, "people who are marginalized in the early stages are marginalized later."[99] Across the spectrum of environmental justice, "risk assessment fails to account for experiences of the poor and people of color."[100] By disregarding the voice of the vulnerable and adhering to statistical facts, a dimension of effective policy change is lost. So many of the issues involved in the complexity of vulnerability could be resolved through meaningful inclusionary practices.

When investigating the 2013 floods in Boulder, Colorado, it is important to consider the immediate and long-term potential of creating vulnerable groups. Because Boulder has such low racial diversity, it is not found to be a major determinant in differential vulnerability. Instead, our inquiries are sensitive to the more subtle forms of less "classically" defined vulnerability. Since this study was conducted very soon after the floods, it was difficult to summarize vulnerability with the absence of a cumulative overview. In the research, however, we attend to the role of justice and how it incorporates itself into not only, the initial flooding but also the following months of recovery and reconstruction. By being open to the complex manifestations of classic and unexpected vulnerability, we bring an explorative mindset to our research full of intent without expectation.

In conclusion, vulnerability is a highly complex term that embodies a range of socially manipulated characteristics. When components of differential vulnerability are compounded with aspects of environmental injustice, natural disasters become less of an unpredictable occurrence of natural forces, and can be seen as an accumulation and display of the pressures we place on the natural and social environment. In order to change the cyclic patterns vulnerable populations

99 Fothergill, Maestas, and Darlington, "Race, Ethnicity and Disasters in the United States," 168.

100 Melissa Checker, "'But I Know It's True': Environmental Risk Assessment, Justice, and Anthropology," *Human Organization* 66, no. 2 (June 1, 2007): 113.

experience in relation to disasters, we need to evaluate and monitor the relationship of justice to the care we take in populating and maintaining the health of our environment.

(4) Theorization of Racism

In order to better understand the social consequences of a natural hazard event, such as the recent floods in Boulder, it is imperative to assess the role of race in the formation of differential vulnerability. Racism, although commonly accepted as an action founded in ideologies of the past, is a relatively modern phenomenon. The United Church of Christ Commission for Racial Justice defines racism to be "racial prejudice plus power" resulting from "a belief in superior racial origin, identity or supposed racial characteristics."[101] The concept of one race being inferior to another, based purely on physical attributes, has likely been around since the beginning of human history, but was particularly highlighted during the age of European colonialism. To justify the taking of land, white European men deemed the black peoples of Africa, in particular, to be less developed humans, if humans at all. Skin color proved to be a convenient visible marker of ascribed status. Advances in modern science have since shown no genetic evidence for difference based on skin color; race not a biological category but a social construction. Despite this revelation, racism continues to persist. In examining the effects of a natural hazard it is essential to recognize racism as a socially constructed institutionalized concept and to be the largely *unintentional* result of policies and actions.

There is a tendency, especially in the United States, to oversimplify the nature of race and racism. Despite knowing that race is not a biologically supported notion, the majority of Americans still tend to discuss race within what Patricia Price has dubbed the "black-white binary"; either an individual is black and of African American heritage or an individual is white

101 *Toxic Wastes and Race in the United States: A National Report on the Racial and Socio-economic Characteristics of Communities with Hazardous Waste Sites* (Public Data Access, 1987).

and of European heritage.[102] While this simplistic dichotomy is attractive, it also places a limit on which racial or ethnic groups can be seen as subject to discriminatory behavior or policy. Price demonstrates how this is true in her study of racism in regard to Latino/a immigrants to the United States. She explains that due to the relatively high number of undocumented immigrants, there is an unfortunate inclination to assume all Latino/as are illegal. This allows an individual to frame his or her anti-Latino/a sentiment as patriotic rather than racist. The individual perceives that the Latino/a should not and does not legally deserve to be here; thus, in the individual's mind, there is a socially acceptable reason to be "racist" towards a Latino/a immigrant. In making this distinction, Price attests that, from this view, "true racism" is reserved for the "black-white binary" only. Consequently, racism is only recognized as racism in one particular context. This oversimplification results in the oppression and inequalities experienced by numerous different racially marginalized groups being overlooked. The definition of racism needs to be expanded in recognition of all groups experiencing racial inequality and injustice.

While there are some policies protecting against racial discrimination, these laws address only definable, identifiable and visible intentional racism. Racism is, however, often not visible. As Cole and Foster state, "'racism' molded by judicial constructions, is myopic in its failure to accommodate for the fact that the nature of racism has become appreciably more subtle."[103] In their discussion of environmental justice, Cole and Foster discuss two common explanations for why communities of color are disproportionately exposed to toxic facilities or hazardous environments. The first, "lifestyle causation," argues that many people of color are poor and are therefore forced to live in cheap urban areas where toxic facilities are located or in floodplains,

102 Patricia Price, "Race and ethnicity: Latino/a Immigrants and Emerging Geographies of Race and Place in The USA.," *Progress in Human Geography* 36, no. 6 (2012): 800–809.

103 Luke W. Cole and Sheila R. Foster, *From the Ground up: Environmental Racism and the Rise of the Environmental Justice Movement*, Critical America (New York: New York University Press, 2001).

for example. In the "market causation" explanation, a community's value drops when a toxic facility is built nearby. This results in "white flight" and the dropping of real-estate prices, allowing people of color, again assumed to be poor, to move into the neighborhood.[104] Both scenarios assume that people of color are poor. Why, though, are disproportionate numbers of people of color poor?

People of color are disproportionately poor and disadvantaged because society has been structured to keep people of color poor and disadvantaged. As Omi and Winant explain, "racial dynamics are understood primarily in terms of the social allocation of advantage and disadvantage."[105] Expanding on this, Ruth Gilmore argues that "whatever its place-based particularities, practitioners [of racism] exploit and renew fatal power-difference couplings."[106] In America this would be the "black-white binary." During the Nazi reign of Germany, this would have been the Arian-Jewish binary.[107] While the type of racism differs based on place-based historical context, at its core racism is a struggle for dominance.

Historically, the United States dealt with the horrors of slavery. Whites were in social and political power. Blacks were at the bottom of the pile. When slavery was abolished in 1865, people of color were not suddenly in a position to take political power or influence social thought. Even one hundred years later during the Civil Rights Movement people of color were still not in a position of direct political power, despite gaining considerable social power. The system was, and in many ways still is, set up to keep whites at the top, and people of color on the bottom. Omi and Winant refer to these systems of hegemony, or white power, as "racial

104 Ibid.

105 Michael Omi and Howard Winant, *Racial Formation in the United States From the 1960s to the 1990s*, Second (New York & London: Routledge, 1994).

106 Ruth Wilson Gilmore, "Fatal Couplings of Power and Difference: Notes on Racism and Geography.," *The Professional Geographer* 24, no. 1 (2002): 15–24.

107 Barnor Hesse, "Im/plausible Deniability: Racism's Conceptual Double Bind," *Social Identities* 10, no. 1 (January 2004): 9–29, doi:10.1080/1350463042000190976.

projects"–invisible institutions built into society that perpetuate a racist state.[108] There is no obvious foul play here. No individual, company or institution appears to be intentionally racist. It is only when one takes a step back and considers a structural analysis that there is evidence for racism. Moving forward, racism needs to be understood as structural and unintentional in order to encompass more cases of discrimination.

Racism needs to be examined within a place-based historical context. In many ways, racism is not literally invisible but is rather built into society to the extent that it is not even considered to possibly relate to racism or be racist. For example, in "Acknowledging the Racial State: An Agenda for Environmental Justice Research" Hilda Kurtz explores several ways in which the "state shapes urban economic processes to racialized ends"[109] (there will be a larger discussion on the role of the state and economy in maintaining environmental racism in the State and Economy section, below). Like Pulido, Sidawi and Vos, Kurtz explains that racism, particularly the spatial distribution of communities of color, must be examined within a historical framework. Particularly she looks at how the "subsidization of suburbanization" in conjunction with state sanctioned redlining due to the Federal Housing Act and the construction of the national highway system after World War Two greatly contributed to racialized neighborhoods.[110] [111] People of color were still looked down upon in the early 1900s and were consequently restricted from serving certain posts during both world wars. They also did not receive the same benefits as whites did for service. After World War Two, soldiers were compensated for their services, receiving low mortgage rates for newly built homes in the suburbs. People of color were denied such compensation. Much of the country became

108 Omi and Winant, *Racial Formation in the United States From the 1960s to the 1990s*.
109 Hilda E. Kurtz, "Acknowledging the Racial State: An Agenda for Environmental Justice Research," *Antipode* 41, no. 4 (2009): 684–704, doi:10.1111/j.1467-8330.2009.00694.x.
110 Ibid.
111 Laura Pulido, Steve Sidawi, and Robert O. Vos, "An Archaeology of Environmental Racism in Los Angeles," *Urban Geography* 17, no. 5 (July 1, 1996): 419–439, doi:10.2747/0272-3638.17.5.419.

segregated, with whites in the suburbs and African Americans in the inner cities. The segregation was considered politics, not racist, and it still exists in many places.

Kurtz provides anther example in which racism is invisible. Citing Goldberg, she explains the Unites States Census to be a marker of a racist state. According to Goldberg, in order for the government to create the racial and ethnic categories on the census they must have extensive knowledge of the population. In fact, the state has been collecting racial data since the early 1820s. This was deemed necessary for the making of policy. For Kurtz, the census highlights how a hegemonic society was formed by white homogeneity.[112] [113] Old white men decided, based on their knowledge of race as based on skin pigmentation, how society should be divided into "superficial" groups. These racial categories are still used to group people today, and this repeated categorization continues to reinforce the idea that people *are* different based on race. Racism is a relic of the past that has simply been left untouched, left to stew, left to continue segregating people into groups. In mitigating racism it is important to look at institutions that appear racist, but also those that do not necessarily seem to be racist; racism is all encompassing.

Differential vulnerability suggests that certain populations, such as people of color, are substantially more vulnerable to the negative effects of natural hazards than their counterparts, and the intentional and unintentional or structural bases for this outcome must be examined. While racism can be "understood to be the *deliberate* action against a nonwhite group,"[114] there needs to be a much greater emphasis placed on unintentional racism as a product of

112 Kurtz, "Acknowledging the Racial State."
113 Omi and Winant, *Racial Formation in the United States From the 1960s to the 1990s*.
114 Laura Pulido, "A Critical Review of the Methodology of Environmental Racism Research," *Antipode* 28, no. 2 (1996): 142–159, doi:10.1111/j.1467-8330.1996.tb00519.x.

institutionalized racial projects.[115] Cheryl Teelucksingh states, "Agents' intentional actions can result in unpurposeful racist outcomes, [as those] outcomes are often systematic."[116] Systematized racist outcomes are certainly visible in differential vulnerability to hazards. While expanding the definition of racism, as Laura Pulido has fought for,[117] makes it more difficult to create laws and policy, racism needs to be understood as unintentional, institutionalized and should be extended to those outside of the "black-white binary." New communities and categories of racial identification will be recognized as disadvantaged or discriminated against. In addition, more actions, laws and social norms will be scrutinized as racist. Perhaps, with any luck, this will lead to an increase in attention toward subtle racism and result in both social and political changes that will help to lessen differential vulnerability in the event of a natural hazard.

(5) State and Economy

Historically, governments and economies across the globe have shaped their environments to the detriment of minority populations. Such marginalization has been enacted primarily through state partnerships with corporations that inherently have little geographic or cultural sensitivity and through implementation of superficially equitable neoliberal policies. These policies are imbued with theoretical shortcomings that prevent racial and ethnic minority populations from having equal opportunities for recovery following environmental disasters, or that even increase exposure to environmental hazards.

To determine the role government and economy play in reproducing or mitigating differential vulnerability to environmental disasters, it is imperative to acknowledge the ways in which politics and economy intersect. In the words of Laura Pulido, "The real challenge is to

115 Omi and Winant, *Racial Formation in the United States From the 1960s to the 1990s*.
116 Cheryl Teelucksingh, "Environmental Racialization: Linking Racialization to the Environment in Canada," *Local Environment* 12, no. 6 (December 2007): 645–661, doi:10.1080/13549830701657455.
117 Pulido, "A Critical Review of the Methodology of Environmental Racism Research."

understand how racism operates in conjunction with a particular political economic system."[118] The potentially ruinous effects of these intimate relations are made apparent by such case studies as the development of the petroleum industry in Nigeria. Described at length by Michael Watts, this representative example of a federal government partnering with delocalized capital interests resulted in significant capital gains for the empowered ethnic majority at the expense of ecologically devastated ethnic minorities. In summation, "the majority of the oil wealth is captured by the federal state and allocated to the so-called ethnic majorities in the politically dominant northern and western states. By almost any measure of social achievement, the core oil states are a calamity."[119] In this scenario, minority communities were targeted due to their proximity to natural resources; similarly, a community's perceived economic resources may motivate oppressive power dynamics. From a capitalist perspective, these include, but are not limited to, cheap real estate, industrial zoning, and a lack of organized political opposition. Such characteristics save frugal corporations the expenditures of purchasing high-value land, effectively managing their waste so as to exist harmoniously with adjacent zonings, or spending time and money to advance their political agendas. Unfortunately, disenfranchised communities are also economically inclined to reside in areas with these characteristics. Thus, "there is also an economic dimension to the 'environmental racism' thesis; that is, because of 'economic vulnerability' minority communities have been targeted for environmentally hazardous facilities."[120] Summarily, government partnerships with industry for the purpose of exploiting natural or economic resources can result in severe degradation of the environments in which marginalized populations reside.

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118 Ibid.

119 Michael Watts, "A Tale of Two Gulfs: Life, Death, and Dispossession Along Two Oil Frontiers," *American Quarterly* 64, no. 3 (2012): 437–467, doi:10.1353/aq.2012.0039.

120 Lester, Allen, and Milburn-Lauer, "Race, Class and Environmental Justice," *Progress in Human Geography* 19 (March 1995): 111–122.

In addition to economic partnerships that lead to environmental hazards, the methods of remediation undertaken by government-affiliated organizations following "natural" environmental disasters can either exacerbate or moderate differential vulnerability. Largely due to a deficiency of successful communication with residents, relief and aid distribution after hurricane Katrina failed to provide adequate assistance to racial and ethnic minority communities. Major obstacles included "a lack of cultural competency, [the] silencing of discussions about inequality and racism in the community, an over-emphasis on accountability to donors, and an attachment to outcomes at the expense of processes on the part of the NGOs [non-governmental organizations]."[121] In retrospect it is apparent the local government had not properly prepared itself to best help its entire constituency in case of emergency, thus many neighborhoods were left underserved. Speculatively, the government could have better prepared by providing information in the languages of immigrant populations and hosting programs in widely accessible locations. However, instead of facilitating a generally equitable recovery, the goals-oriented state programs failed to meet the specific needs of affected minority communities, disproportionately slowing their recovery.

Not only the distribution of aid, but also the means of reconstruction were racialized in the case of Katrina. Acting solely on economic interests, the state and federal government issued no-bid contracts with guaranteed profit margins exclusively to contracting industry giants. As a result, a form of disaster capitalism expertly took all control of the recovery effort away from local citizens. This reality hit minority communities hard because they lacked a voice in the political realm. Furthermore, to accommodate the extreme circumstances of the hurricane,

121 Christine L.1 Day, "Katrina Seven Years On: The Politics of Race and Recovery— Notes on a Roundtable Organized for the 2012 APSA Annual Meeting," in *PS: Political Science & Politics*, vol. 46, 2013, 748–752, doi:10.1017/S1049096513001017.

"government agencies eschewed responsibility for workplace health and safety regulation."[122] Selective enforcement and the outright suspension of many immigration and labor laws "created a context that encouraged labour and human rights violations."[123] When rebuilding contracts expired and construction companies abruptly departed, an estimated 30,000 Latino workers were abandoned without any legal recourse. On top of all this, some of the temporary mobile housing units provided by contractors "were found to contain hazardous levels of formaldehyde."[124] In these ways, agency practices "not only magnified persistent and emerging challenges in labour equity, but also actively contributed to structuring Latino workers' vulnerability in a post-Katrina labour market."[125] Although unfair labor practices were present to some degree before Katrina, the lack of integrity within the contractors and regulatory agencies during rebuilding exacerbated the problem by unnecessarily exposing vulnerable populations.

These factors illustrate just one example of disaster capitalism, an emerging trend as companies develop ways to profit heavily from the effects of disasters. Assuming best intentions on the part of the government, we can imagine that these steps were meant to speed up the recovery process, allowing shortcuts to begin the work as quickly as possible. Yet the economic incentive for the local government to allow contractors such leeway certainly poses a conflict of interest. Undoubtedly, it was the corporations that really benefitted from such practices as no-bid contracts with guaranteed profits and the deregulation of labor practices. The shift in regulation that allowed corporations to take advantage of a natural disaster cleanup can hardly be justified by profit and timeliness after considering how many people were hurt by the very same practices.

122 N. Trujillo-Pagan, "Neoliberal Disasters and Racialisation: The Case of post-Katrina Latino Labour," *Race & Class* 53, no. 4 (March 16, 2012): 54–66, doi:10.1177/0306396811433986.
123 Kurtz, "Acknowledging the Racial State."
124 Ibid.
125 Ibid.

Especially in disaster prone areas like New Orleans, city planners go to great lengths to improve the resiliency of city infrastructure when given the opportunity of reconstruction. Sometimes, these efforts include the decision to not rebuild in particular areas that were worst affected, with the aim of limiting damage that could be incurred in the future. These changes come with other benefits, too; newly constructed cities can offer new public services, better utilities, and improved accessibility of city resources.[126] Day points out that facilitating access to social services benefits minority communities, who are statistically more likely to patron those services. Choosing not to rebuild entire communities, however, also causes displacement, oftentimes of the same minority populations who would benefit most from the restructuring. This one-two punch amounts to a huge burden if people do not have access to savings, loans, or other support networks.[127] Additionally, a firmly held cultural identity associated with a particular place strongly motivates residents to rebuild an affected community just as it was before. "The dream of a strategically planned recovery collides with reality when residents hear that their neighborhoods, their homes and community support systems, are to be uprooted for the sake of right-sizing the city."[128] Minority populations with a history of relocation are especially reluctant to move under these circumstances. This fact highlights the need to work *with* communities in rebuilding after a disaster and energetically incorporate social considerations in order to best mitigate disaster and preserve cultural character and values.

Distinct from economic partnerships between government and the agents of disaster recovery, the discourse of law itself has the ability to reinforce differential vulnerability, as observed in the realization of neoliberal philosophy. Foundational to neoliberalism is the Horatio Alger myth, which ostensibly frees individuals from inherited socio-economic privilege or

126 Day, "Katrina Seven Years On."
127 Ibid.
128 Ibid.

hindrance by promoting the willingness to work hard as the only prerequisite to success in a liberated society such as contemporary America. Accordingly, "under neoliberal racism the relevance of the raced subject, racial identity and racism is subsumed under the auspices of meritocracy."[129] Therefore, even legitimate claims of differential vulnerability based on racialization are undermined by neoliberal ideology and simplistically attributed to personal failures, thereby excusing the state from raced economic disparity, stonewalling conversations about active racial projects and derailing neoliberal self-criticism. Under the guise of "neutral arbiter between capital and civil society" the neoliberal state leads to a system in which "environmental regulation creates openings for capital interests to produce hazardous waste, even while positing the state as a neutral arbiter between capital and civil society."[130] Subsequently disenfranchised populations are disproportionately burdened with this very waste while any claims of oppression are muted by neoliberal theory.

Ideological shortcomings of neoliberalism can also cause environmental burdens in the absence of disaster. In the 2007 paper entitled "Blaming the Victim; the Role of Decision Makers in the Occurrence of Environmental Injustice," Vos et al. describe how racial or ethnic minority populations may be left out of important environmental decisions.[131] In several case studies involving environmental injustices, the government or other decision-makers perceived relevant minority populations to have a lack of interest in local environmental issues, and they were consequently left out of the conversation.[132] Ultimately their lack of input, let alone awareness,

129 Dana-Ain Davis, "Narrating the Mute: Racializing and Racism in a Neoliberal Moment 1 2," *Souls* 9, no. 4 (2007): 346–360, doi:10.1080/10999940701703810.

130 President's Council on Integrity and Efficiency (U.S.) and Executive Council on Integrity and Efficiency (U.S.), *Oversight of Gulf Coast Hurricane Recovery a Semiannual Report to Congress* (Washington, D.C: PCIE/ECIE, 2006), http://purl.access.gpo.gov/GPO/LPS77554.

131 Pulido, "A Critical Review of the Methodology of Environmental Racism Research."

132 Jaap J. Vos, Alka Sapat, and Khi V. Thai, "Blaming the Victim; the Role of Decision-Makers in the Occurrence of Environmental Injustice," *International Journal of Public Administration* 25, no. 2–3 (2002): 305–331, doi:10.1081/PAD-120013238.

resulted in many problems for these populations who nonetheless had to live with the environmental consequences they were not informed of. The authors explored a variety of explanations for the perceived lack of interest in environmental issues, many of which pointed to the greater socio-economic context. Consistently, the notion that minorities were simply uninterested was discarded as a viable explanation. More likely, these communities did not have the time, expertise, or resources to combat past issues.[133] Clearly this scarcity could well be a function of other social and economic pressures, such as working multiple jobs, being a single parent, having poor health due to toxics exposure, or a combination of these and other possible factors. In other words, the authors imply that privilege empowers communities to fight against undesirable environmental projects, and develop a reputation over time of having done so. Vos et al. explain that supposing a lack of interest due to ignorance of the extant racial realities can be just as, if not even more, subjugating than actively avoiding minority input; the end result is equally exclusionary decision making and mistakenly assumed complacence.[134]

Admittedly the scales of Boulder's floods are not on par with those of coastal Louisiana, nor are Boulder's residents subjected to the environmental burdens of immediate resource extraction, yet by no means do those facts alone exempt Boulder from experiencing marginalization caused by governmental and economic actions in times of natural disaster. The theorization of neoliberalism is acutely relevant given Boulder's demographics. White privilege is characterized by a process of normalization in which those systematically benefited by their racial identity are conditioned to accept the associated advantages as given, and to presume

133 Pulido, "A Critical Review of the Methodology of Environmental Racism Research."
134 Ibid.

others enjoy the same.[135] Combined with a neoliberal ideology that categorically rejects all claims of racial disadvantage, Boulder may in fact prove a perfect storm for sympathetic but utterly ignorant disaster policy. If Boulder's minority populations are indeed believed to have access to all of the resources for post flood recovery the hegemonic class does, and are moreover expected to experience no added difficulties on account of their minority status, then they may well be overlooked by those organizations that might otherwise provide assistance, inadvertently deemed ineligible for assistance, or ineffectually made aware of the resources available. While this research concludes that Boulder has managed to control this conjectural segregation, it is possible that longer-term and more in-depth research will discover areas in which it succumbed to the errors described so extensively by the present literature.

(6) Flooding and Its Implications in the Context of Climate Change

6.1 Introduction

In this section we examine flooding that occurred in large areas of Colorado including the city of Boulder during September 2013. These events are placed into a larger context by addressing whether or not connections can be made between specific flooding events and trends of global climate change. The trajectory of changes in global temperature are examined in the context of precipitation and flooding, and strengths and limitations of climate models are identified. The available evidence for links between global warming and precipitation and/or flooding at both local and global scales is used to conclude that the September 2013 floods in Boulder were a severe flood event and that the frequency of rainfall-driven floods such as the recent event can be expected to increase aggregated at the global scale due to global warming. Specifically, climate change may thus have contributed to both the unusual duration of Boulder's

135 Laura Pulido, "Rethinking Environmental Racism: White Privilege and Urban Development in Southern California," *Annals of the Association of American Geographers* 90, no. 1 (March 2000): 12–40, doi:10.1111/0004-5608.00182.

flooding as well as the time of year at which these events occurred. In addition to potential global-scale responses to climate change, community-based responses and local mitigation efforts to climate change related floods (and other hazards) are identified as being of critical importance. Moreover, the challenges to orchestrating an equitable sharing of the burdens arising from climate change on a global level among the world's nations (climate justice) are related to the challenges to achieving an equitable share of burdens (environmental justice) at the local scale.

6.2 Flooding in the Context of Climate Change

Regarding Boulder's flooding in the fall of 2013 as well as floods and other extreme weather events elsewhere, the question of whether climate change may be a cause for such extreme events comes to the minds of many, and is further highlighted by the media. Climate scientists often point to a flaw in the question itself, and in doing so, give a disappointing reply to the general public not trained in the scientific approach to this type of question: "Attribution is not a 'yes or no' issue as the media might prefer, it is an issue of probability."[136] An abundance of research has shown that global warming trends do influence the intensity, frequency, and duration[137] of extreme weather events such as unusual flooding. What this evidence does not, and cannot, do is exclude that *some* of these floods would also have occurred in a world without the recent warming trends. While collecting data that can be used for probability calculations is an ongoing process, enough physical science evidence and climate modeling exists today to allow robust general conclusions about global weather trends. In short, while the likelihood, or probability, of flooding is clearly increasing, it is often impossible (i) to prove that a specific

136 Dim Coumou and Stefan Rahmstorf, "A Decade of Weather Extremes," *Nature Climate Change* 2, no. 7 (July 2012): 491–496, doi:10.1038/nclimate1452.

137 Timmons J. Roberts, and Parks, Bradley C. *A Climate of Injustice: Global Inequality, North-South Policies, and Climate Policy*. Cambridge, MA: MIT Press, 2007. 9

flood event is caused by climate change or (ii) to predict specific floods in specific locations at specific times.

Carbon dioxide (emitted by the rampant burning of fossil fuels) is not the only greenhouse gas contributing to global warming: "Water vapour is the most important contributor to the natural greenhouse effect, and the amount of water vapour in the atmosphere is expected to increase under conditions of greenhouse-gas-induced warming, leading to a significant feedback on anthropogenic climate change."[138] As human society today contributes to global warming through unprecedented carbon dioxide emissions, this rise in global temperature causes an increase in conversion of liquid water to water in its gaseous form (water vapor in the atmosphere), which in turn contributes to additional increases in temperature as more heat is trapped in the atmosphere. Furthermore, and as elaborated in the following section, information about the hydrological cycle (the evaporation of liquid water on the Earth's surface to water vapor in the atmosphere and return to the surface via precipitation) can be used to predict (i) that increased levels of water vapor in the atmosphere increase the likelihood of heavy rainfalls[139] [140] and (ii) that increases in the likelihood of heavy rainfall increase the likelihood of flooding.[141]

A rapid increase in global temperature of approximately 0.2°C per decade has occurred for the past three decades[142]. The Clausius–Clapeyron equation, which states that air will hold 7% more water vapor per each 1°C of temperature increase, is consistent with the observed

138 Katharine M. Willett et al., "Attribution of Observed Surface Humidity Changes to Human Influence," *Nature* 449, no. 7163 (October 11, 2007): 710–712, doi:10.1038/nature06207.

139 Atsushi Okazaki et al., "Changes in Flood Risk Under Global Warming Estimated Using MIROC5 and the Discharge Probability Index," *Journal of the Meteorological Society of Japan. Ser. II* 90, no. 4 (2012): 509–524.

140 B. Wilhelm et al., "Does Global Warming Favour the Occurrence of Extreme Floods in European Alps? First Evidences from a NW Alps Proglacial Lake Sediment Record," *Climatic Change* 113, no. 3–4 (August 1, 2012): 563–581, doi:10.1007/s10584-011-0376-2.

141 Clare M. Goodess, "How Is the Frequency, Location and Severity of Extreme Events Likely to Change up to 2060?," *Environmental Science & Policy* 27, Supplement 1 (March 2013): S4–S14, doi:10.1016/j.envsci.2012.04.001.

142 Stern 2006 p.5 quoted in Gwilym, Pryce, and Chen, Yu. "Flood risk and the consequences for housing of a changing climate: An international perspective." Risk Management 13, no. 4 (2011): 230.

finding that the atmosphere is around 4% more moist today than 30 years ago.[143] When there is more water vapor in the atmosphere, there is consequently a greater likelihood of this additional water falling as precipitation.[144] Remarkably, global warming leads not only to an increase in heavy rainfall, but also to a decrease in moderate rainfall, which can lead to an increased frequency of drought.[145] [146] A comprehensive review of multiple precipitation models under climate change found "about [a] 100% increase for the annual top 10% heavy precipitation and about 20% decrease for the light and moderate precipitation for one degree warming in the global temperature."[147] While multiple different climate models have been constructed that vary in the quantitative extent of predicted changes in precipitation patterns,[148] the qualitative predictions of these various models are remarkably consistent.[149] [150] The qualitative results drawn from modeling, "statistical analysis of observed data," and "physical reasoning,"[151] uniformly support this trend of increased weather extremes brought about by rising average global temperature.

6.3 Boulder Flooding September 2013: Preliminary Assessment

A mere few months after Boulder's September floods, researchers are still working on compiling descriptive information about the flooding and its effects. A preliminary assessment[152] of flooding on the Colorado Front Range was compiled and released in late September 2013 by experts at the Cooperative Institute for Research in Environmental Sciences

143 Coumou and Rahmstorf, "A Decade of Weather Extremes."
144 Ibid.
145 William K.-M. Lau, H.-T. Wu, and K.-M. Kim, "A Canonical Response of Precipitation Characteristics to Global Warming from CMIP5 Models," *Geophysical Research Letters* 40, no. 12 (2013): 3168.
146 Coumou and Rahmstorf, "A Decade of Weather Extremes."
147 Chein-Jung Shiu et al., "How Much Do Precipitation Extremes Change in a Warming Climate?," *Geophysical Research Letters* 39 (September 14, 2012), doi:10.1029/2012GL052762.
148 Ibid.
149 Ibid.
150 Coumou and Rahmstorf, "A Decade of Weather Extremes."
151 Ibid.
152 Jeff Lukas. "Severe Flooding on the Colorado Front Range." (September 25, 2013). http://wwa.colorado.edu/resources/front-range-floods/assessment.pdf.

(CIRES) Western Water Assessment at the University of Colorado, the National Oceanic and Atmospheric Administration (NOAA) Physical Science Division, and the Colorado State University Colorado Climate Center. The assessment explains the flooding events as caused by unusual weather patterns, provides rainfall statistics, and reports on the relative magnitude and causation of these flooding events as compared to past floods in the area.

Boulder does have a history of flooding events, each with its own contributing factors and effects. The above-mentioned report on the fall 2013 events in Colorado points out that, rather than being driven by rain on deep snowpack or by high rainfall intensity over a short duration and small scale (e.g. thunderstorm-driven), the September 2013 floods were characterized by lower-intensity rainfall over a long duration and broader spatial extent. The fall 2013 rainfall driven flooding set record-breaking 1-day, 2-day, and 7-day rainfall totals in Boulder, and is described as a "1000-year rainfall" event.[153] On the other hand, peak hourly rainfall levels and height reached by floodwaters were well below past record levels.[154] The scientists contributing to the above-mentioned assessment of the 2013 events in Colorado tentatively conclude that, for each year, there is a probability of 1 in 100 that flooding such as experienced in September 2013 may reoccur (thus making such an event a "100-year flood"). The driving forces behind September's "unusual and persistent" weather pattern include record levels of atmospheric moisture for September and monsoonal moisture being pulled from the Pacific Ocean by a "near-stationary low-pressure system."[155] There is a possibility that climate change contributed to the timing and duration of this rainfall-driven flooding. The following section addresses the reliability with which extreme weather events can be attributed to global warming and predicted at a local scale.

153 Ibid.
154 Ibid.
155 Ibid.

6.4 Limitations in Predicting Accurate Local Trends

While the literature on climate change and flooding indicates that events like the recent rainfall-driven Boulder floods are more likely to occur in response to climate change, it is not possible to *prove* such a link for a specific event. Apart from the inability to determine absolute causation of events, there are also limitations when it comes to predicting future extreme weather events such as flooding. While it has been noted that there is a lack of observed data about past trends in Boulder,[156] even the availability of such data does not allow binding future projections due to the inability of modeling to predict specific events for specific locations at specific times as opposed to providing probabilities for such events. In addition, current extreme weather models are better at predicting temperatures than precipitation because "the higher spatial variability of precipitation requires higher-resolution modeling together with dense observational networks for calibration/validation of models and monitoring purposes"[157] at local scales. Lastly, compounding variables also limit the ability to predict local flooding outcomes: "Catchment storage, evapotranspiration and snowmelt, together with watershed and flow management and engineering practices (such as dikes and dams), and land use changes all affect flood risk."[158] While local outcomes can thus not be predicted with certainty, physical reasoning and global climate models project clearly that regions with already extreme weather patterns are going to get more extreme; drought-prone areas will get even drier and very wet areas will get even wetter. Thus an increased global *probability* of higher frequency, intensity, and duration of flooding is no longer in question. Applied to the specific case of Boulder flooding, however, the predictions are inevitably vague. Flooding in Boulder occurs with a certain likelihood even without climate change, and flood magnitude is not directly linked to, and cannot be predicted

156 Ibid.
157 Coumou and Rahmstorf, "A Decade of Weather Extremes."
158 Ibid.

from, rainfall magnitude. In addition, the incomplete historic record limits extrapolations.[159] It is, however, also important to realize that uncertainty about specific events should not be an excuse for inaction, for management practices can greatly shape the severity of damage to property and disruption of lives.

6.5 Climate and Environmental Justice

To counteract and mitigate the risk of increased rainfall-driven flooding, one appropriate response is to target solutions that address the underlying cause of global warming. However, who is most vulnerable to floods and climate change neither corresponds closely to who is chiefly responsible for carbon emissions nor to who is most able to contribute to mitigation efforts.[160] Developing nations "have suffered immeasurably more loss of life and livelihood from hydrometeorological disasters than those in rich nations"[161] who are disproportionately responsible for carbon emissions. In 2007, more than 60 percent of global greenhouse gases were contributed by the richest 20 percent of the earth's inhabitants, and the figure grows higher (above 80 percent) if past emissions are included.[162] The position of developed countries experiencing "higher standards of living and wealth"[163] and better average ability to cope with natural disasters would not have been possible without this historic emissions output.

While at least some of the developed countries acknowledge the differential responsibility and unbalanced ability to contribute to solutions among the world's nations, ongoing international efforts[164] to reduce carbon emissions are hampered by being dependent on

159 Lukas, Jeff. "Severe Flooding on the Colorado Front Range."
160 Ibid.
161 Roberts, and Parks. *A Climate of Injustice: Global Inequality, North-South Policies, and Climate Policy*. 10.
162 Ibid.
163 Fuji, 1990 and Smith 1991 cited in J. Ikeme, "Equity, Environmental Justice and Sustainability: Incomplete Approaches in Climate Change Politics," *Global Environmental Change-Human and Policy Dimensions* 13, no. 3 (October 2003): 202.
164 P. Baer et al., "Climate Change - Equity and Greenhouse Gas Responsibility," *Science* 289, no. 5488 (September 29, 2000): 2287–2287, doi:10.1126/science.289.5488.2287.

voluntary commitments to carbon-emission reductions as well as various current limitations to the ability to achieve these reductions. At the same time, "transfer of wealth, relevant technologies, scientific knowledge, management and adaptation skills" from developed to developing countries is expected by the global community[165] in recognition of the differential vulnerability and ability to invest in mitigation. It becomes clear that international policies needed to tackle both (i) the human behaviors contributing to global warming and (ii) the limits in technological, economic, social, and political capability of states to respond to, and try to prevent, natural disasters through mitigation.[166]

Differential vulnerability and unequal ability to defend against and cope with extreme weather events exists not only on a global scale, but also at local scales. An effort to achieve climate justice is thus paralleled by an effort to achieve environmental justice in specific communities. The fact that people of color in New Orleans were disproportionately exposed to flooding caused by Hurricane Katrina and were least able to recover from the disaster's effects is a well-known example. Is it possible that the Boulder flooding and its aftermath is, likewise, being experienced differently by different populations? Even if geographic proximity to flooded areas were to turn out to be unaffected by socioeconomic or minority status in the case of the Boulder or larger Colorado flooding events, the question of a potential differential ability depending on socioeconomic or minority status to recover from flooding-induced property damage and loss of belongings should be further investigated in the longer term recovery efforts. Like at the global scale, it needs to be ascertained at the local scale who is worst affected and who has the resources to contribute to solutions in order to devise the best corrective course of

165 J. Ikeme, "Equity, Environmental Justice and Sustainability: Incomplete Approaches in Climate Change Politics," *Global Environmental Change-Human and Policy Dimensions* 13, no. 3 (October 2003): 195–206, doi:10.1016/S0959-3780(03)00047-5.

166 Tim Forsyth, "Climate Justice Is Not Just Ice," *Geoforum*, accessed October 28, 2013, doi:10.1016/j.geoforum.2012.12.008.

action to prevent and mitigate the effects of extreme weather events.

6.6 Summary and Outlook

Boulder experienced extreme rainfall-driven flooding in September 2013 due to record levels of precipitation occurring over extended time in connection with high atmospheric moisture levels late in the season. Although these flooding events cannot be unequivocally attributed to global climate change as their cause, there is a high probability that global trends of increased moisture in the atmosphere are related to an increase in the frequency, intensity, and duration of rainfall-driven flooding events. Irrespective of the influence of climate change, local history indicates that Boulder should expect to flood again. The Boulder floods of September 2013 and the possibility of future floods provide more than enough reason to investigate and address any differential vulnerabilities and abilities to mitigate among Colorado's constituents.

IV. Research Findings

(1) Demographics of Boulder: Minority & Immigrant Populations

1.1 Introduction

As was explained earlier in this paper, racial and ethnic minorities, our focus being people of color and immigrants, frequently live in undesirable and often hazardous locations. For many of these populations, the physical likelihood of being hit and affected by a natural hazard is high. In the case of the recent floods, it is essential to realize that Boulder sits on a floodplain. Being at the base of the Rocky Mountains there are many, roughly twenty, large creeks that flow from the foothills down through Boulder out into the plains. In addition to having many offshoots, several of the creeks congregate together to form the large Boulder Creek in the center of town (see Appendix A). Logically, some parts of the city are at much more risk than others

based on both the natural physical topography and the built landscape. Our goal here is to discuss where in Boulder racial and ethnic minority populations have historically lived and where they live currently. We will then examine the location of the floods. And finally, we will discuss the floods in light of the affected populations–was it minority populations living in the floodplain?

1.2 Brief History of Boulder

The Pikes Peak Gold Rush of the 1850s bought thousands of gold prospectors across the Mississippi to the Rocky Mountains and then down into the wild western plains of Colorado. The land became dotted with new towns. One of these towns, Boulder, built right up against the base of the Rocky Mountain foothills, was founded in 1858 and quickly transformed into an ever growing, increasingly prosperous city. Demographically the city was home exclusively to Anglo-European pioneers. The city remained racially homogenous until 1880 when thirty African Americans moved into an area known as Goss-Grove.[167]

1.3 Goss-Grove

The Goss-Grove is the area bordered by Canyon Boulevard to the north, 23rd Street to the east, Goss Street to the south and 19th Street to the west. A tiny area, Goss-Grove is only about ten square blocks. First settled by the African American families of James Hall, Henry Stevens, and Oscar White in 1880, Goss-Grove became the place where racial minority populations lived within Boulder.[168] For over one hundred years, until the 1950s when a new minority group of Hispanics moved into the area, the "neighborhood" was home to Boulder's African American community and a large Swedish-German immigrant population.[169]

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167 Boulder History Museum, "A Boulder Timeline," *Boulder History Museum*, n.d., http://boulderhistory.org/timeline.asp.

168 Christine Whitacre and R. Laurie Simmons, *1985/1986 Boulder Survey of Historic Places* (Boulder, Colorado: Front Range Research, Inc., August 1986).

169 Diane R. Mayer, *The Goss-Grove Neighborhood: a Unique Preservation Opportunity*, History (Boulder, Colorado: The Goss-Grove Neighborhood Association, May 16, 1985).

Known as the "other side of the tracks," Goss-Grove was both an undesirable and hazardous place to live. Built right in the center of the Boulder Creek floodplain and below water level, the area was often flooded. This was made worse by the railroad that ran next to the street. The area was extremely dirty. There was substandard housing. The streets remained unpaved until 1980. The homes were built outside of code. The streets lacked drainage. Trash was not collected. Goss-Grove was where the poor lived.[170]

1.4 Current Racial Demographics

In 2013 Boulder remains an exceptionally white city. According to the "Profile of General Population and Housing Characteristics: 2010" conducted by the United States Federal Census Bureau, Boulder's population was 90.4% white in 2010. Only 0.4% of the population was African American. Ethnically 8.7% of residents considered themselves to be Hispanic or Latino/a of any race.[171] These percentages have been projected to remain roughly stable through 2015 with the Hispanic or Latino/a population increasing to 10%.[172]

The African American population in Boulder is miniscule when compared the entire state of Colorado. Similar to the rest of the mid-western states, Colorado's African American population is 4% of the total population.[173] Why then are their so few African Americans in Boulder? One argument is that Boulder, as a space of hegemonic whiteness, is not a welcoming or comfortable location for African Americans to be. Rather, Boulder is an exclusive and hostile city. A second argument, however, reasons there are a lack of African Americans in Boulder due to an overabundance in the town of Greely and the surrounding areas of Weld County. In 1910 Oliver T. Jackson, an African American man who had traveled west with the gold rush, founded

170 Christine Whitacre and R. Laurie Simmons, *1985/1986 Boulder Survey of Historic Places*.
171 U. S. Census Bureau, "American FactFinder - Results," accessed December 2, 2013, http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk.
172 Boulder History Museum, "A Boulder Timeline."
173 Bureau, "American FactFinder - Results."

Dearfield. The small farming town attracted over 700 hundred people of color by 1921.[174] People were attracted to Dearfield in part due to the ideas presented in the first argument above, Boulder's hegemonic whiteness. While Boulder was not physically segregated, Burgess Drugstore was the only store in all of Boulder that offered lunch service to the local African American residents until after the mid 1950s.[175] Ruth Cave Flowers, a young black woman living in Boulder in the 1930s recalled, "Everything in town was off-limits to them."[176] Although Dearfield crumbled into a ghost town by 1940 with successive years of drought, the African American community remained strong in the neighboring town of Greely. Today Greely's African American community constitutes over 5% of the total population.[177]

Traveling back to Boulder, it has been hard to pinpoint where racial or ethnic minority populations might be concentrated within the city. There seems to be general consensus that many Hispanics or Latino/as live in the Goss-Grove area despite any hard data.[178] Today Goss-Grove is a rent-dominated area with over 90% of properties owned by owners living elsewhere.[179] It is likely that assumptions about Hispanics or Latino/as being uneducated and not well off have propelled ideas about them living in the cheap area of Goss-Grove; according to Figure 4 it costs $604.000001 - $800.00 a month to rent there. Boulder Housing Partners claim that Hispanics or Latino/as live scattered throughout the city rather than in one concentrated area. And Erica Meltzer, a writer for the Boulder Daily Camera, comments that Boulder County's

174 Carol Taylor, "Boulder's Jackson Founded Dearfield 100 Years Ago," *The Daily Camera*, September 19, 2010, sec. Boulder County History.
175 Christine Whitacre and R. Laurie Simmons, *Survey of Historic Places: Whittier, West Pearl, Downtown*, Land and Demographic Survey (Boulder, Colorado: Front Range Research, Inc., 1988).
176 Christine Whitacre and R. Laurie Simmons, *1985/1986 Boulder Survey of Historic Places*.
177 Bureau, "American FactFinder - Results."
178 *Boulder Minority Resource Directory* (Chamber of Commerce (information provided by U.S. Census Bureau), 1991).
179 Christine Whitacre and R. Laurie Simmons, *1985/1986 Boulder Survey of Historic Places*.

Hispanic or Latino/a population has moved out of Boulder and into Longmont.[180] There is still a small population within the city of Boulder, but only a small spread out population.

Although still not an overly desirable location, and still susceptible to flooding, the United States Federal Census Bureau reports Goss-Grove to be predominately white. There is a point to be made, however, that many university students live in the area and are likely more vulnerable in the face of hazard recovery than a economically independent individual or homeowner would be; a renter is in the hands of his or her contract and landlord's actions.[181]

1.5 The Floods

The September 2013 floods hit large portions of Boulder and Weld counties. While other cities and towns within Boulder County were devastated far beyond the extent of anything in Boulder, the city was still greatly affected by the natural hazard: flooded homes, schools and business closed for weeks, debris covered roads. (Appendix A shows the preliminary report of the extent of flooding based on crowd source data.) While all of Boulder experienced the floods, some areas were hit harder than others. At this point in recovery there is little data to draw on besides the number of instances of damages reported. Based on these instances there are two areas that appear to have suffered significantly in the face of the floods. The two neighborhoods are Arapahoe Ridge on the eastern edge of Boulder and Whittier in the central/downtown area.

1.6 Arapahoe Ridge

Arapahoe Ridge was built in the 1950s.[182] While the majority of Boulder hosts a wealthy population with people earning in the triple digits, Arapahoe Ridge's median annual income is 26,862.0001 – 42,361.00 dollars (Figure 1). Renters also dominate the area. There were forty-

180 Erica Meltzer, "Immigrant Population Stays Flat: Neighborhoods See Increases That May Reflect Integration.," *Boulder Daily Camera*, December 19, 2010, sec. Boulder County Demographic.
181 University of Colorado, Boulder, "Learn About Boulder," *Off-Campus Housing & Neighborhood Relations*, n.d., http://ocss.colorado.edu/content/learn-about-boulder.
182 Boulder History Museum, "A Boulder Timeline."

two reports of damage in the area, second only to Whittier neighborhood. Whether Arapahoe Ridge has low property prices due to the risk of flood is unclear, but, regardless, the neighborhood is home to a vulnerable population in the face of recovery: low-income renters.

1.7 Whittier Neighborhood

With the most reports of damage at 82 (see Figures 1-4, below), Whittier neighborhood is the zone bounded by 18th Street to the west, Walnut (previously Front) Street to the north, 25th Street to the east and Bluff Street to the south.[183] Whittier shares many of the same demographic characters–median annual income and cost of rent per month–of Arapahoe Ridge and is also roughly the same size in area. Why then does Whittier have so many more reports? There are many possibilities including that more people reported an instance of damage for whatever reason (again there are many possibilities as to why someone would or would not choose or have the chance to report). Topography might have played a hand in the number, but referring to a map of the flooding extent by the City of Boulder (Appendix A), this seems unlikely as the flooding was actually more severe in Arapahoe Ridge. If we look at Figure 4, however, it can be seen that there are 6.133001 – 10.963520 dwelling units per acre in Whittier, as opposed to 2.037256 – 6.133000 in Arapahoe. Boulder has long had a policy restricting building height so when there are more dwelling units per acre it is not that the area is vertically dense, but rather the area is simply incredibly dense.[184] Historically Whittier housed "former mayors, attorneys, and business leaders" and was considered the rich-hub of Boulder. After the Great Depression the Works Projects Administration converted numerous houses into rentals with the hopes of

183 Christine Whitacre and R. Laurie Simmons, *Whittier Neighborhood History and Walking Tour Guide*, Land and Demographic Survey (Boulder, Colorado: Front Range Research, Inc., May 1989).
184 Boulder History Museum, "A Boulder Timeline."

generating more income for the owners.[185] The rental trend stuck and continues today. As a result, it was again vulnerable low-income renters in the area hit by the floods.

1.8 Discussion with Regards to Flooding

There does not appear to have been any environmental injustices in regards to people of color or immigrants living in undesirable or hazardous locations in the City of Boulder. Instead it appears that it was white low-income renters who were most affected by the floods. While not necessarily the first group to come to mind, this is a vulnerable population for the reason mentioned above in the Goss-Grove section: renters are in the hands of their contract and landlord. It is also important to consider that, while there appear to be no directly visible acts of environmental *racism*, it does not mean there are not other structural barriers restricting racial or ethnic minority groups' access to resources and recovery help. Through our research we have found it extremely challenging and frustrating to navigate recovery websites. Just trying to locate the phone number for city organizations can be a twenty-minute process. Not everyone has the time, speaks English, or has the money for repairs or displacements costs. An individual must also fit certain requirements to receive aid; many people will be considered too wealthy for financial aid despite not having the money necessary for replacing a sump-pump, removing mold, or fixing structural damage. We address these concerns in the final section of this report.

(2) Maps and Figures

Generated using Esri Geographic Imaging Systems, the following maps plot the 100 year and 500 year floodplains as identified by the City of Boulder against median annual income, the cost to own or rent property, and dwelling units per acre. All demographic information is sourced

185 Christine Whitacre and R. Laurie Simmons, *Survey of Historic Places: Whittier, West Pearl, Downtown*.

from the census of 2010. Also plotted are the number of reports of flood-related damage as identified by the City of Boulder's crowd sourced online map.

This exercise was undertaken in an attempt to reveal correlations between the 100 and 500 year floodplains, median annual income, the cost to rent or own property, dwelling units per acre, and the number of reports of flood-related damage. Alone, any correlations illustrated by these maps do not necessarily signify causation. Furthermore, any relationships that may exist between median annual income, the cost to rent or own property, or dwelling units per acre and the minority populations studied by this paper are similarly indirect. The results of this exercise will be weighed against the rest of the presented information in the findings section.

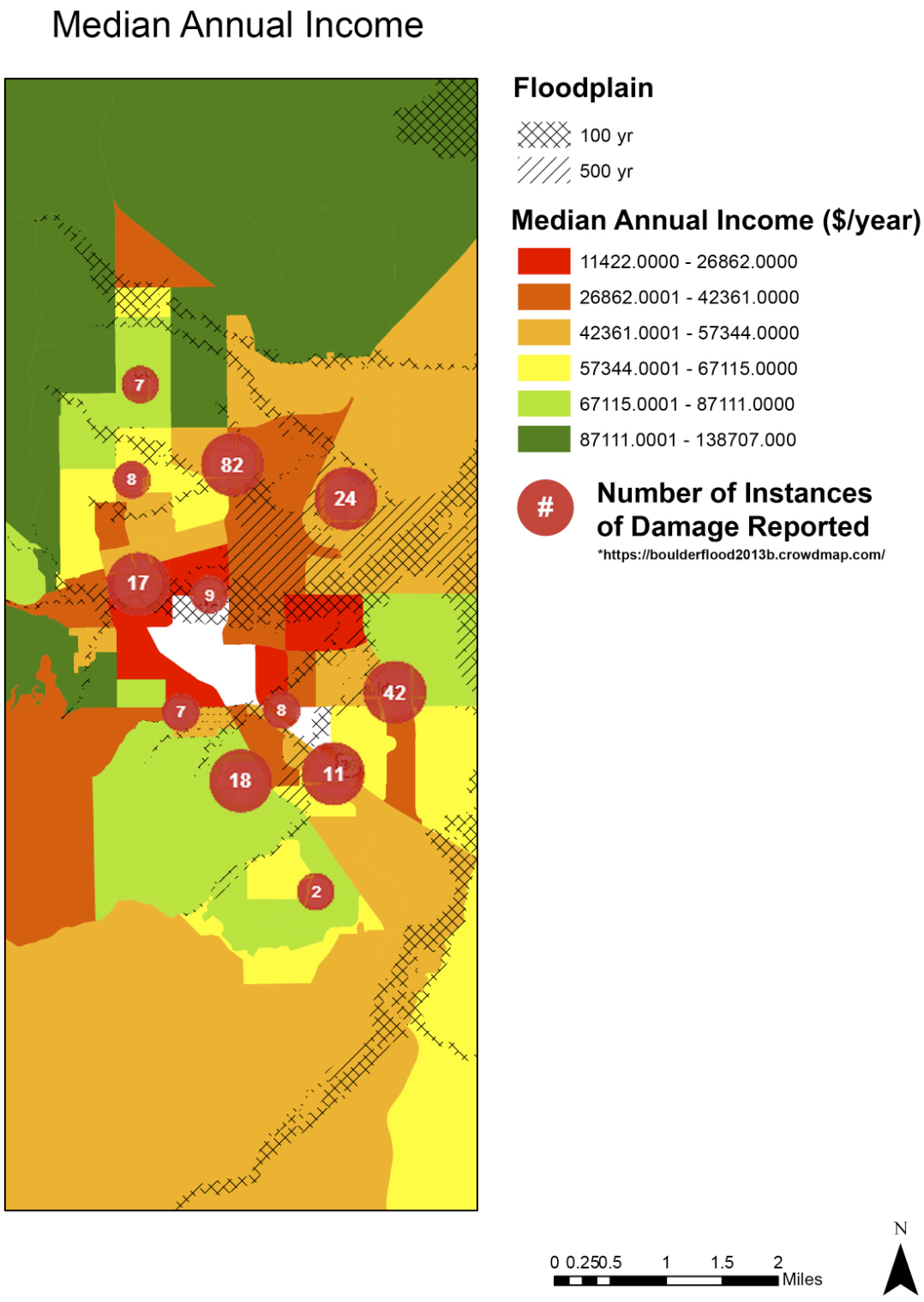

Figure 1. Median Annual Income.

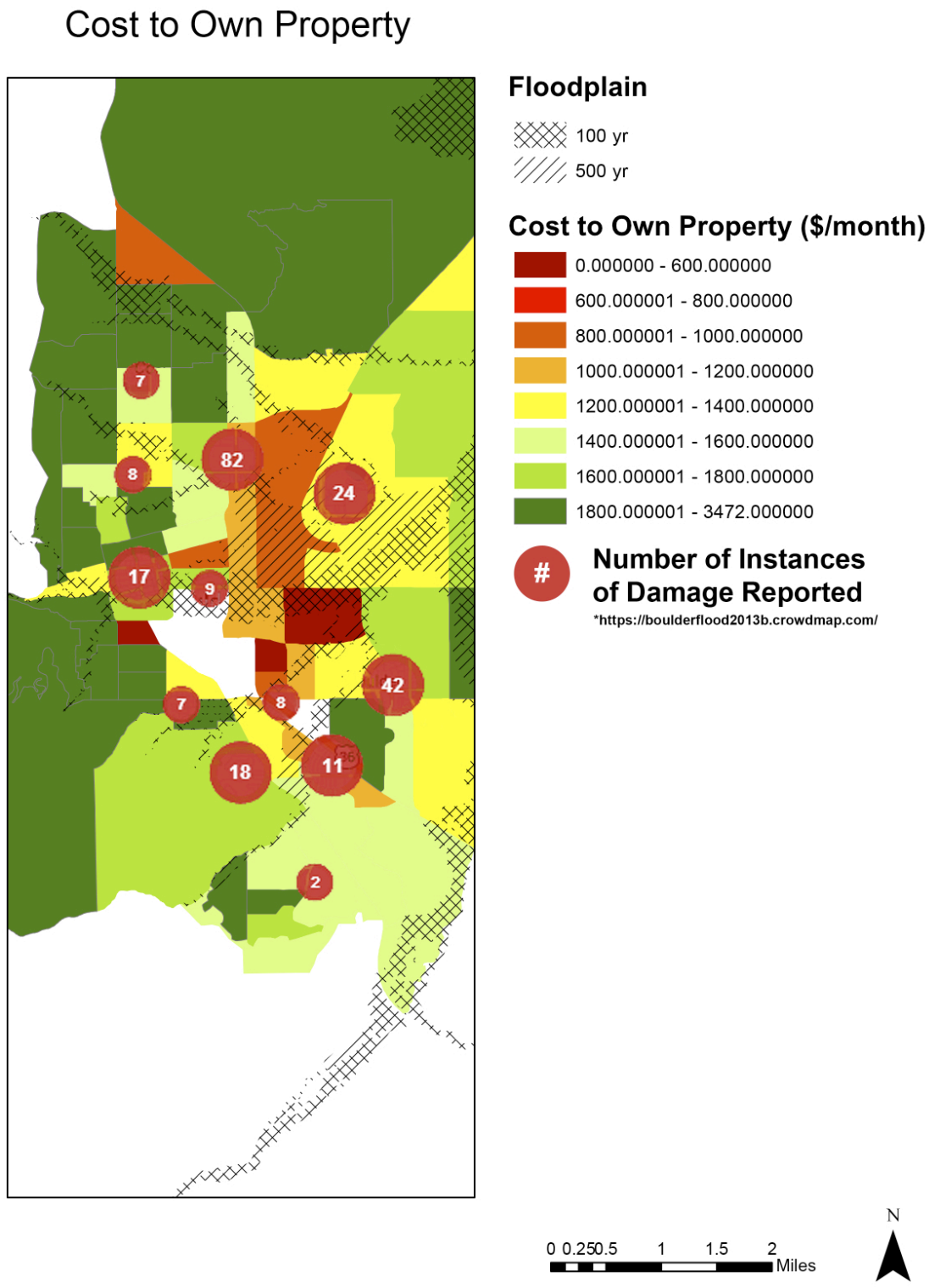

Figure 2. Cost to Own Property.

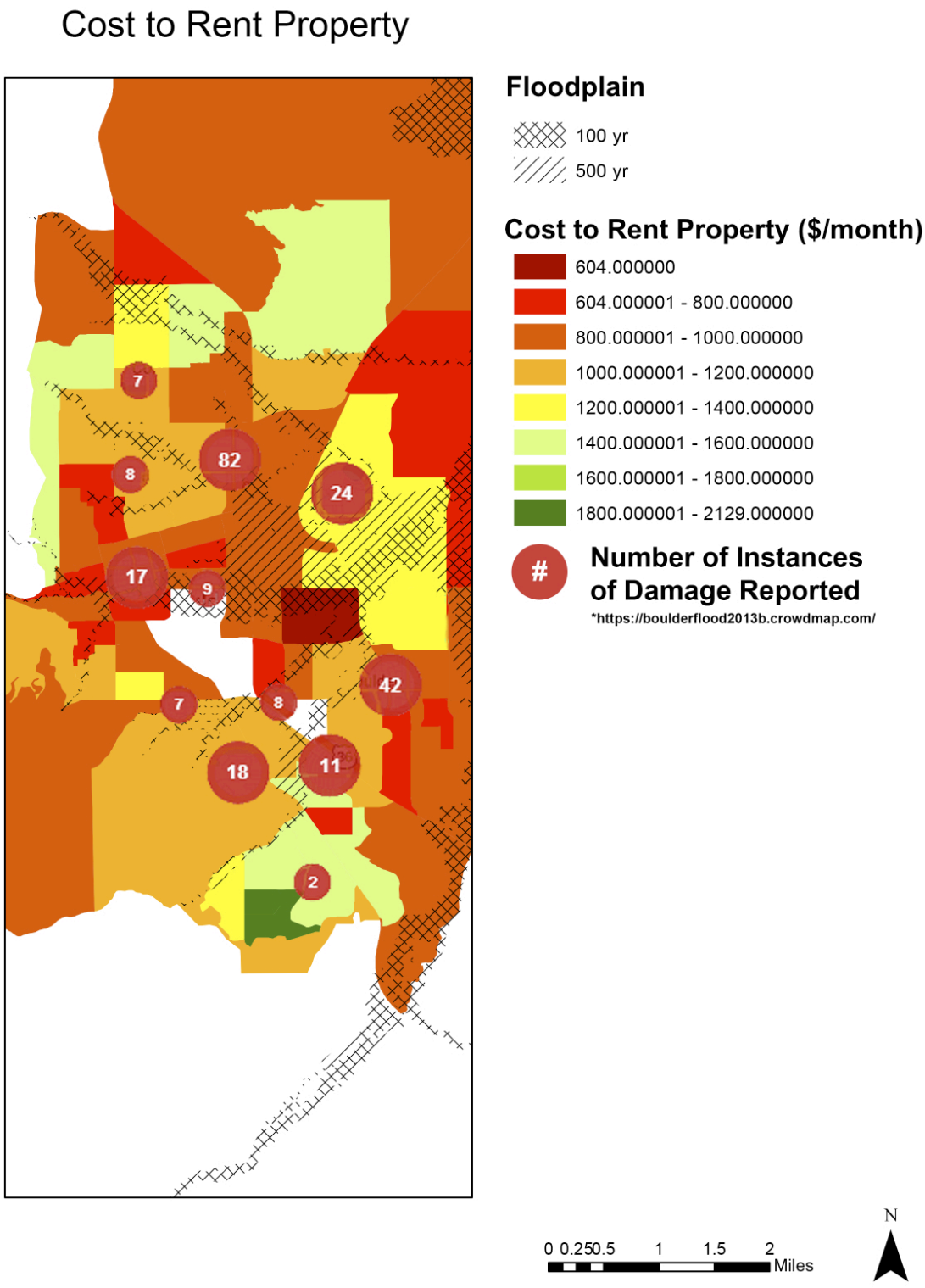

Figure 3. Cost to Rent Property.

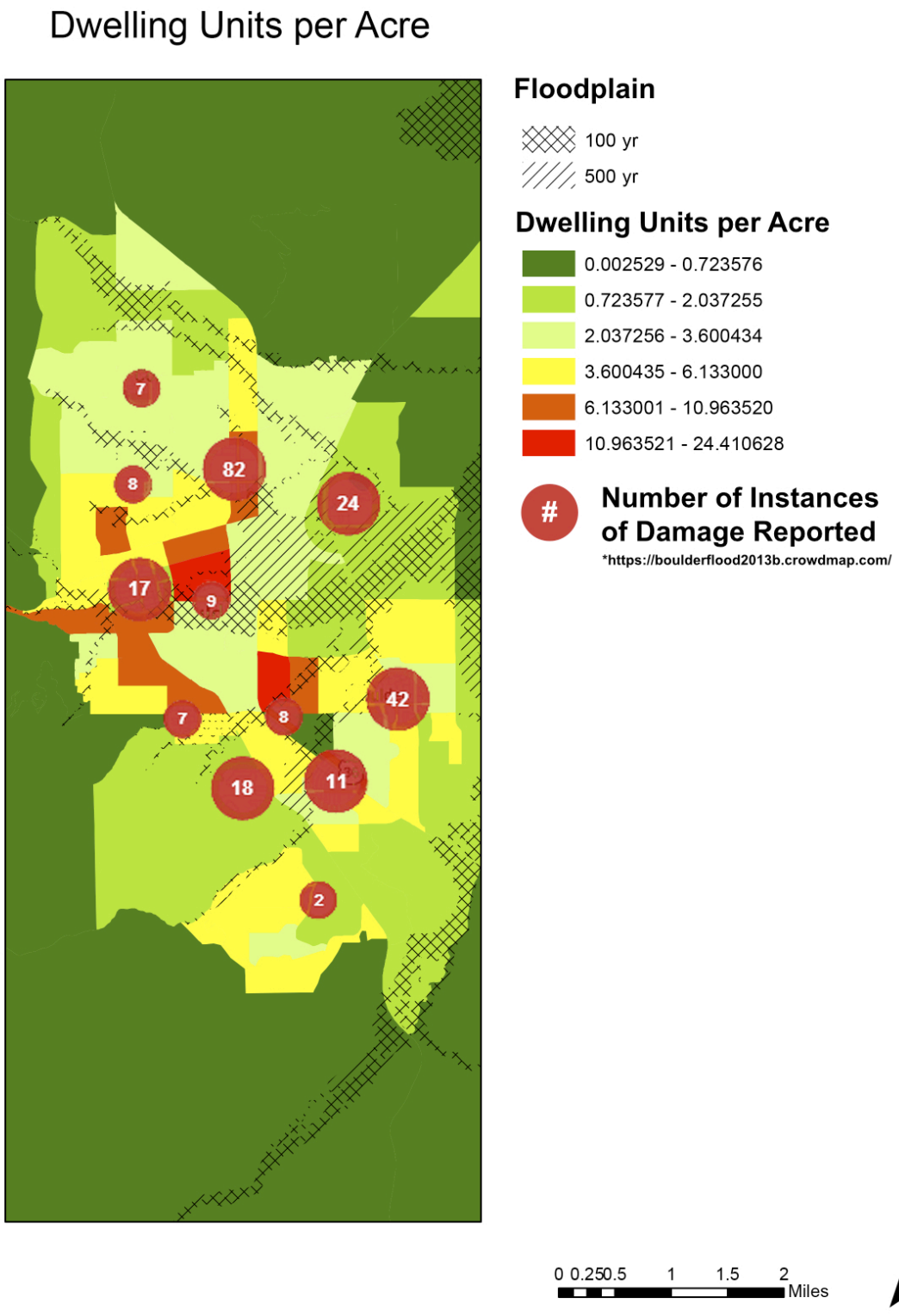

Figure 4. Dwelling Units per Acre.

(3) A Historical Overview of Flood Mitigation in Boulder, Colorado

Since its early settlement, Boulder has been prone to flooding. Because of its proximity to the mountains, the city is subject to flooding from fifteen major drainage ways. In May 1894, Boulder experienced severe and devastating flooding which prompted a need for flood mitigation planning. Although flood mitigation efforts were first met with resistance by the community, Boulder successfully implemented structural changes and regulations as well as non-structural policies and programs allowing the city to be prepared at the 100-year flood level.

Even from its initial settlement in 1858, Boulderites knew about the flood potential inherent in their landscape yet held to the belief that they would not be affected. Although Boulder was not initially intended to be a permanent destination for settlers, the prospects of gold lured people to the area. When the first mining party arrived, they were warned by Bear Head, an Arapaho chief whose people had inhabited the land for two hundred years, that a terrible flood foreseen in his dream visions was coming.[186] Although the warning was likely meant to scare off the settlers from the native's hunting ground, the threat validates the knowledge and history of flooding. As more and more people arrived, Boulder was described as "a hideous collection of frame houses on the burning plain."[187] Little was done to adopt civic improvement measures. In fact, Boulder "gained the reputation for giving an argument to almost every proposal."[188] During the early 1900s, however, two measures were implemented acknowledging the danger of the surrounding creeks. The first, which may have been unintentional, was the high price of housing along Boulder Creek.[189] At the time, no one had enough money to pay five cents to ride the streetcars let alone buy a house by the creek. Secondly, in 1908, Barker Dam and Reservoir was

186 Phyllis Smith, *History of Floods and Flood Control in Boulder, Colorado* (City of Boulder Colorado, 1987), 11.
187 Ibid., 3.
188 Ibid.
189 Ibid., 4.

built twelve miles upstream.[190] Although water does occasionally spill out of the dam, it serves to decrease the flow from snowmelt before plunging into the valley. Despite these few preemptive measures put into the city's plans before the flood of 1894, the fluctuation in settlement left Boulder relatively unprepared for major flooding.

The flood that occurred at the end of May in 1894 devastated the city of Boulder. The *Denver Republican* summed up the situation as "waterspout after waterspout breaking on the hillsides...adding to the fearfully swollen streams."[191] For five days, Boulder was completely cut off from the outside world. Even within Boulder, there was no way to cross Boulder Creek, which separated north and south Boulder. Farmland was covered with poor, silty soil, irrigation pathways were ruined, and mine shafts filled with amounts of water rendering them unrepairable.[192] In the midst of disaster, however, Boulder maintained its character. The northern half of Boulder, where most people lived, experienced a temporary beer famine until "the brewery employees, by means of rope, hoisted kegs of beer across the creek."[193] Despite these somewhat comical anecdotes, Boulder faced $725,000 in damages. After the flooding subsided, it was estimated that the peak discharge was 7,400 cubic feet per second (cfs).[194] Although most functions returned back to "normal" five days after the flood, the city council decided to "declare the necessity of certain improvements by reason of casualty in the City of Boulder and making an appropriation therefore."[195] Unfortunately it took a serious incident to initiate change, and the City of Boulder chose to heed this warning by putting forth efforts to change and adapt to rather than just rebuild. It instigated meetings, proceedings, and efforts to progress in flood mitigation that would last many decades.

190 Ibid., 7.
191 Ibid., 15.
192 Ibid., 24–5.
193 Ibid., 23.
194 Ibid., 30.
195 Ibid., 29.

As an initial response to the 1894 Flood, the City of Boulder and Corps of Engineers developed the first mitigative measures which legally defined the flooding behavior in Boulder as a basis for scientific investigation and city proposals. Besides building barriers along the creek banks, which is documented as the first mitigative move, the council defined "flood frequency" and "flood of record." Flood frequency refers to the recurrence interval, or the percent chance that a flood may occur in a given year.[196] For instance, a 100-year flood has a 1% change of occurring randomly in any given year. In this sense, "probability of flooding should not be confused with possibility"[197]; it is possible but not probable that a flood of a given magnitude could occur in any year. As discussed below, this 100-year flood classification is used to define the floodplain and the regulations for development. The flood of record refers to the largest flood for a given stream. In the case of Boulder Creek, the flood in 1894 is the historical flood of record.[198] By establishing this terminology, Boulder was able to forward their mitigative efforts by hiring landscape architects, engineers, geographers, and by passing ordinances and extending public education.

One of the first architects whom the Boulder City Improvement Association (a private group of Boulder citizens), contracted was Frederick Law Olmsted Jr. (son of Olmsted Sr. who designed New York City's Central Park).[199] In his report, Olmsted Jr. offered four main suggestions. The first of these suggestions was to "keep good records in order to understand future flood possibilities."[200] The second aspect of Olmsted's report consisted of his outlines for structural changes to the Boulder Creek channel. In the end, hedid not recommend these changes, however, because of their poor economic feasibility (the expenses were more than the potential

196 Sherry D. Oaks, *Floods in Boulder County, Colorado: A Historical Investigation* (Natural Hazards Research and Applications Information Center, 1982), 8.
197 U.S. Army Corps of Engineers, "Boulder's Flood Protection Decision--A Choice to Live With...," 1977, 3.
198 Sherry D. Oaks, *Floods in Boulder County, Colorado: A Historical Investigation*, 50.
199 Phyllis Smith, *History of Floods and Flood Control in Boulder, Colorado*, 33.
200 Ibid.

flood damage costs). The third suggestion was the development of Boulder Creek "Park."[201] This would not be a "highly polished and exquisite [park] with costly flowers and other decorations" but a recreational ground that would serve as an overflow site for flood water. The last recommendation that Olmsted Jr. observed was the need "to act now to restrict construction in the broad flood plain."[202] As said by Olmsted's successor Gilbert White, "Floods are acts of God but flood losses are largely acts of man." Although Olmsted Jr. presented some valuable ideas, the council did not adopt his plans marking the beginning of a "65 year search for solutions."[203]

Following Olmsted Jr., engineers from the Boston firm Metcalf and Eddy were hired again by the Boulder City Improvement Association to examine sewage and drainage of Boulder Creek. Metcalf and Eddy proposed two main changes. First, they recommended that a "depressed channel" be built at the "center of the natural waterway."[204] This would give the creek more vertical volume and direct the current. In addition to the channel, Metcalf and Eddy proposed "further straightening, deepening, and widening of Boulder Creek."[205] Unlike the Boulder Creek's current pathway, the Creek was much more constricted in size and directed around sharp corners. Despite these valid recommendations, the council again shelved the report and nothing was implemented. Years later in 1944, S. R. DeBoer, a parks specialist, submitted another report to council. He warned that Boulder Creek's bridges were too low and would catch debris in a flood and proposed that Boulder acquire property rights to Boulder Creek, build flood walls, and construct another dam upstream.[206] DeBoer also urged the council to apply for government funding through the newly passed Flood Control Act of 1939. Although nothing was done in response to his report, it helped to promote action within the next year.

201 Ibid., 34.
202 Ibid.
203 Ibid., 35.
204 Ibid.
205 Ibid., 36.
206 Ibid., 44.

In 1945, the Corps of Engineers completed the first comprehensive study of the South Platte River basin, which proposed a new set of flood-control projects. From this study the Corps of Engineers proposed five main adjustments to the tributaries in Boulder designed to handle a flood equal to the flood in 1894. First, they proposed straightening the main creeks in Boulder–eliminating the sharp turns where flood water would overflow. Then they proposed new revetment which involved lining the waterways with cement walls. Third, they suggested multiple bridge adjustments, including: building, removing, and reconstructing bridges along the creek. Fourth, they recommended that about 50 houses and commercial buildings be relocated off or removed from the floodplain. Lastly, they urged the construction of setback levees which would create a major city boulevard.[207] Unlike past plans, this proposal was authorized for construction. The people of Boulder, however, did not support a federally sponsored project and it joined the accumulating collection of flood proposals–on the shelf. Although this was the first time Boulder had the opportunity to begin mitigation implementation, the public's attitude towards federally funded development squandered the efforts.

Hoping to keep Boulder localized and "hidden" from outside investors, Boulderites stubbornly opted to neglect flood mitigation operations. With a large population growth from 1930 to the 1950s, residents were tentative to involve federal authorities. As Smith recounts, "they stubbornly clung to their vision of a small, unchanging community. Thus, instead of addressing themselves to growing civic problems–flood control included–they often elected to do nothing at all."[208] According to University of Chicago geographer Gilbert White's studies, the population by 1950 had increased by 78% since 1930. Along with this increase in population, the

207 Gilbert F. White et al., "Changes in Urban Occupance of Flood Plains in the United States" (University of Chicago, n.d.), 96.
208 Phyllis Smith, *History of Floods and Flood Control in Boulder, Colorado*, 48.

potential for flood damage increased by at least 38%.[209] New and old residents took on one of three main mindsets, the first being the belief that though there may have been a flood risk in the past, it not longer existed.[210] The second was that "flooding is a risk well worth taking,"[211] particularly when developing the floodplain. The final belief was ignorance towards the entire flooding situation. According to Smith, "New residents in the area had never heard of the flood of 1894."[212] With the public's disbelief and distrust that state and federal spending would make a difference, hardly any progress was made.

Unfortunately, progress was minimal until another wake-up call emerged. In June of 1965, the South Platte River flooded, devastating the city of Denver and causing $325,000,000 in damages.[213] As a result, council members hired Gilbert White to, once again, study the flood hazard in Boulder. Different from some of the previous reports, White's report suggested changes in the city's zoning, including: no further construction would be permitted in the floodway, buildings in the floodway must be flood proofed, and adoption of a flood warning system.[214] Finally in Ordinance 3505, "floodway and flood storage areas were defined."[215] Additionally, based on the 100 year flooding predictions, areas that would encounter two or more feet of floodwater were subject to "mandatory flood-proofing requirements."[216] In subsequent ordinances, flood maps, radar installation, early warning systems, floodplain regulations and drainage plans were initiated. Although the progress wasn't drastic, progress was happening.

In 1976, another major flood missed Boulder by 35 miles. Named the Big Thompson, this flood killed 139 people and caused $35 million in damages. This devastation served as another

209 Ibid.
210 Gilbert F. White et al., "Changes in Urban Occupance of Flood Plains in the United States," 97.
211 Ibid., 99.
212 Phyllis Smith, *History of Floods and Flood Control in Boulder, Colorado*, 48.
213 Ibid., 53.
214 Ibid., 55.
215 Ibid., 56.
216 Ibid.

warning to Boulder. After the flood, the Boulder city council commissioned Leonard Rice Consulting Water Engineers, Inc. to plan and implement a warning system.[217] In addition to the warning system, rainfall and river gauges were installed, channels were redone to decrease the size of the floodplain, and the predicted peak discharge for a 100 year flood was established as 12,000 cfs.[218] A few years later in the mid-1980s, along the lines of Olmsted Jr's. suggestions, Boulder moved towards "respecting, and restoring, where appropriate, the Creek corridor ecology."[219] To meet this guideline, Boulder acquired creekside property, created continuous pedestrian and biking paths, and installed snap-away bridges (so they would not fully detach in a flood, rather snap to the other side of the river).[220] Additionally, Boulder established deep pools at intervals along the river and a kiddy fishing pond. These measures were very successful and are still present today. Finally, after years of deliberation, Boulder was implementing sound flood mitigation structures.

Today, most of Boulder's flood mitigation measures involve maintaining well working structures as well as keeping the public attuned to the possibility of flooding. The Floodplain Management Program in Boulder works by five main mitigative principles: 1) preserve the floodplains, 2) be prepared for floods, 3) help people protect themselves from flood hazards, 4) prevent adverse impacts and unwise uses in the floodplain, and 5) seek to accommodate floods, not control them.[221] To preserve the floodplain, the city is active in acquiring open space and constructing "greenways" to not only preserve the natural habitat but also establish pedestrian pathways throughout the town. To enhance preparedness for floods, the city takes special measures to carefully map the floodplain in accordance to FEMA's standards, improve early

217 Ibid., 75.
218 Ibid., 76.
219 Ibid., 83.
220 Ibid., 84.
221 City of Boulder Department of Public Works and AMEC Environment and Infrastructure, Inc., *City of Boulder, Colorado Multi-Hazard Mitigation Plan*, 2012, 4.195.

flood warning systems (during the flood season, Urban Drainage and Flood Control District contracts a "24-hour meteorologist" to monitor stream and rainfall gages as well as give forecast updates during extreme weather.[222] Additionally, the City of Boulder set up cameras along Barker dam and Fourmile Creek to monitor water flow. To help people protect themselves from flood hazards, Boulder promotes flood safety through awareness and educational outreach. During peak flood season, Boulder distributes flood notifications through the newspaper, utility bill inserts, and door hangers in high risk neighborhoods. The city also maintains an updated online reference at www.boulderfloodinfo.net. In 2011, the Gilbert White Memorial Flood Level Marker was installed in Central Park. This serves to remind and promote awareness of Boulder's history of flooding. In addition to education, Boulder is part of the Community Rating System (CRS) through National Flood Insurance Program (NFIP) which, through FEMA, provides policyholders a 20% discount for flood insurance in special flood housing areas.[223] By the city's continuing to regulate urban growth on the floodplain, maintain bridges, remove vulnerable buildings, and fund bank stabilization projects and channel widening projects,[224] Boulder Creek is "one of the most carefully documented [creeks] in the United States."[225]

In light of the flooding in Colorado this year, the City of Boulder, although affected by the flood, seemed sufficiently prepared for the flood in terms of mitigative policies and proper structures. Although Boulder's history of flood mitigations is a story of unimplemented studies and proposals, in the last 40 years Boulder has made significant advances in terms of innovation and implementation. In mitigating its potential flood loss, the City of Boulder has preserved its "natural, earthy" landscape yet manipulated it enough to recover quickly after flooding disasters.

222 Ibid., 4.197.
223 Ibid., 4.195–4.196.
224 Anderson Consulting Engineers, Inc., *Boulder Creek Floodplain Mapping Study*, 2013, 1.
225 Phyllis Smith, *History of Floods and Flood Control in Boulder, Colorado*, 90.

(4) Population Impacts and the Recovery Process

4.1 Introduction

In order to determine whether differential vulnerability was exhibited during the September flooding in Boulder, we had to determine who in Boulder was most impacted by the floods and in what ways they were impacted. Additionally, we wanted to identify who was having difficulty recovering from the floods and what challenges they faced in the recovery process. Based on our findings, it seems differential vulnerability was not exhibited during the flooding itself; rather, differential vulnerability was evident in the recovery process. In this section, we will explore how individuals were impacted by the floods and what characteristics exacerbated the challenges they faced to recovery. Additionally, we will identify the greatest obstacles faced by both flooding victims and organizations conducting flood relief in the recovery process, analyze flood recovery cycles, and explore the difficulties we encountered in our data collection.

4.2 Scale

While the focus of our paper is on the City of Boulder, we did obtain some information on different areas of both the county and state during our interviews and data collection. Incorporating this additional information can provide valuable perspective by situating the impacts of the flood in Boulder within a larger context. Relevant outside information will be included in the sections below where appropriate.

In comparison to other areas in the state, our research suggests that Boulder may have been more well-equipped than other places in Colorado to handle the flooding and recovery efforts. Sonia Marquez, Northern Coordinator for the Colorado Immigrant Rights Coalition, said that originally the focus of her post-flood work was in Boulder, but quickly shifted to Weld

County and Littleton, the reason being that Boulder seemed to have more resources for recovery that were widely available versus Weld County that had a perceived greater degree of physical damage, higher concentrations of marginalized populations, and fewer resources than Boulder to cope with the flooding.[226] In addition to Marquez, we interviewed several non-profit organizations helping with flood relief including Foothills United Way. In the wake of the flood, Foothills United Way started a flood relief fund which to date has given over a million dollars to organizations in need of additional funds for providing flood recovery support. Doug Yeiser, President and CEO, and Heather Spencer, Marketing and Communications Director, seemed to share this sentiment that Boulder was relatively well-equipped for flood relief and has mobilized resources to help expedite the recovery process. According to Yeiser, in the days following the flood the City and County of Boulder as well as non-governmental organizations (NGOs) in the area came together and were in frequent communication. Together, they have worked to identify need, determine what support different organizations are offering, and start to identify what needs remain unmet.[227] All of this has been done in collaboration with FEMA, which most of our interviewees seemed to agree has been doing an effective job of helping with flood recovery in the area. Thus, as a whole it seems that Boulder may have more resources and networks in place to rebuild and help its residents recover from the flood compared to other areas within the state.

4.3 Flood Recovery Cycles

Several organizations independently identified similar trends in the recovery effort after the flood, especially in terms of needs, funding, and volunteers.

226 Sonia Marquez, interviewed by Michael Salka, phone interview on Nov. 19, 2013.
227 Doug Yeiser and Heather Spencer, interviewed by Melanie Ferraro, Nov. 11, 2013.

Needs

In the first couple of weeks after the flood, the need was still unclear. Matt Carlson, senior pastor at Boulder Valley Christian Church who has helped coordinate immediate recovery efforts in his community stated that "our main obstacle right after the flood was finding the people who most needed help."[228] Furthermore, even where information was available, it was in many cases broad and vague immediately after the actual event, making relief efforts more difficult. Micki Trost, a spokeswoman for the Colorado Office of Emergency Management (COEM), explained the nature of the initial assessments undertaken by her agency: "We just did flyovers. We didn't do door-to-door assessment for this disaster...What we have is approximate numbers, because we wanted to get the process started and get the money into the program so people can apply."[229]

While this course of action may have been necessary to begin the recovery process, it meant that more specific information on needs was not made available, which complicated our research (see above). This has been the case for other disasters, however, even those in areas more accustomed to them. Mike Steele, spokesman for the Louisiana Governor's Office of Homeland Security and Emergency Preparedness, told *The Denver Post* that "[corralling the numbers] takes a lot more time than most people would initially think... After Katrina, we were still finding damage a year or year and a half after the storm."[230]

Funding

Funding, too, has changed over time since the flood. Micki Trost spoke of COEM's desire to get the money flowing quickly.[231] However, other sources suggest that this quick

228 Matt Carlson, email response to Cameron May, Nov. 6, 2013
229 "One Month Out, No Firm Account of Colorado Flood Damage Estimates."
230 Ibid.
231 Ibid.

outpouring was not only unwise, but might not have actually occurred at all. In fact, Foothills United Way reported that many people expected to see the money flow quickly but were impatient at the actual result.[232] Foothills United Way also stated that such a course of action is necessary because giving out money too soon affects people's ability to collect money from insurance companies and FEMA, which have more money to give.[233]

Not surprisingly, donations tended to start out strong, then decrease in the more distant aftermath. The Foothills Flood Relief Fund had raised $3.7 million and distributed $1 million of that by November 11th, two weeks after the flood, noting, "the other $2.7 million will go towards individual assistance."[234] However, Yeiser and Spencer did express some concern with this process, as they have struggled to keep donors interested. In other words, when the public hears $3.7 million has been raised, they think that that is a large amount, and that few to no additional donations are therefore needed, when in reality Boulder County faces $1 billion worth of damages, so $3.7 million is very little in comparison.[235] Donations continued to come in, at least to Foothills United Way, for around six to seven weeks after the floods occurred. Yeiser and Spencer attribute this to the three solid weeks of press coverage that the floods received.[236]

Volunteers

The most obvious patterns can be found in the information gathered about volunteer efforts in the days and weeks following the floods. Matt Carlson stated that Boulder Valley Christian Church's "main obstacle after about two weeks was finding people who were willing to volunteer."[237] Yeiser and Spencer observed that the number of volunteers they worked with

232 Doug Yeiser and Heather Spencer.
233 Ibid.
234 Ibid.
235 Ibid.
236 Ibid.
237 Matt Carlson.

decreased after two to three weeks.[238] This is not because of diminished need, because Matt Carlson said in early November, "At first there was immediate need and a lot of volunteer interest. Now there is still need, but much less interest."[239] This is likely correlated to the aforementioned three solid weeks of press coverage. We will return to the topic of volunteering patterns below.

4.4 Vulnerable Characteristics

Matt Carlson, senior pastor at Boulder Valley Christian Church who has helped coordinate immediate recovery efforts in his community, stated "the flood was indiscriminate."[240] Based off our small, preliminary sample, it appears the flood might have been indiscriminate in that no specific groups of people seemed to suffer more detrimental impacts compared with the rest of the population. Instead of population characteristics such as race, geography and proximity to water channels seemed to be the biggest indicating factors of how much physical damage was incurred. However, even if the flood was indiscriminate, some people have faced greater obstacles in the flood recovery process than others. Our data suggest that certain characteristics, rather than specific demographic populations, are more indicative of whether an individual or family will face greater challenges in the flood recovery process. We will examine these characteristics in detail.

Trailer Home Residents

Looking specifically within the City of Boulder, Claire Wan, a temporary flood caseworker for the Emergency Family Assistance Association (EFAA), identified people living in trailer homes as facing additional obstacles in their attempt to recover from the flood in

238 Doug Yeiser and Heather Spencer.
239 Matt Carlson.
240 Matt Carlson.

comparison with other Boulder residents.[241] One of the biggest adversities some families residing in trailers are facing is proving trailer ownership. Families who do not have their trailer in their name have found it extremely difficult and sometimes impossible to access aid.[242] One reason for this is FEMA requires proof of ownership for a family to receive funding.[243] [244] Wan provided two reasons why some families are unable to prove ownership of their trailer. First, undocumented immigrants are often unable to produce a title. While we could not determine the exact reason for this, it is important to keep in mind that immigrants, especially those without residency or citizenship documentation, experience additional risk of exploitation. In this case, it is possible that exploitation may include unofficial leases or sales. Second, a family member who once lived in the trailer but no longer resides there might be in possession of the title, leaving the current inhabitants without access to it.[245] In our research, it was very difficult to determine the differences in property rights and ownership for someone residing in a trailer versus a house. It may be equally challenging for trailer residents to sort out these rights as well, potentially leaving them more vulnerable in the face of natural hazard events. Since some people living in trailers are unable to prove ownership of their property, they may face additional challenges in the recovery process in comparison with other Boulder residents as the lack of a title prevents them from obtaining FEMA aid.

In addition to challenges presented by not having a title, people living in trailers have fewer resources available to them for home repair. For example, Habitat for Humanity is committed to helping Boulder homeowners whose income is 80% below the area median

241 Claire Wan, interviewed by Melanie Ferraro, Nov. 20, 2013.
242 Ibid.
243 Ibid.
244 "Help After a Disaster," FEMA. accessed Nov. 28, 2013, https://www.fema.gov/txt/assistance/process/help_after_disaster_english.txt.
245 Claire Wan.

income.[246] However, as part of their policy, Habitat does not help rebuild trailers.[247] Thus, people residing in trailers may have less support and resources available to them than other homeowners within the city.

Immigrants

Another group that has been adversely impacted by the September floods is the immigrant population. In our research, we found it very difficult to determine how immigrant communities within the City of Boulder were impacted. Both organizations and individuals we interviewed speculated that immigrants in Boulder, especially those without proof of citizenship, experienced higher vulnerability during the flooding; however, we were unable to find concrete information about this group and the ways in which they were impacted by the flood. We tried contacting both Intercambio Uniting Communities and the Immigrant Legal Center of Boulder County, but neither organization said they were engaged with flood relief, and neither had severely impacted people come forward and ask them for recovery assistance. However, while we were not able to find information on immigrants in Boulder, our interview with Marquez from the Immigrant Rights Coalition and our search of various newspaper articles provided us information on ways in which immigrants faced additional challenges recovering from floods throughout Colorado.

Over 300 immigrants in Northern Colorado, many of whom do not qualify for federal aid, were flooded out of their trailer homes and apartments.[248] As a result, some families lost all of their papers when their homes flooded and now must dedicate extra time and energy to getting

246 "St. Vrain Habitat For Humanity." *Habitat for Humanity.* Accessed December 14, 2013. http://www.stvrainhfh.org/BodyStyle.asp?mmid=228.
247 Claire Wan.
248 Nancy Lofholm, "Immigrants in Turmoil," *The Denver Post* (Denver, CO), Oct. 14, 2013.

those documents replaced.[249] While some individuals must struggle to replace their papers, others were undocumented to begin with. Because a significant number of these 300 individuals were undocumented, they could not qualify for FEMA unless they have children born in the U.S. and can register through them.[250] [251] Even if some of these families are able to register through their children, they experience an additional disadvantage compared to citizens recovering from the flood because of the way FEMA calculates how much aid a household can receive. One of the ways FEMA determines household aid is by looking at the average household income per person. FEMA totals the entire household income of every individual in the house, but only takes the number of legally documented residents living within the home as the household occupancy.[252] This means average household income per person is overestimated for families with undocumented members. This may limit the amount of aid some immigrant families can receive compared to other fully documented or citizen families. These findings concerning immigrants were all geographically specific to places outside the City of Boulder, but some were located in Boulder County.

In the wake of the flood, many immigrants faced housing discrimination, especially those who were undocumented, outside of the City of Boulder.[253] [254] [255] [256] This has manifested in multiple ways. First, as immigrants try to find places to rent, some landlords require that

249 Lesley McClurg, "Flood Leaves Many Colo. Immigrants Homeless and Paperless," *Colorado Public Radio*, Sept. 19, 2013. http://www.cpr.org/news/story/flood-leaves-many-colo-immigrants-homeless-and-paperless.
250 Sonia Marquez.
251 "Housing Crunch Plagues Colorado Flood Victims," narrated by Ryan Warner, Colorado Matters, *Colorado Public Radio,* Nov. 14, 2013, http://www.cpr.org/news/story/housing-crunch-plagues-colorado-flood-victims.
252 Claire Wan.
253 "Immigrants in Turmoil."
254 "Housing Crunch Plagues Colorado Flood Victims."
255 Sonia Marquez.
256 "In Flooded Colorado, Immigrants' Livelihoods Washed Away," narrated by Kirk Siegler, Morning Edition, *NPR,* Oct. 18, 2013. http://www.npr.org/2013/10/18/236236286/in-flooded-colorado-immigrants-livelihoods-washed-away.

immigrant families submit documentation of citizenship.[257] [258] This requirement is a blatant form of discrimination, as non-immigrant applicants would not be asked for this same documentation. Colorado Public Radio even reports a few instances of immigrant families being turned away from mobile home parks because of their status as immigrants.[259] Second, when some housing facilities or landlords discover their renter is undocumented, they raise the price of the home or rent.[260] According to Marquez, in some cases rent and property prices were raised as much as 100%.[261] Housing discrimination has made it extremely difficult for many immigrant families displaced by the flood to find new places to live, even if they were recipients of FEMA aid. It is important to note too that this racial discrimination takes a toll on the psychological well-being of individuals and families suffering from discrimination.

Finally, one additional obstacle that might be faced by immigrants is a language barrier as they seek help in the flood recovery process. For example, sometimes town meetings are held entirely in English and thus inaccessible to non-English speakers.[262] A language barrier can severely limit a person's ability to seek help and additional resources in a disaster situation. We would like to note that there were some resources available for Spanish speakers within Boulder, for example the City of Boulder has a Spanish call option; however, we do not know the extent to which these resources were made available or whether resources for other non-English or non-Spanish speaking immigrants were made available. Regarding all of the challenges faced by immigrants in flood recovery, it is possible that immigrants within the City of Boulder did face the challenges outlined here, but we did not find evidence of these instances within the city.

257 Ibid.
258 "Housing Crunch Plagues Colorado Flood Victims."
259 Ibid.
260 "In Flooded Colorado, Immigrants' Livelihoods Washed Away,"
261 Sonia Marquez.
262 Ibid.

Mountain Town Residents

While this study focuses mainly on the City of Boulder, it is important to include the impacts of the flood on the mountain towns in the greater Boulder County. Both Foothills United Way and EFAA identified residents of mountain towns, especially those in Jamestown and Fourmile Canyon, as being the hardest hit within Boulder County due to the massive property and infrastructure damage suffered in these towns. Some people in these communities saw their homes either washed completely away or so severely damaged that they are unlivable until further repairs can be made. Many of these individuals are now experiencing financial strain as they struggle to pay both their home mortgage and the rent of their temporary housing.[263] [264] (This will be further discussed in the challenges section, below). Wan, who is currently serving a number of clients from Jamestown, further reported that residents of the town still do not have water services and that water access is not expected to return until the summer of 2014.[265] This means that the people of Jamestown are dependent on water delivered by the Salvation Army and/or water purchased individually outside the community and brought into town.[266] Individuals or families purchasing their own water must drive down a single-lane road (the only way of access to Jamestown currently), purchase five-gallon bottles of water, and haul them back up to Jamestown, spending up to $100 a week on gas money in the process.[267] In comparison with the mountain towns, the City of Boulder seemed to fare better. In our interviews we did not identify any areas in the City that lacked basic functionality a full two months after the flood. Finally, it is worthwhile to note that some Boulder County and NGO resources are being channeled into these mountain towns for recovery purposes.

263 Doug Yeiser and Heather Spencer.
264 Claire Wan.
265 Ibid.
266 Ibid.
267 Ibid.

People with Low Incomes

When we talked with Foothills United Way and EFAA, they said one of the biggest indicators of whether someone would have trouble recovering from the Boulder flood is income. According to representatives from both organizations, people who were struggling to make ends meet before the flood were sometimes the most severely impacted in regards to their ability to quickly and effectively recover from the flood. Yeiser from Foothills United Way notes that people struggling to make ends meet before the flood might be literally unable to afford taking time off work to register their property damages at disaster recovery centers.[268] Even though these people may qualify for and need aid, their current economic situation does not allow them time to register and seek this help. Further, during the flood, many people, including some individuals with low incomes, could not go to work and thus did not get paid for the week of the worst flooding.[269] This lack of income for a family already stretched thin would be more problematic for families who already had low incomes before the flood than for more affluent families in Boulder.

In addition to those struggling to recover from a week of lost work, Wan notes that some of her clients facing the most difficulty in the recovery process were those without savings prior to the flood.[270] Again, it is likely that this phenomenon is most prevalent among families with low incomes before the flood who would not have enough disposable income to put towards any significant savings. Without savings, these individuals do not have the financial resources to repair physical or other damages caused by the flood that are not covered by government aid.

It is also very important to note that income may intersect with other factors we have identified, with compounded effects. For example, an individual or family with a low income

268 Doug Yeiser and Heather Spencer.
269 Ibid.
270 Claire Wan.

may also live in a trailer park or be an immigrant family or live in a mountain town. Thus, the recovery challenges for an individual or family with a low income and living in a trailer, for example, are amplified. This family may have little to no savings, and since they live in a trailer, may not be eligible for additional rebuilding services offered by organizations such as Habitat for Humanity. Individuals and families residing in these spaces of intersection may be the hardest hit by the flood and face the greatest challenges in the recovery process.

People Who Are Homeless

Homeless individuals were also identified by Wan as being more adversely impacted by the flooding and facing additional challenges in the recovery process than other Boulder residents.[271] Tom Dozer, a member of the board of directors for the Boulder Outreach for Homeless Overflow (BOHO), said the following:

> Homeless people lost possessions just like housed residents did. Packs were swept away in some of their campgrounds in the mountains and in town. In most cases, a lost pack means that a homeless person has lost all their belongings, as meager as they are... Without a physical address (such as a home) filing for compensation from FEMA or other government agencies is almost impossible. Proving a loss is impossible. Lost medications are difficult to replace.[272]

Many homeless people lost personal property, but cannot receive government assistance for their lost possessions. FEMA often will not cover lost personal items outside the context of a home.[273] Thus, some of the homeless population within Boulder who already had close to nothing lost everything and have very few resources to recover those items.

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271 Claire Wan.
272 Tom Dozer, email response to Melanie Ferraro, Nov. 20, 2013.
273 Claire Wan.

Homeless individuals also suffered heightened negative impacts during the flooding itself. Many of the campsites and parks the homeless community occupied were flooded, leaving them without shelter during the flooding itself.[274] Further, for the first few days of the flood, homeless individuals were turned away from the Red Cross emergency shelter at the YMCA, forcing organizations such as Bridge House and BOHO to open and increase capacity to serve these people.[275] Because the emergency shelter was turning away homeless individuals, some literally had no place to go during the flooding event.

People with Unreported Need

Foothills United Way and EFAA both emphasized that there are a number of people within Boulder who have not stepped forward to receive assistance or ask for help in the wake of the flood. These individuals, even though they may be in desperate need of help, have not yet received aid, drastically limiting their ability to recover quickly. Yeiser provided a number of reasons why individuals and families may not have come forward and applied for aid from either the government or NGOs. First, undocumented immigrants may be hesitant to come forward because they do not want government attention and fear deportation.[276] [277] [278] Further, undocumented immigrants looking to obtain papers in the future may face greater challenges doing so if it is known that they have already been a recipient of government aid.[279] Other groups Yeiser suggested that might not step forward and register for help include the following: people distrustful of the government, people struggling to make ends meet who cannot afford to take the time off work to register, elderly people who cannot leave their homes, and people without access to information on where to turn for support. Foothills United Way seemed very

274 Tom Dozer.
275 Ibid.
276 Doug Yeiser and Heather Spencer.
277 Claire Wan.
278 "In Flooded Colorado, Immigrants' Livelihoods Washed Away,"
279 Claire Wan.

concerned about how to contact individuals and families who have not come forward. Until they get people on the ground going door-to-door, it is impossible to identify who has not received aid and what needs are unmet.

4.5 Challenges Faced

Individuals

Individual victims faced many unique challenges in the aftermath of the floods. Some of these challenges came up in the immediate aftermath while others were more long-term. Still others may have in fact predated the floods entirely, but were exacerbated by the floods.

Housing

Most obviously, many people were displaced from their homes, while many others faced varying levels of damage. A large portion of the people affected did not have flood insurance.[280] [281] For these people, especially those who lost everything or close to everything, the road to recovery is long. Joey Bunch with *The Denver Post* found that victims across the flood zone "humble themselves to charity, take out loans, cash in stocks and drain their retirements to get back to where they were before the rain started falling."[282] One woman had even turned to begging, because she has $30,000 worth of damages, but her check from FEMA was a mere $9000, and "her losses are almost entirely uninsured."[283] On the other hand, even people who have flood insurance are finding the insurance woefully inadequate to cover their losses. FEMA, as well as other relief organizations and flood insurance programs, "will only pay to make... homes 'livable and safe,' but not comfortable or attractive."[284] This is not a unique problem; in

280 Doug Yeiser and Heather Spencer.
281 Matt Carlson.
282 Bunch, Joey. "Debts, delays left in wake." *The Denver Post* (Denver, CO), Nov. 10, 2013.
283 Ibid.
284 Ibid.

fact, "the limits of flood insurance is a national dilemma."[285] These limits are easy to see when flood insurance is compared to other types of insurance. Here in Colorado, for example, "while the average payout for the September flood is about $22,000 per claim, the average for private insurance in June's Black Forest fire in El Paso county was nearly $81,000."[286] This limited coverage on the part of flood insurance programs, when compared with other types of insurance, contributes to the hardship many people are facing as they attempt to recover from the floods.

Another obstacle people are facing, in terms of housing, is finding a place to relocate to after being completely displaced by the floods. Even before the floods, "vacancy rates in Northern Colorado were between one and three percent."[287] Unfortunately, these low-vacancy areas (Boulder, Longmont, Greeley, etc.) were the most impacted by the floods, meaning that people who lost their homes have to search long and hard to find new places to live. For many families, this means "moving well away from where [they] need to be for work," and, thus extended commute times.[288] This lack of available housing is impacting both the rental and homeowner markets. Rental houses are currently showing around a two percent vacancy rate, while the prices of houses on the market for purchase are currently increasing around eight to ten percent each year.[289] Furthermore, rental prices were on the rise even before the floods, especially in the low-vacancy areas. Thus, families and individuals displaced by the floods are going to face low vacancy rates and increasing rental and purchase prices as they attempt to find new places to live.

Income

Many people affected by the flood had to take time off of work and school, and this

285 Ibid.
286 Ibid.
287 Lesley McClurg, "Housing Crunch Plagues Colorado Flood Victims," *Colorado Public Radio*, November 14, 2013, http://www.cpr.org/news/story/housing-crunch-plagues-colorado-flood-victims.
288 Ibid.
289 Ibid.

resulted in their losing income and falling behind in their studies. The lost income problem is two-fold. First, a number of people in Lyons and Jamestown were put out of work because the floods damaged their places of employment. Despite this loss of income, these people were still expected to pay their home mortgages, as well as their rent if they had additionally been displaced from their homes.[290] Second, other people who did not lose their jobs still lost income from having to take time off of work to clean up their properties or relocate to new ones. While these people had a stable work situation to return to, their lost income in many cases limited the amount of money that they could spend on fixing their homes or paying for new housing. This issue of moving also plagued students at the University of Colorado, many of whom had to take time off of school to move their belongings to a new place. One student, Darby, said that it took her "about two weeks after the flood to find a new place and move."[291] Before this, however, she had to take "four days of class off so that [she] had time to move [her] things out of [her] waterlogged apartment and into storage."[292]

Transportation and Childcare

Many families faced inadvertent adversities taking the form of additional transportation hassles, and/or changes in child care arrangements. During the floods, and, in many cases, in the first week after, many schools were closed. Additionally, some childcare facilities were flooded.[293] This forced the parents of these affected children to take time off of work to take care of their children, which contributed even further to the loss of income situation described above. Furthermore, as previously discussed, with people displaced and low vacancy rates, the city of Boulder has had to relocate some of these people up to 80 miles away. For families with

290 Doug Yeiser and Heather Spencer.
291 Darby, CU Student, email response to Melanie Ferraro, Nov. 18, 2013.
292 Ibid.
293 Doug Yeiser and Heather Spencer.

children, this means finding new childcare in the areas to which they have been relocated. These families also face new challenges in regards to commuting to work and getting their children to and from school.[294] In short, transportation and childcare concerns represent additional indirect losses that affect families and individuals in many cases just as severely as home loss.

Organizations

In our interviews with organizations working with flood relief, representatives identified challenges they face in trying to provide the most beneficial services for flood victims.

Identifying Need

Based on our conversations with Foothills United Way and EFAA, identifying need, specifically unmet need, seemed to be biggest challenge to providing the most effective flood relief.[295] [296] In the immediate wake of the flood, some physical needs were readily apparent such as debris removal, building repair, and the need for temporary housing and other basic necessities. After this emergency need has been met, however, it becomes more challenging to identify who still needs support, what support they need, and who has been unable to access this support. This can include families whose costs and damages exceeded the amount of government aid they received and thus still have significant unmet need. According to both Yeiser and Wan, it is also extremely difficult to identify who has unmet needs if families or individuals do not come forward to ask for help.[297] [298] It is extremely difficult to identify these groups since organizations thus far have had little to no contact with them. According to Yeiser,

294 Ibid.
295 Doug Yeiser and Heather Spencer.
296 Claire Wan.
297 Ibid.
298 Doug Yeiser and Heather Spencer.

finding this information will take a lot of groundwork that will involve door-to-door surveying.[299]

Decreasing Volunteers

As noted above, immediately following disaster events there is an influx of volunteers to an area. These volunteers are especially useful for activities such as debris removal. However, after about two or three weeks when most of the rubble seems to have disappeared, as was the case in Boulder, the number of people looking to volunteer with recovery efforts drops dramatically. After obvious physical damage is addressed, there is a bit of a lull while organizations try to identify what needs still exist within the community and whose needs are unmet. By the time organizations and the city and county can really start to identify these, the flood recovery volunteer force has severely dwindled. It is a big challenge to reach out to the public and solicit volunteers months after the flooding, even though there is still much work to be done.[300]

Working with the Public

Another challenge noted by Yeiser is keeping the public interested. Press coverage for disaster events is limited–a few weeks at most–because another event will catch the attention of the media and soon the disaster becomes old news.[301] Without this media coverage it is increasingly challenging to maintain donor and volunteer interest and support since their exposure to the event is likely decreasing.

In addition to maintaining public interest, Yeiser mentions that working with the public is challenging, as people get impatient when they do not see money being distributed right away.[302]

299 Ibid.
300 Ibid.
301 Ibid.
302 Ibid.

Foothills United Way's disaster recovery fund is rationing most of its funds for after FEMA aid stops and unmet needs are identified. Unmet need may be equal to that which has already been calculated and met.[303] Yeiser says its difficult explaining to the public that organizations cannot give out all of their money right away because otherwise no money will be left for future unmet need.[304] Thus, an impatient public may provide an additional challenge or hindrance to providing the best flood recovery support possible.

4.6 Research Challenges

The greatest challenge that we faced as a research team was finding information on who was affected by the flooding. However, we were not the only people to run into this problem. *The Denver Post*, for example, tried to solidify the accounting on damage incurred from the flooding. However, in their efforts to acquire data from the 24 counties included in the state emergency declaration, "calls to eight of the counties yielded no numbers, and emergency officials in only two counties, Boulder and Larimer, returned calls requesting the information."[305] The governor's office could not agree on figures, and referred "questions on inconsistencies to the Office of Emergency Management. The agency took several days and a series of phone calls to parse the governor's numbers."[306] FEMA published its own set of data, but their numbers only cover the nine counties named in the presidential disaster declaration. FEMA spokesman Tom Schafer said that the agency's "numbers shouldn't be used to estimate statewide numbers."[307]

Our team contacted several organizations looking for information, but, as described

303 Ibid.
304 Ibid.
305 Bunch, Joey. "One Month Out, No Firm Account of Colorado Flood Damage Estimates." *The Denver Post* (Denver, CO), Oct. 17, 2013.
306 "One Month Out, No Firm Account of Colorado Flood Damage Estimates," accessed December 2, 2013, http://www.denverpost.com/news/ci_24326790/one-month-out-no-firm-account-colorado-flood?IADID=Search-www.denverpost.com-www.denverpost.com.
307 Ibid.

below, many of these attempts came up short:

- One of our team contacted several different departments within the City of Boulder government, and got a single reply. They dismissed his request for an interview, and gave him only some basic information.
- Another member of our team went in person to the Disaster Recovery Center on Arapahoe Avenue, checked in, described our project research goals, waited to hear from someone checking with a manager in the back, and was then turned away with a stack of papers about how to receive aid from organizations such as the Red Cross or psychological services.
- We were stonewalled by The Department of Planning & Development in Boulder. They said if we did not have any damages to report than they did not have anything to tell us.
- FEMA did not really have any information for us as they were also in the preliminary stages of information gathering. Also, because we are undergraduate researchers, according to FEMA, we were not qualified to hear about financial matters.
- We attempted contacting various departments of the City of Boulder municipal government and their subsidiaries, including Planning & Development, Community Planning & Sustainability, Health & Human Services, and the Housing Division. Despite varied approaches, we were accommodated with a singular generic email referring us back to the website resources, which we had already read thoroughly.
- We attempted to contact Boulder Flood Relief, a volunteer recovery assistance organization, via both email and phone. Similar to the municipal departments, we requested to be put in touch with anyone willing to answer questions. We received no reply.

- We were hoping to obtain contact information for flood survivors from organizations we contacted in order to interview them. However, this proved difficult as organizations were not always able to give out information on their clients for reasons of confidentiality.
- We sent an email query to the University of Colorado's Department of Human Resources Office of Organizational and Employee Development, and did receive a very supportive, friendly phone call back. However, they were unable to provide information on whether there was differential need for aid demonstrated by CU faculty versus staff (it was "first come, first serve: without analysis of data), and pointed us to University Communications and the Office of Emergency Management.

These challenges to gathering information about effects of the flood and affected populations demonstrate the difficulty of compiling data about a recent hazard event.

4.7 Summary

While the focus of our analysis was on the City of Boulder, briefly examining the surrounding areas allowed us to tentatively conclude that Boulder fared comparatively well. This conclusion is tentative, as we had considerable trouble obtaining specific data from many relief organizations. What we did manage to find, however, fell into a few general trends. Firstly, as one might expect, identifying specific, local needs was a challenge. Also, volunteers and donations, both in large supply in the time immediately after the floods, began to dwindle as the floods fell out of the public limelight–volunteers after two weeks, and donations after six to seven weeks.

While the flood did not seem to affect certain demographic populations more than others, specific groups of people had more difficulty recovering from the floods than others. These

groups included trailer home residents, immigrants, residents of mountain towns, low-income residents, and the homeless. Additionally, there were a number of people who did not step forward to receive aid, severely limiting their ability to recover from the floods. Individuals faced housing loss, loss of income from unemployment or being forced to take time off, and additional childcare and transportation challenges.

V. Flood Response and Recovery: Suggested Solutions for Reducing Vulnerability

(1) Boulder Flood Response and Recovery

In many ways, the city of Boulder was especially lucky coming out of the September floods. It was not nearly as impacted as some of its neighboring cities and towns such as Lyons, Jamestown, or other mountain communities. Despite this relatively lower impact, an immense amount of damage was done to the city and many people were temporarily displaced. Staff at some of the flood recovery organizations felt that the City of Boulder was well equipped to deal with the aftermath of the flood, and rightly so given Boulder's long history of flooding.[308] Still, there are instances of populations being excluded from recovery assistance. Most of these occasions can be deemed "people slipping between the cracks," or failures in the structure of flood recovery aid. Identifying these holes in the system will assist the future work of relief organizations, allowing for more equity in the distribution of recovery support.

Flood recovery, even under the best circumstances, is an incredibly difficult thing to manage. It is apparent that many Boulder residents have struggled, and are continuing to struggle to recover from the September floods. Institutional and structural roadblocks stopped many from gaining access to all of the resources they needed, particularly when attempting to access federal resources. However, some hurdles were present at the local level. These barriers are more easily

308 Sonia Marquez.

removed or available for restructuring than federal policy, and should be scrutinized for improvements. For that reason, this section is dedicated to suggested improvements for local flood response.

1.1 Accessibility of Information

One of the largest barriers to action in the weeks following the flood was a lack of information to work from. Our own research was limited by this problem, as we found it incredibly difficult to access information about affected communities and even had a hard time getting in touch with professionals who had these answers. Non-profit organizations like Foothills United Way and government agencies like FEMA were all unclear on who exactly needed help, and how much help they needed.[309] In the interest of time, early damage assessments were done by aircraft flyovers. While this may have been effective to get initial money flowing into the city for recovery, this method is too imprecise to guide on-the-ground efforts like volunteer coordination. An aerial scan may reveal where creeks overflowed their banks, but it will not show which neighborhoods had issues with extreme basement flooding.

Six weeks after the flood, Foothills United Way was making plans to gather volunteers and go door-to-door and gather information about flood damage because the organization still was not sure which neighborhoods were yet in need of assistance.[310] While this type of effort could yield incredibly useful information, the response happened too late to be helpful for preliminary flood recovery measures. In the future, we would like to see an earlier and more concerted effort at getting out into the neighborhoods of Boulder to get a feel for the location, type, and extent of damage. While this work may be cumbersome, it would provide precise guidance to relief organizations and would make any following projects more effective.

309 Doug Yeiser and Heather Spencer.
310 Ibid.

As a part to one potential solution, there are already many people who have experience working with vulnerable communities. Most of these people are affiliated with non-profit organizations or outreach agencies in Boulder. Organizations working with vulnerable populations before a disaster are best positioned to know how the community is affected and what it needs. The city could establish contacts and relationships with organizations that are already working with vulnerable communities. In case of a disaster, city officials could call these organizations to gather preliminary information how the community was affected and what kind of assistance is most needed. It would also be helpful to open the lines of communication between organizations working within the city. While communication between non-profits did occur, better coordination and work with damage information may result in better service for affected populations.

Organizations working to coordinate volunteers noted a sharp drop in the number of people willing to volunteer about two weeks after the flood.[311] By the time the flood fell out of the public's mind, most of the evident damage has been cleaned up, but there was still a huge need for volunteer assistance. Due to the lack of information previously discussed, volunteer service was not well directed during these first two weeks. Oftentimes, people were looking to help but organizations were unsure of where to send them. Better information collection could help solve this issue in the future, but it is also possible to make the overabundance of volunteers part of the solution. Volunteer hours could be very well spent going out into the community to collect damage information. Also, better outreach between flood relief organizations and the public could help to smooth out the curve of volunteer interest by communicating when and how volunteers hours are most needed.

311 Matt Carlson.

1.2 Structures Preventing Equitable Aid Distribution

Feedback from the staff of organizations involved in a multitude of aspects of flood recovery suggest that money and other support was not necessarily distributed to those who needed it most. Navigating the support systems and aid applications can be a challenge, or even a barrier to some. When considering government assistance, FEMA said that everyone should register for aide. However, many undocumented immigrants did not apply for FEMA funds due to concerns about interacting with the government. While FEMA does not manage information about one's immigration status, people's concerns were very legitimate and they did not request assistance for that reason. Better outreach to communities with known populations of undocumented residents would better support the recovery of those neighborhoods.

Even those who are aware of all recovery resources and competent at filing for damage compensation are confronted by insurance limitations. Most homeowner's insurance policies cover an extremely limited number of flood related damages. Owners of residences lying in the 100 year floodplain are required to purchase flood insurance if they have a mortgage, but many houses in the city were affected by storm runoff that sit outside this floodplain and do not have flood insurance. FEMA funds and money from other organizations were allocated to support those who did not have enough insurance, but some people are still having a hard time finding funding to rebuild or fix property.[312]

It is unprofitable for insurance agencies to cover many flood related damages, so, under the current flood insurance policy system, most people cannot expect significant support from that sector in a flooding event. Understanding this shortcoming may improve funding allocations, but a gross shortage of total funding cannot be helped easily. Building away from creeks is not the complete answer in some of these cases, as severe flooding occurred in some unexpected

312 Claire Wan.

locations. The damage done to 7th Street is a good example of this. During the flood, the street received large amounts of damage and houses on both sides experienced heavier than average flooding.[313] This area is not even marked on floodplain maps, but was inundated as rainwater from higher elevations used this channel to drain towards Boulder Creek. It would be beneficial to look at ways the city could encourage citizens to get proper insurance, and make information on filing for the entirely of their damages more accessible.

Finally, some city residents did not have proper documentation to file insurance claims. This issue was particularly acute in the trailer home neighborhoods of Boulder, where some people were living in trailers that they did not have a title to.[314] This often happened if someone was given the trailer by a relative or friend without an official transfer of paperwork.[315] Because they did not technically own the trailer or have access to that paperwork, they could not receive compensation for even an absolute loss of that home from insurance sources. Allowing insurance and other public funds to assist residents where claims can be filed, then picking up those left behind with private funds from Foothills United Way and other organizations is a viable strategy.

Acknowledging the loopholes that exist in Boulder's flood response systems is the first step towards lessening the various vulnerabilities and exposures that different communities experience. Better allocation of volunteer efforts and more rapid information collection would not have eliminated differential vulnerability during flood cleanup, but could have assisted these affected yet silent communities. Recovery assistance is expected to last for a few years in the future, but it is imperative that we take time to reflect on the effectiveness of our current flood

313 Boulder Flood MAP https://boulderflood2013b.crowdmap.com/main
314 Sonia Marquez.
315 Ibid.

response programs.[316] Effective collaboration after the cleanup, as was present during the flood, can contribute to more equitable recovery assistance in the event of another flooding disaster.

VI. Conclusions

The 2013 Boulder Flood was largely unexpected and thoroughly tested the flood preparation systems established in the city. While not a record-breaking flood event, the disaster was driven by record-breaking rains and caused damage in unexpected locations due to the hyper saturated soil. Boulder fared relatively well in the wake of the event when compared to other mountain towns in the region, and was comparatively well prepared to handle the emergency.[317] Because effects of the flood are influenced by the social, political, and economic landscapes of a region, our preliminary research employed an environmental justice approach to analyze for instance of injustice or differential vulnerability.

The Environmental Justice movement has been very successful over the last several decades. Emerging out of the Civil Rights Movement in the United States, the movement has provoked academic expansion through new literature and the consideration of intersecting oppressions. Additionally, the Environmental Justice framework for thought has aided in many successful campaigns, typically efforts against targeted pollution or other environmental discrimination. Because this movement was largely inspired by the Civil Rights Movement and has its roots in the Anti-Toxics movement of the 1970s, traditional environmental justice cases involved minority populations bearing an unfair burden of pollution or other environmental hazards.[318]

Since its humble beginnings, this movement has evolved to bear witness to other,

316 Ibid.
317 Ibid.
318 Cole and Foster, *From the Ground Up*.

drastically different instances of environmental racism. In some sense, the definition of environmental justice has continually stretched to encompass new types of discrimination. Some fear that this expansion has left the movement unfocused and ineffective, as it is not targeted enough to be effective.[319] To the contrary, however, the movement could be deemed effective if it ceased to exist today, as it has brought attention and acknowledgment to widespread instances of discrimination that were previously slipping by unnoticed. Environmental justice's use as a framework for modern discourse has furthered our understanding of socially constructed oppressions, and its massive breadth has allowed for connections in understanding.

Indeed, little to no case of environmental injustice could be built under a traditional understanding of the discourse after a preliminary look into the effects of the 2013 Boulder Flood. This traditional understanding of environmental justice would guide us to look for unequal negative effects on non-white communities proceeding the flooding event. While the City of Boulder lies on top of a distinct floodplain, and some neighborhoods are inherently at a greater risk of flooding, it was not clear that non-white communities were substantially more affected than other parts of the city.

However, we did notice a difference in certain populations' abilities to recover and an expanded interpretation of environmental justice allows us to consider these communities as vulnerable within that framework. Specifically, these vulnerable groups included immigrants (mainly those who did not speak English proficiently or who are residing in Boulder illegally), people living in trailer homes, the homeless, the elderly, individuals with low incomes, and renters. We found that these populations had less access to recovery resources or assistance.[320]

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319 Ryan Holifield, Michael Porter, and Gordon Walker, "Spaces of Environmental Justice-Frameworks for Critical Engagement," in *Spaces of Environmental Justice*, ed. Ryan Holifield, Michael Porter, and Gordon Walker (Oxford, UK: Wiley-Blackwell, 2010), 1–22, http://doi.wiley.com/10.1002/9781444322767.ch.

320 Doug Yeiser and Heather Spencer.

While some of these access issues are tangled in the mire of insurance or claim paperwork, there are local changes that could help the flood recovery process for some. Efforts were being made to organize a thorough sweep with the goal of claim filing assistance, but this effort would have been better received if it happened earlier and on a larger scale. Also, a lack of information proved to be a hold on efficient aid distribution and non-profit work. Establishing relationships with organizations that work with vulnerable populations before a disaster can contribute to more rapid information gathering after a disaster. This would expedite recovery resource dispersal, including money, materials, and labor.

In light of our findings, we would like to make suggestions about ways in which the environmental justice framework could better support the work happening in Boulder. While the environmental justice movement is established on flexible foundations and can incorporate diverse factors that contribute to discrimination, we feel that the existing literature was still not entirely compatible with what we observed in the Boulder flood. Many other populations outside of communities of color shared an unfair burden of flood effect. While their consideration is accepted within the existing literature, their current absence from formal discussion places them at risk of being ignored or forgotten. We would like to see environmental justice examinations, which currently retain a strong and narrow focus on people of color, expand their consideration to conclude other vulnerable populations.

Also, a heavy emphasis on risk or exposure to hazards is still present within the environmental justice framework. While some publications about the reconstruction of New Orleans following Hurricane Katrina commented on the inequitable recovery for vulnerable groups, attention is rarely paid to vulnerability during the recovery process.[321] Access to recovery assistance was the most widespread vulnerability factor that in our research, so we

321 Day, "Katrina Seven Years On."

consider it to be significant. Consequentially, we advocate for better recovery analysis and suggest that reviewing rebuilding efforts at several intervals after a flooding event could improve response preparation in the future.

While the 2013 Boulder Flood did not present itself to be an egregious example of environmental injustice, we did find other examples of differential vulnerability. The various affected populations and ways in which they were affected were not prevalent in existing literature. For this reason, we encourage others to consider vulnerability in new and different ways. For example, while having limited access to recovery resources may not affect one's likelihood of being flooded, it does increase the consequences of such an event. Reconsidering who is vulnerable and in what ways they are vulnerability will assist in better resource allocation.

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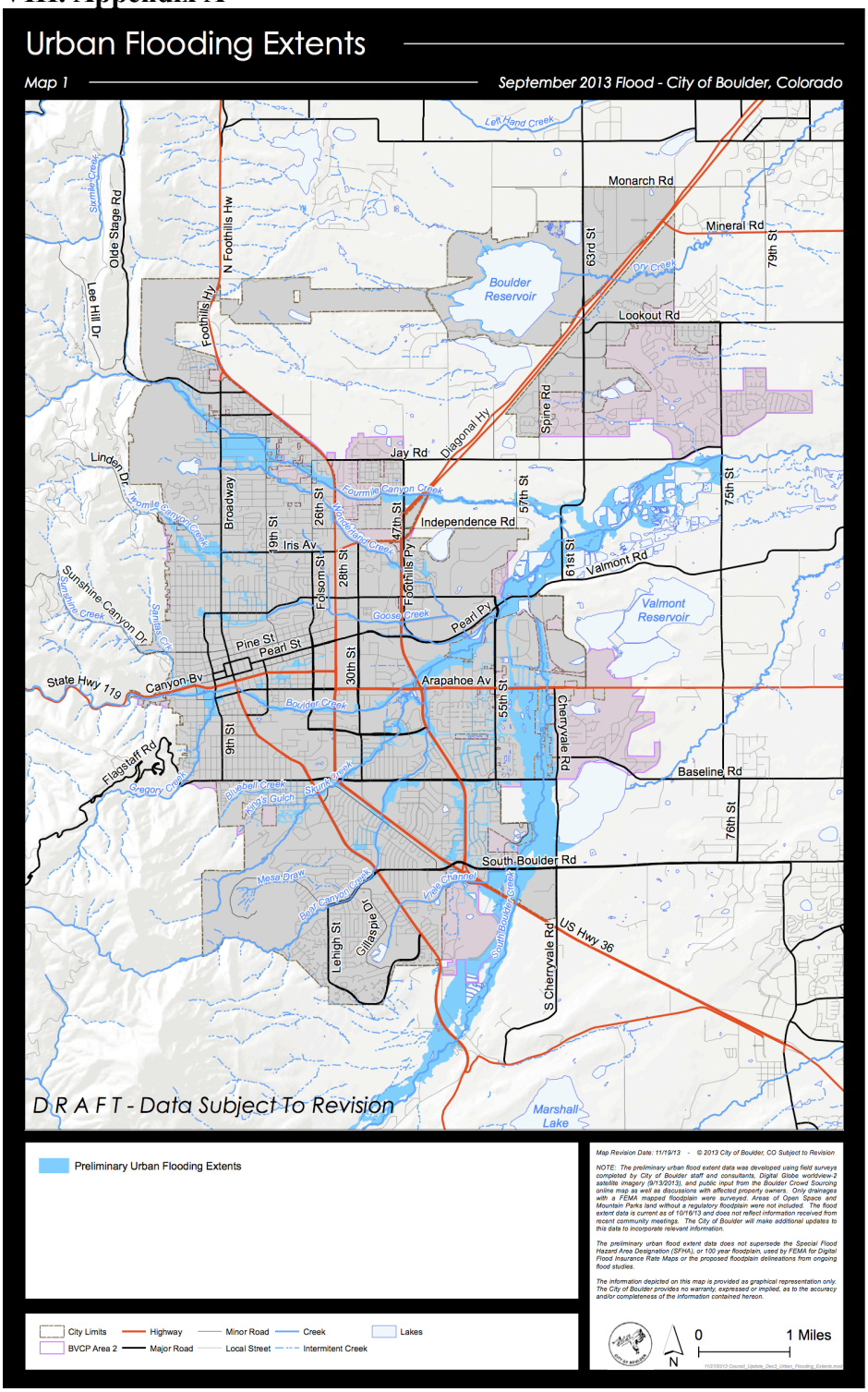
VIII. Appendix A



Preliminary Map of Flooding extent in the City of Boulder. Map created from crowd-sourced data gathered by the City of Boulder, courtesy of the City of Boulder GIS Department. [322]

[322] City of Boulder. "Urban Flooding Extent: September 2013 Flood - City of Boulder, Colorado," Draft September 2013 Flood Event – Preliminary Findings (Boulder, Colorado: City of Boulder, November 19, 2013), https://www-webapps.bouldercolorado.gov/pds/flood/Council_Update_Dec3_Urban_Flooding_Extents.pdf.