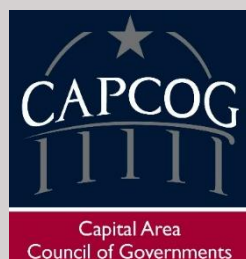


Disaster Resiliency & Recovery in the Texas Capital Area



The Economic Impact and Local Response to the 2015 Memorial Day Disaster Event



Acknowledgements

The Capital Area Council of Governments acknowledges the support of the Economic Development Administration, whose provision of funding made this work possible. The Capital Area Council of Governments also acknowledges the critical work undertaken by first responders, local governments, and the public to help communities in the Capital Area recover and grow more resilient to future disaster events.

Contents

Acknowledgements	2
List of Tables	5
List of Figures	6
Executive Summary.....	7
Introduction.....	8
Report Objectives.....	8
The 2015 Memorial Day Disaster Event.....	11
Case Studies From the Memorial Day Flood Event	14
Old Glory Ranch	14
7A Ranch Resort.....	16
Economic Impacts of the 2015 Memorial Weekend Disaster Event in the Capital Area.....	18
National Flood Insurance Program Claims.....	18
FEMA Assistance to Households	20
FEMA Public Assistance.....	23
Other Disaster Impact Data	25
Modeling Flood Vulnerabilities and Impacts Throughout the Capital Area	27
Disaster Impacted Counties in the Capital Area	27
Bastrop County.....	27
Blanco County	29
Caldwell County	30
Fayette County	32
Hays County	33
Lee County	35
Travis County	36
Williamson County	38
HAZUS Damage Estimates: Communities Along the Blanco River in Focus.....	39
Martindale	39
San Marcos.....	41
Wimberley.....	42
Planning to Make the Capital Area More Disaster Resilient.....	44
Regional Resiliency Issues	44
Emergency Notification	44
Land Use and Development	44
Business Liquidity.....	47

Regional Preparedness and Mitigation Actions	48
Warn Central Texas.....	48
Texas Flood Response System	49
Disaster Ready Austin and Get Back in Business Austin	50
ATX Floods.....	51
Buyout Programs in Flood-Prone Areas.....	52
Flood Mitigation in San Marcos, TX	53
Opportunity Identification	54
Regional Hazard Mitigation Plan	54
Proactive Regional Business Stability Activities	55
Ensure Critical Facilities Are Protected.....	56
Conclusion	57

List of Tables

Table 1: National Flood Insurance Program (NFIP) Claims	18
Table 2: FEMA Assistance to Individuals and Households Program (IHP) – Homeowners.....	21
Table 3: FEMA Assistance to Individuals and Households Program (IHP) by Grant Size - Homeowners ..	21
Table 4: FEMA Assistance to Individuals and Households Program (IHP) - Renters	22
Table 5: FEMA Public Assistance Recipients in the Capital Area (DR-4223)	24
Table 6: Small Business Administration Home Disaster Loans	25
Table 7: Small Business Administration Business Disaster Loans.....	25
Table 8: Texas Private Passenger Vehicle Incurred Losses Due to Flooding.....	26
Table 9: TxDOT Projects In Response to DR-4223.....	26
Table 10: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Bastrop County (Millions of Dollars)	28
Table 11: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Blanco County (Millions of Dollars)	30
Table 12: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Caldwell County (Millions of Dollars)	31
Table 13: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Fayette County (Millions of Dollars)	33
Table 14: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Hays County (Millions of Dollars) ..	34
Table 15: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Lee County (Millions of Dollars) ...	36
Table 16: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Travis County (Millions of Dollars)	37
Table 17: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Williamson County (Millions of Dollars)	39
Table 18: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, City of Martindale (Millions of Dollars)	40
Table 19: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, City of San Marcos (Millions of Dollars)	42
Table 20: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, City of Wimberley (Millions of Dollars)	43

List of Figures

Figure 1: Population Change in the CAPCOG Region (2010-2016)	9
Figure 2: Map of Texas' Capital Area (CAPCOG Region)	10
Figure 3: Memorial Day Disaster Event Rainfall.....	11
Figure 4: Damage Near the Blanco River Following the Memorial Day Flooding	12
Figure 5: Federal Disaster Declaration (DR-4223) Affected Counties	13
Figure 6: Old Glory Ranch Chapel.....	14
Figure 7: Old Glory Ranch River Pavilion (Destroyed)	15
Figure 8: Tree Damage Near the Blanco River on the Old Glory Ranch Property	15
Figure 9: Front Office Building for the 7A Ranch Resort (Undamaged)	16
Figure 10: Concrete Slab Remains of a 7A Ranch Casita that was Damaged by Flooding (River in Background)	17
Figure 11: New Construction of Casitas at 7A Ranch to Replace Those That Were Damaged.....	17
Figure 12: National Flood Insurance Program (NFIP) Claims, Losses Paid by ZIP Code	19
Figure 13: National Flood Insurance Program (NFIP) Claims, Losses Paid by Census Block for Hays County	20
Figure 14: FEMA Assistance to Individuals and Households Program (IHP) Verified Losses by ZIP Code ..	22
Figure 15: FEMA Public Assistance and Unmet Need by Category in the Capital Area.....	23
Figure 16: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Bastrop County	28
Figure 17: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Blanco County	29
Figure 18: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Caldwell County	31
Figure 19: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Fayette County	32
Figure 20: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Hays County	34
Figure 21: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Lee County	35
Figure 22: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Travis County	37
Figure 23: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Williamson County	38
Figure 24: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, City of Martindale	40
Figure 25: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, City of San Marcos	41
Figure 26: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, City of Wimberley	42
Figure 27: Lost Property Tax Valuation Due to the Memorial Day Flood Event in San Marcos	46
Figure 28: Addresses Along the Blanco River Currently in the Flood Insurance Rate Map (FIRM) and Advisory Based Flood Elevation (ABFE) Zones	47
Figure 29: Warn Central Texas Flier (Spanish Version)	48
Figure 30: Texas Flood Response System	49
Figure 31: Readiness Postcard Promoting Disaster Ready Austin	50
Figure 32: ATX Floods Website.....	51
Figure 33: Map of Lower Onion Creek Flood Mitigation Buyout Project.....	52
Figure 34: Approved Flood Mitigation Projects in San Marcos, TX.....	53
Figure 35: Components of Hazard Mitigation Planning	54
Figure 36: Sample Organizations That Offer Unique Disaster Funding for Businesses	55
Figure 37: Critical Disaster Facilities and the 100-Year Floodplain (FIRM)	56

Executive Summary

Federal Disaster Declaration DR-4223 came in response to severe flooding and wind conditions throughout much of Texas. In the Capital Area, 8 counties were included in the declaration. Flooding along the Blanco River was most severe, causing significant damage and loss of life in Blanco, Hays, and Caldwell counties.

This report summarizes much of the available disaster data in an effort to quantify the economic impacts of the disaster event in the Texas' Capital Region. Some of the findings include:

- 858 insurance claims filed through the National Flood Insurance Program, with a total of \$62.9 million in losses paid
- 2,454 households that filed for FEMA assistance with total damages assessed of \$18.2 million
- 1,144 households approved for FEMA assistance for a total of \$9.7 million.
- Over \$10.5 million in FEMA assistance to local governments, with an additional \$3.4 million spent by local governments from their own resources
- 342 loans from the Small Business Administration to homeowners for a total of \$15.6 million in disaster financing

This report also uses FEMA-administered software, called Hazus, to estimate flood impacts and vulnerability throughout the Capital Area. Throughout the region, this report estimates the impacts of a 100-year flood scenario on regional residential, commercial, and industrial property. This estimation of losses in such a scenario is useful for planning purposes and in prioritizing regional resiliency priorities. Map images are provided in the following section of this report, but digital versions in PDF format, as well as GIS data are available via CAPCOG's [Open Data GIS Portal](#). Interactive maps are also available via the [Project Map Portal](#).

Lastly, this report documents the regional response to improve disaster resiliency and identifies opportunities to further enhance resiliency. Regional efforts like *Warn Central Texas* and *ATX Floods* have made significant inroads to strengthen the Capital Area's ability to communicate critical information during a disaster. Other efforts are underway as well, and certainly further work is still required. The hope is that this report serves as a catalyst for continued efforts to enhance mitigation and resiliency efforts.

Introduction

On May 29, 2015, a federal disaster declaration was made (DR-4223) in response to severe storms, tornadoes, straight-line winds, and flooding. The final duration for the disaster declaration spanned from May 4th to June 23rd of 2015. A total of 48 Texas counties were included as part of the disaster declaration, eight of which were in the Capital Area.

Report Objectives

The Economic Development Administration (EDA) has funded this report, which examines the disaster impacts of DR-4223 in the Capital Area in greater detail.

One of the challenges in disaster planning, response, and recovery lies in the disaggregation of data for the event. During a disaster, data collection is often treated with less of a priority than providing services to residents and businesses as part of a recovery effort. Moreover, Federal agencies that provide disaster assistance often collect data in a way that silos information according to various programs and departments. As a result, collecting and analyzing data for any specific event is often difficult. However, quantifying damage impacts is critically important for resiliency planning, as it informs the scale of vulnerabilities and the potential benefits of mitigation measures. This report catalogues data pertaining to the DR-4223 event in the Capital Area into a single location, providing a comprehensive view of the event's impacts in the region.

In addition, this report presents damage estimates for modeled disaster events, as opposed to the DR-4223 event. The Federal Emergency Management Agency (FEMA) administers a software tool, called Hazus, that models damage impacts for flood events of specified extents. This report presents Hazus estimates for the Capital Area, revealing where the region is potential susceptible to damage from severe flood events that do not necessarily follow the same pattern as the DR-4223 event.

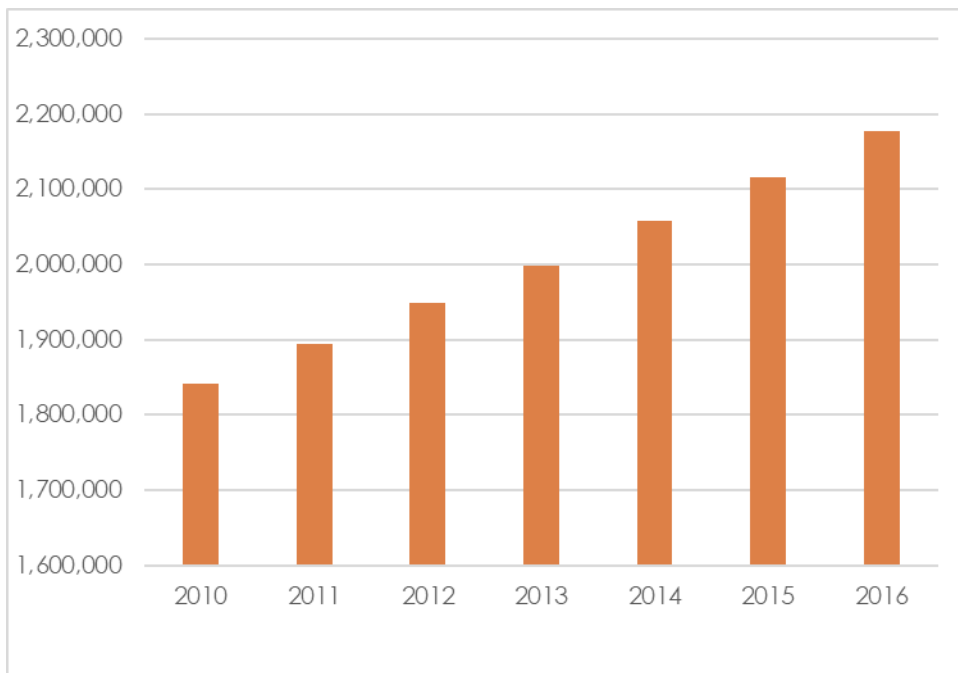
Finally, this report consolidates a number of resiliency and mitigation measures undertaken by stakeholders in the Capital Area with an eye toward identifying where investments at a regional scale can make for efficient mitigation and more effective disaster response. The report also identifies a number of efforts employed by communities in other parts of the region that are relevant to the Capital Area's context.

The components of this report work together in an effort to provide the Capital Area with the information needed to support further resiliency and mitigation planning efforts. To ease accessibility of this information and to broaden its use across the region, much of the analysis included in this report has been made viewable online via the [Project Map Portal](#) in story map format. Much of the data and analysis are also shared online as downloadable GIS files via CAPCOG's [Open Data GIS Portal](#).

Overview: The Capital Area of Texas

The Capital Area of Texas refers to a 10-county region surrounding Austin, Texas' capital city. The region is home to some of the fastest growing cities in the country, including Austin, Round Rock, Georgetown, San Marcos, Kyle, Buda, and others. Much of the growth in the region is concentrated in communities along IH-35, a major corridor that runs across the entirety of Texas from the Mexican border through San Antonio, Austin, and Dallas, and points further north.

Figure 1: Population Change in the CAPCOG Region (2010-2016)



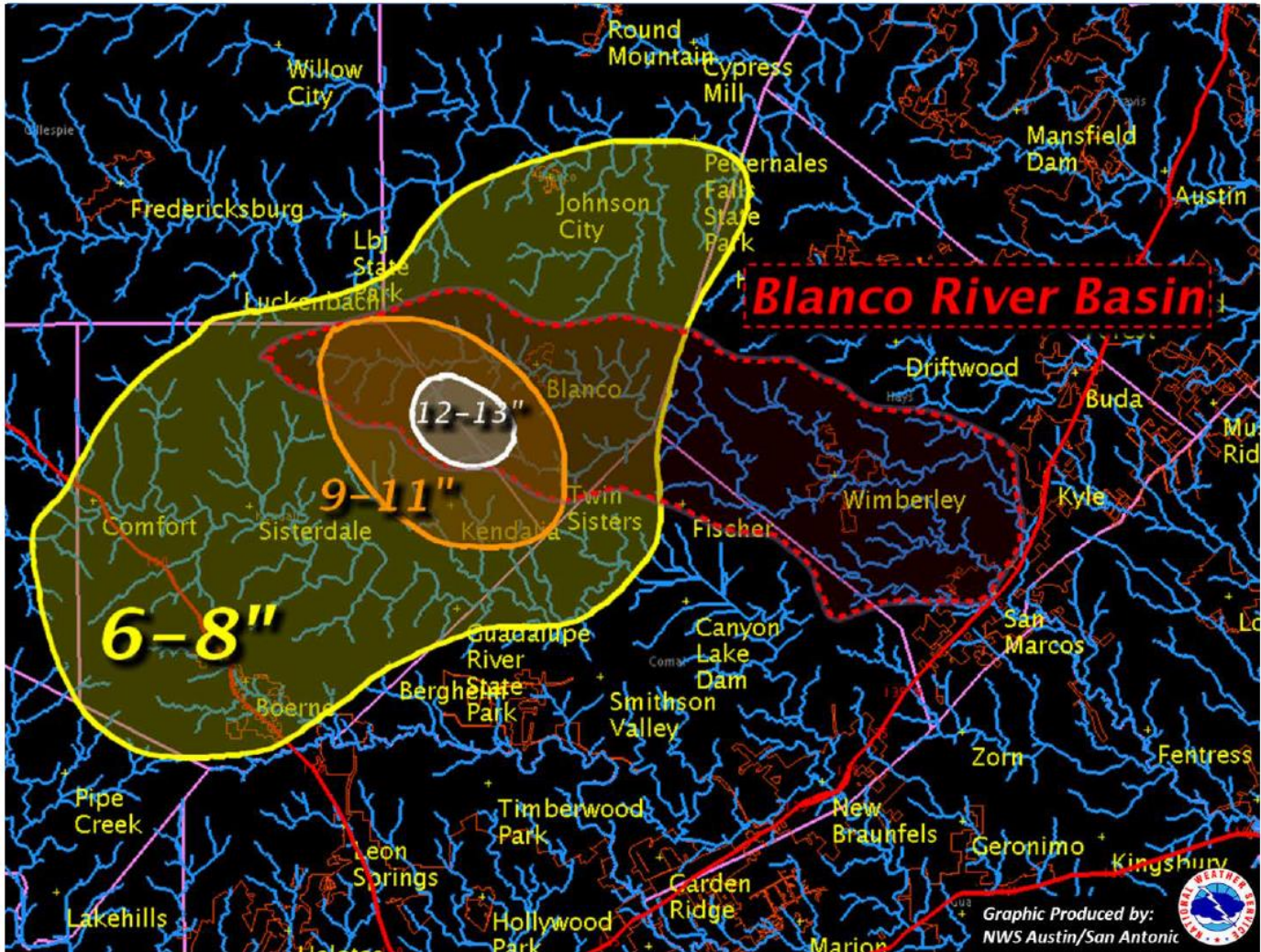
The region is also home to several river systems. The Colorado River, which runs from Burnet County in the northwest of the region through Fayette County in the southeast. The river is dammed in several locations to create a series of lakes, including Lake Austin and Lady Bird Lake in Travis County. The Blanco River runs through the southern part of the region, from Blanco through Hays and Caldwell Counties.

Because of the presence of these water systems, the region has proclivity for flooding. This vulnerability has been exacerbated by the rapid development in the region, which has increased the amount of impervious cover and made draining of rain water less effective. Rapid population growth has also meant that much of the existing transportation infrastructure is at capacity, which poses a potential issue should the region need to evacuate in the face of a disaster.

The 2015 Memorial Day Disaster Event

On Saturday, May 23rd and into Sunday, May 24th, roughly 6 to 8 inches of rain fell across a wide section of the Texas Hill Country. As much as 10 to 13 inches of rain fell in certain locations in Blanco County. As a result of this massive rain event, the Blanco River, which runs from Blanco County in to Hays and Caldwell counties created a forceful flash flood. The Blanco River at Wimberley "rose from near 5 feet at 9pm to near 41 feet by 1am."¹ This rapid rise fed downstream to the San Marcos River as well, affecting the communities of Wimberley, San Marcos, Martindale and others.

Figure 3: Memorial Day Disaster Event Rainfall



Source: National Weather Service

The impact of the flooding for these communities and other developments along these rivers was severe. Thirteen people were killed in the flooding, and nearly 2,500 households throughout the CAPCOG region would later apply to FEMA for disaster assistance.

¹ Memorial Weekend Flooding, May 2015. National Weather Service. Weather Event Summary.

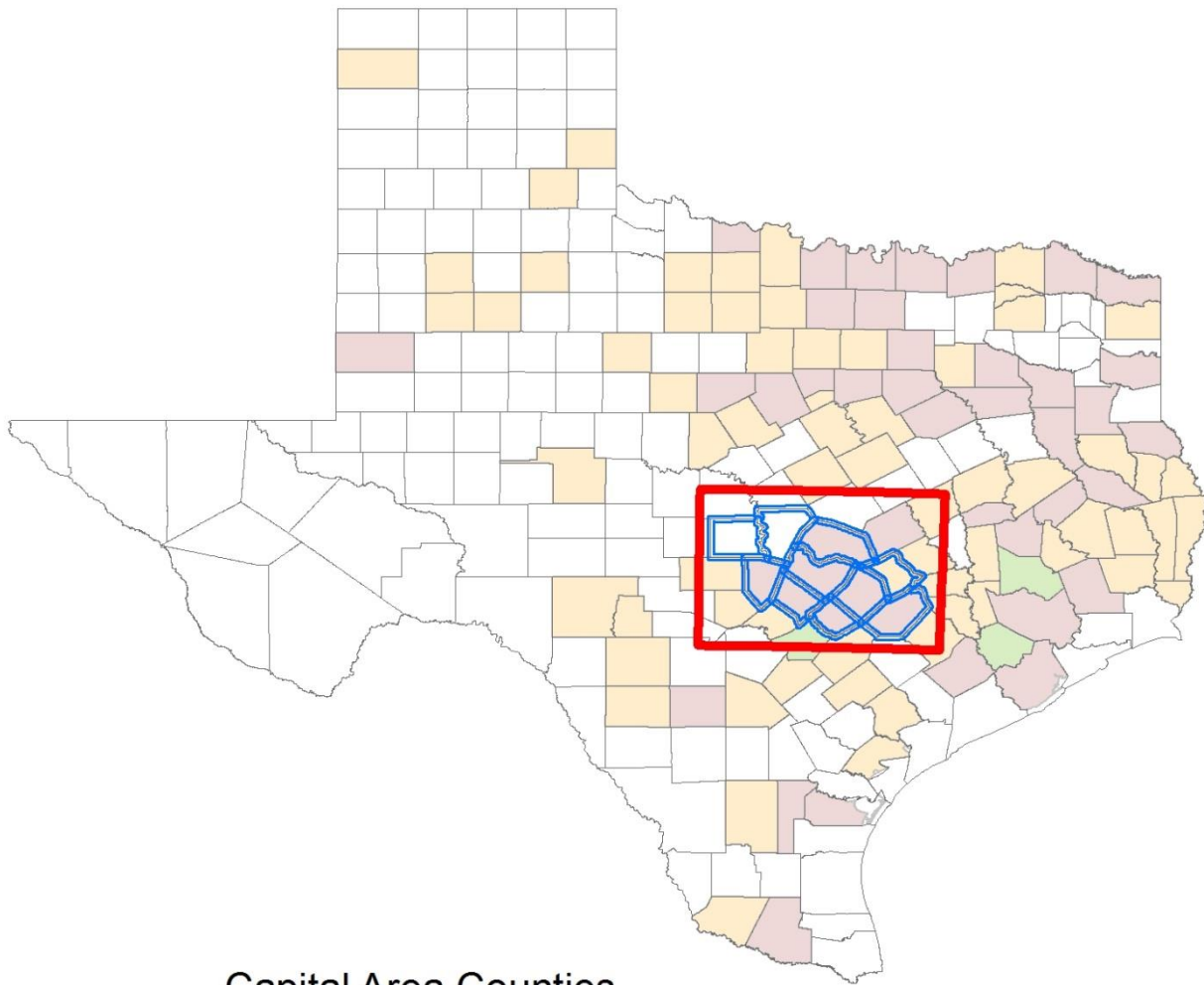
Figure 4: Damage Near the Blanco River Following the Memorial Day Flooding



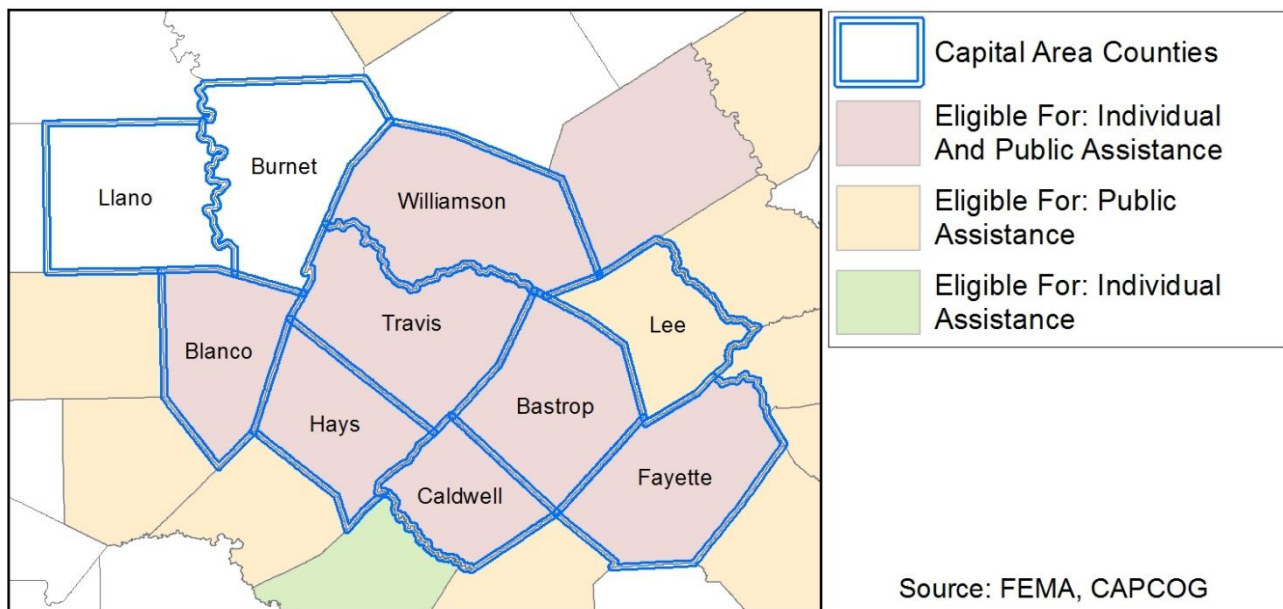
Source: Drew Andrew Smith/Getty Images

President Obama issued a Major Disaster Declaration for in response to the storm on May 29th. The disaster declaration (DR-4223) would later be expanded to include counties throughout much of the state of Texas that had been affected by this storm system and subsequent ones shortly thereafter. A map of the counties included in the DR-4223 declaration, as well as a map of the CAPCOG region for reference, follows.

Figure 5: Federal Disaster Declaration (DR-4223) Affected Counties



Capital Area Counties



Source: FEMA, CAPCOG

Case Studies From the Memorial Day Flood Event

Old Glory Ranch

Situated along the Blanco River on River Road, just outside of the Wimberley city limits, Old Glory Ranch is a wedding and event venue. On the Saturday night when the Blanco River flooding began, Old Glory Ranch was hosting a wedding. A security guard is hired for every wedding at Old Glory Ranch, and on this night, the guard heard through informal networks that the Blanco River was rising rapidly. This advanced warning allowed for Old Glory Ranch to take precautions in advance of the flood.

All of the 150 guests at the wedding were safely evacuated, the owner and employees on site were able to shelter in place, and the ranch animals were moved to safer locations on the property.

While it is fortunate that there was no loss of life at the Old Glory Ranch, there was still considerable property damage. A riverside platform for marriage ceremonies was completely destroyed. The loss of trees on the property was estimated to be worth a loss of \$2 million in land value by a damage assessor.

Removing these fallen trees and other disaster debris was a long term project for Old Glory Ranch, as volunteer help was allocated primarily to households, and FEMA assistance is not available for clearing private land. This loss of "scenic ambiance" cost Old Glory Ranch in future months, as weddings and events were down by roughly 20% in the year following the disaster. Staff positions had to be cut due to the lost event activity.

Figure 6: Old Glory Ranch Chapel



The Old Glory Ranch Chapel sits up a hill from the banks of the Blanco River and was not damaged in the flooding.

Figure 7: Old Glory Ranch River Pavilion (Destroyed)



Figure 8: Tree Damage Near the Blanco River on the Old Glory Ranch Property



7A Ranch Resort

The 7A Ranch was originally opened in 1946 with several cottages along the Blanco River. Eventually it grew to feature a lodge, additional cabins, and a Pioneer Town set in the 19th century. Through its history, 7A was owned and operated by the Czichos family.

During the Memorial Day flood event, the Blanco River rose high enough to sweep away several of the cottages on the 7A property. None of the patrons was harmed, once again thanks to a warning phone call received through an informal network from someone upstream of the river. However, considerable damage was done to the property; ultimately, 15 of the 19 cabins on the property were lost. Moreover, because the river had never threatened the resort in its long history, the owners did not have a flood insurance policy.

The economic impact of the damage was devastating. With many of the facilities damaged, business slowed by roughly 50% in the following year. The 7A Ranch Resort estimated that roughly 10,600 visitors were lost while repairs were made from May to September. The Czichos family was ultimately forced to sell the property. It was purchased by another locally-based family and is now operated by an Austin-based hospitality management company.

Figure 9: Front Office Building for the 7A Ranch Resort (Undamaged)



Figure 10: Concrete Slab Remains of a 7A Ranch Casita that was Damaged by Flooding (River in Background)



Figure 11: New Construction of Casitas at 7A Ranch to Replace Those That Were Damaged



Economic Impacts of the 2015 Memorial Weekend Disaster Event in the Capital Area

The following sections of this report outline economic impacts in Bastrop, Blanco, Caldwell, Fayette, Hays, Lee, Travis, and Williamson Counties associated with the Memorial Weekend Disaster (DR-4223). It is important to note that in most disasters, data generated when services or aid are provided to affected parties. In some cases, affected persons do not seek or receive aid or assistance, and the impact of the disaster on them can go unreported. Because of this, it is reasonable to expect that these damage estimates are conservative estimates of the actual damage caused by the event. However, even these conservative estimates provide useful context for the scale of the damage caused during DR-4223.

National Flood Insurance Program Claims

The National Flood Insurance Program (NFIP) is administered by the Federal Emergency Management Agency (FEMA) and allows property owners to purchase insurance against flood damage. The following table presents NFIP claims associated with DR-4223 in disaster-affected counties in the CAPCOG region.

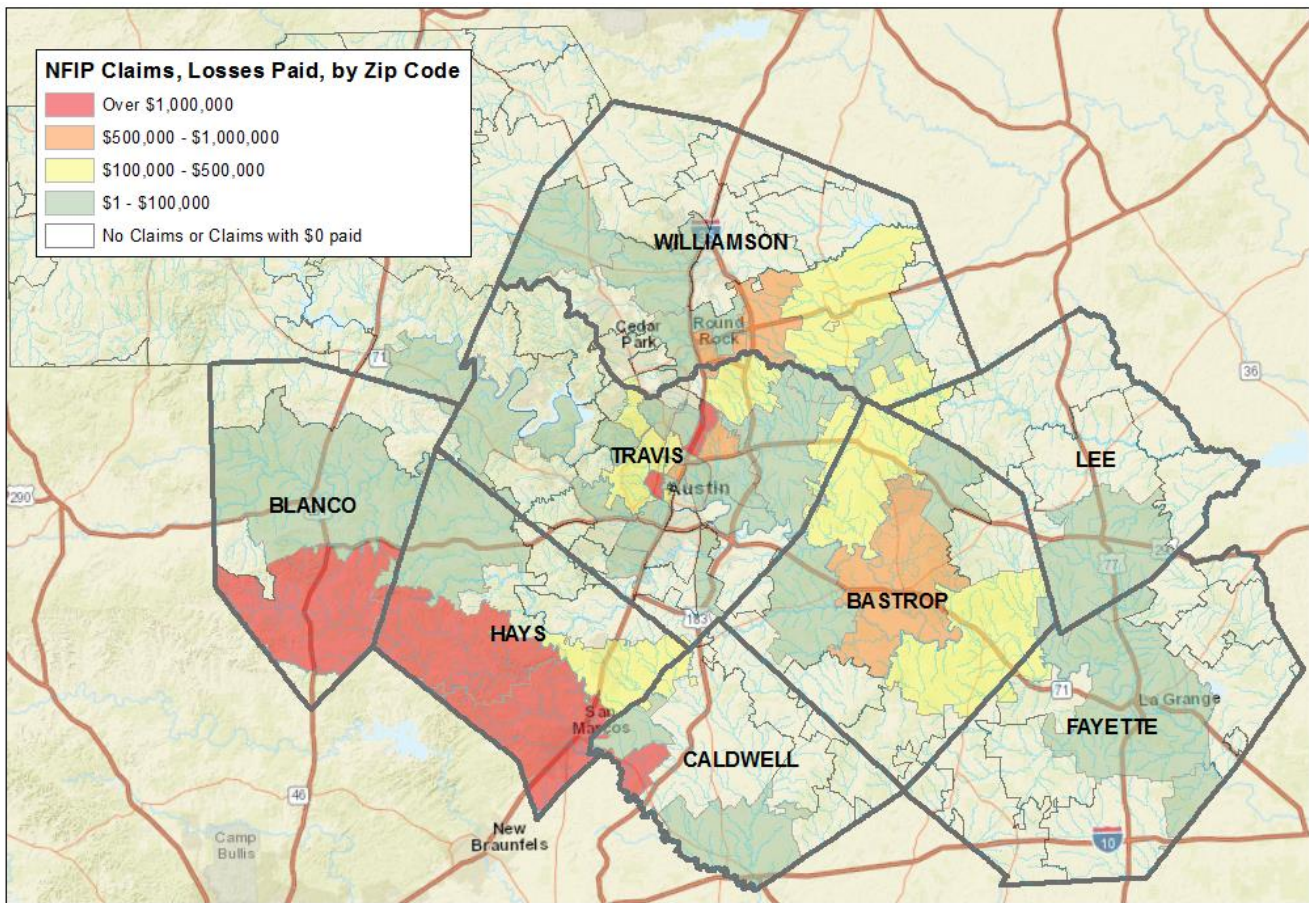
Table 1: National Flood Insurance Program (NFIP) Claims

County	NFIP Claims	Total Losses Paid
Bastrop	46	\$1,129,440
Blanco	32	\$2,384,189
Caldwell	72	\$4,758,792
Fayette	5	\$65,041
Hays	400	\$45,092,674
Lee	4	\$27,855
Travis	245	\$6,962,674
Williamson	54	\$2,445,159
Total	858	\$62,865,824

Given the extent of flooding in the extent of flooding in the Blanco and San Marcos Rivers, it is unsurprising to see the large numbers of claims in Hays County. Travis County also saw a large number of claims, though it is worth noting that the average loss paid was much higher in Hays County (\$112,731) than in Travis County (\$28,419). Caldwell County saw the third highest number of claims, with an average claim amount of just over \$66,000.

The following map presents NFIP losses paid by ZIP Code for the Capital Area.

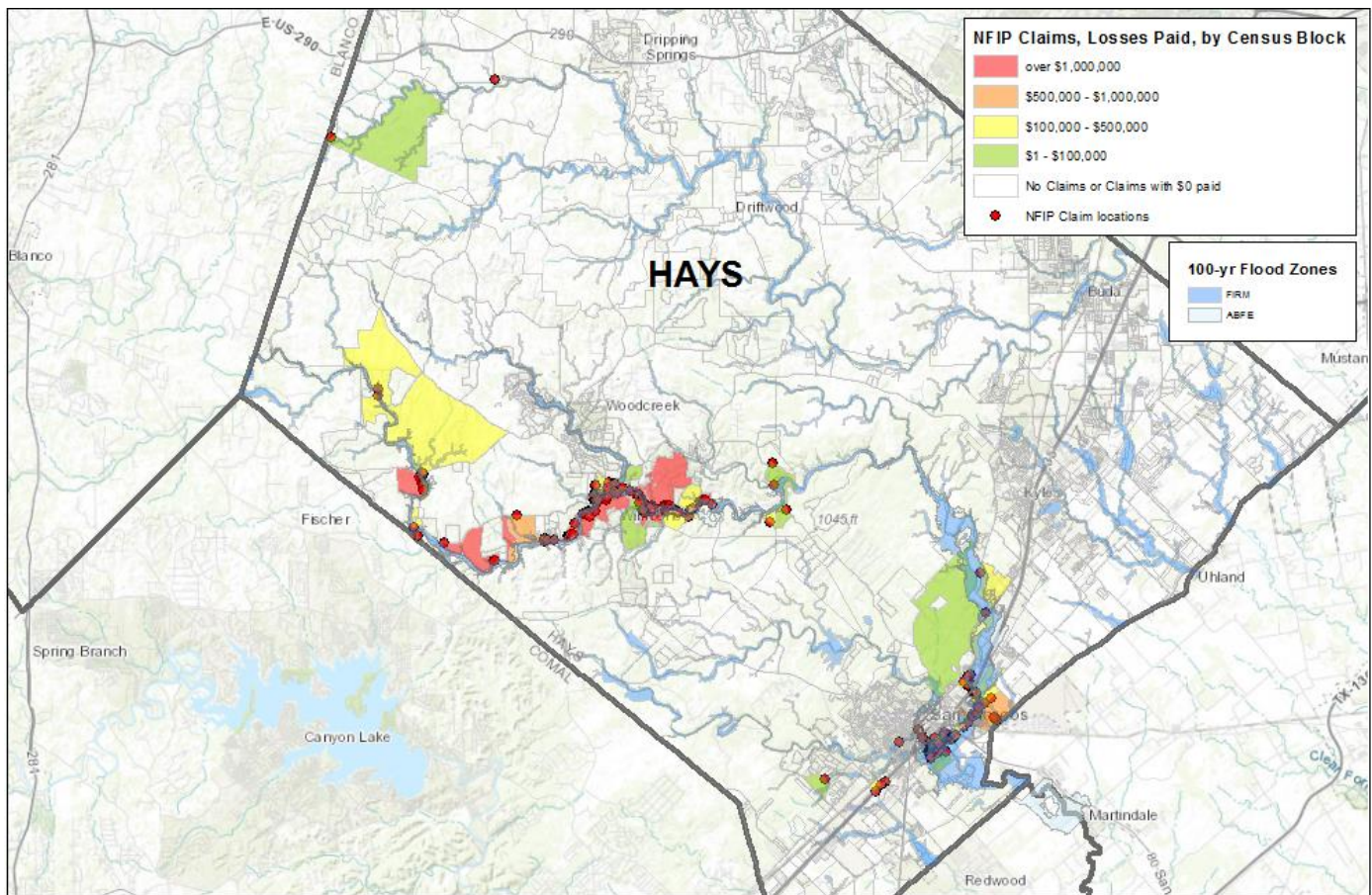
Figure 12: National Flood Insurance Program (NFIP) Claims, Losses Paid by ZIP Code



As expected, the Blanco and San Marcos river sheds show high numbers of claims and losses paid. In other parts of the region, the losses are concentrated where development is denser (e.g., central Austin, Bastrop, and southern Williamson County).

The following map presents NFIP claims in Hays County in greater detail.

Figure 13: National Flood Insurance Program (NFIP) Claims, Losses Paid by Census Block for Hays County



The figure shows NFIP claims concentrated along the Blanco and San Marcos rivers in Wimberley and San Marcos. Claims in unincorporated areas of the county are also present along the river's footprint. The losses paid are the highest in the orange and red census blocks along the southern portion of the county (near Fischer), along River Road leading to Wimberley, and northeast San Marcos.

FEMA Assistance to Households

For those households without flood insurance, or those affected by the heavy winds and rains included in the disaster declaration, FEMA offers assistance through its Individuals and Households Program (IHP). Individuals and households that experience damage to their primary residence can apply for FEMA assistance, FEMA will inspect and assess the damage to the structure, and FEMA will then award a grant to the individual or household. The program has a maximum grant amount that changes from year to year. In 2015, the maximum IHP grant amount was \$32,900.

Table 2: FEMA Assistance to Individuals and Households Program (IHP) – Homeowners

County	Valid Household Registrations	Households Approved For FEMA Assistance	Total Damage Assessed	Total Approved IHP Amount	Households Receiving Maximum Grants
Bastrop	450	186	\$1,323,609.98	\$1,047,107.26	2
Blanco	133	59	\$972,319.10	\$512,747.99	5
Caldwell	197	120	\$1,796,064.42	\$965,464.76	1
Fayette	29	11	\$80,279.03	\$50,611.45	0
Hays	943	492	\$11,954,795.98	\$5,589,834.78	54
Travis	402	155	\$1,098,420.20	\$818,463.84	1
Williamson	300	121	\$1,013,734.29	\$764,189.11	0
Total	2,454	1,144	\$18,239,223.00	\$9,748,419.19	63

A total of 2,454 individuals and households registered for FEMA assistance, and the amount of damage assessed by FEMA inspectors exceeded \$18 million. Notably, the number of households actually receiving assistance was only 1,144, meaning that more than half of all applicants for assistance did not receive it. Common reasons for being denied IHP assistance include²:

- The property owner has insurance to cover the losses;
- The damages to the home were not caused by the disaster
- The home did not sustain sufficient damages to essential living areas to qualify for disaster assistance
- The property is a secondary or vacation home

Given the prevalence of vacation and secondary homes along the Blanco river in particular, this may be a likely explanation for the large number of FEMA assistance applications that were denied. Nevertheless, the combination of applications denied and the maximum grant means that only \$9.7 million in assistance was awarded, despite \$18.2 million in damages assessed.

Table 3: FEMA Assistance to Individuals and Households Program (IHP) by Grant Size - Homeowners

County	Households Approved For FEMA Assistance	Assistance Grants Between \$1 and \$10,000	Assistance Grants Between \$10,001 and \$25,000	Assistance Grants Between \$25,001 and the IHM Maximum Grant	Average FEMA IHP Assistance Amount
Bastrop	186	147	34	5	\$5,629.61
Blanco	59	43	8	8	\$8,690.64
Caldwell	120	82	30	8	\$8,045.54
Fayette	11	8	3	0	\$4,601.04
Hays	492	286	121	85	\$11,361.45
Travis	155	125	29	1	\$5,280.41
Williamson	121	93	27	1	\$6,315.61
Total	1,144	784	252	108	\$8,521.35

In addition to providing assistance to homeowners, the IHP program also provides assistance to renters. Assistance is typically awarded for the purpose of replacing items damaged due to the disaster as well as for paying for alternative housing for a specified period, should the renter need to relocate. Because

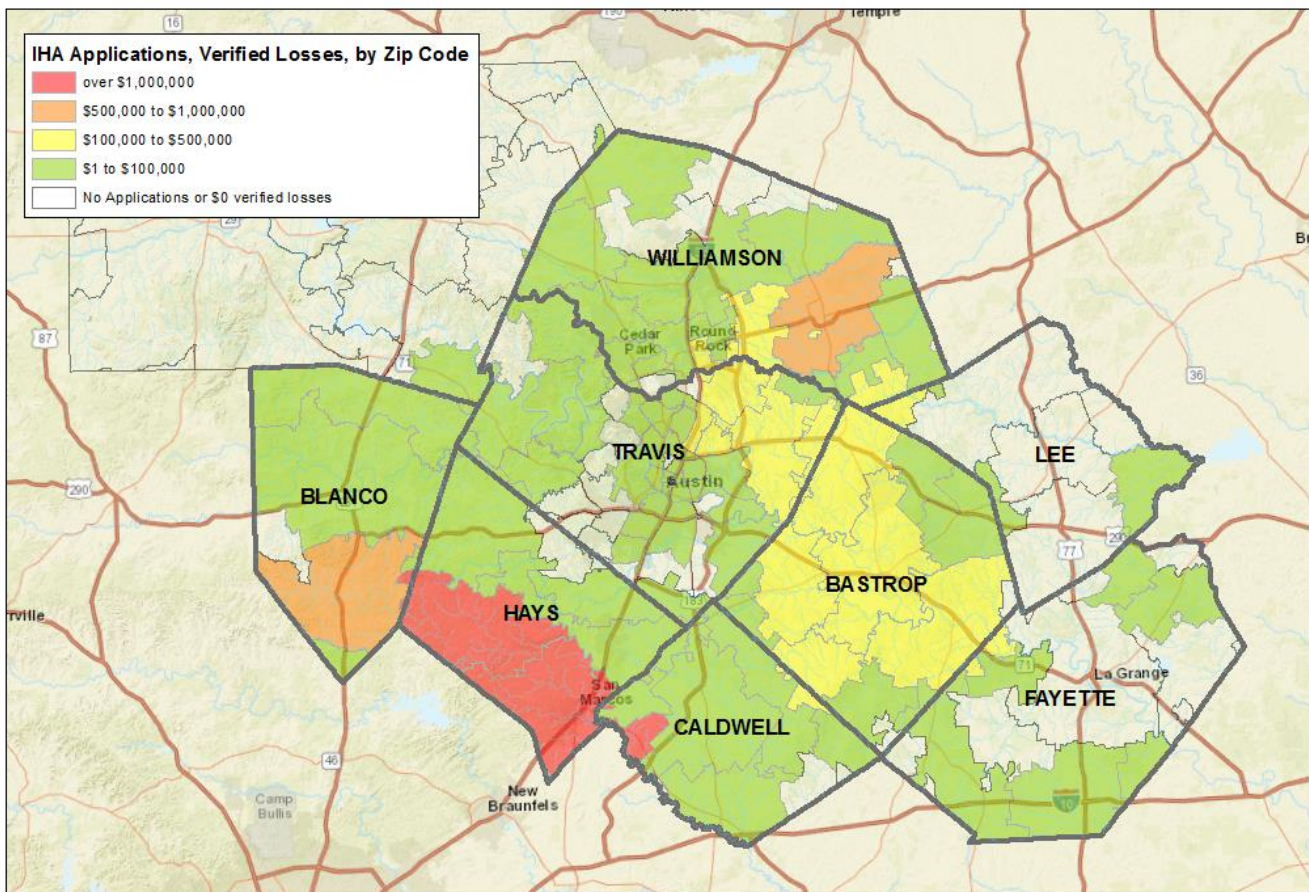
² Source: FEMA. Available at <https://www.fema.gov/faq-details/Common-reasons-for-individual-assistance-denial-1370032117600>.

it does not cover damage to the actual property, assistance to renters through the IHP program is typically in smaller amounts than that provided to property owners.

Table 4: FEMA Assistance to Individuals and Households Program (IHP) - Renters

County	Valid Household Registrations	Households Approved For FEMA Assistance	Total Approved IHP Amount	Average IHP Assistance Per Household
Bastrop	44	22	\$57,423.69	\$2,610.17
Blanco	20	12	\$57,383.11	\$4,781.93
Caldwell	89	52	\$238,272.19	\$4,582.16
Fayette	3	1	\$830.11	\$830.11
Hays	965	609	\$2,904,573.06	\$4,769.41
Travis	121	49	\$131,400.82	\$2,681.65
Williamson	126	81	\$436,261.39	\$5,385.94
Total	1,368	826	\$3,826,144.37	\$4,632.14

Figure 14: FEMA Assistance to Individuals and Households Program (IHP) Verified Losses by ZIP Code



FEMA Public Assistance

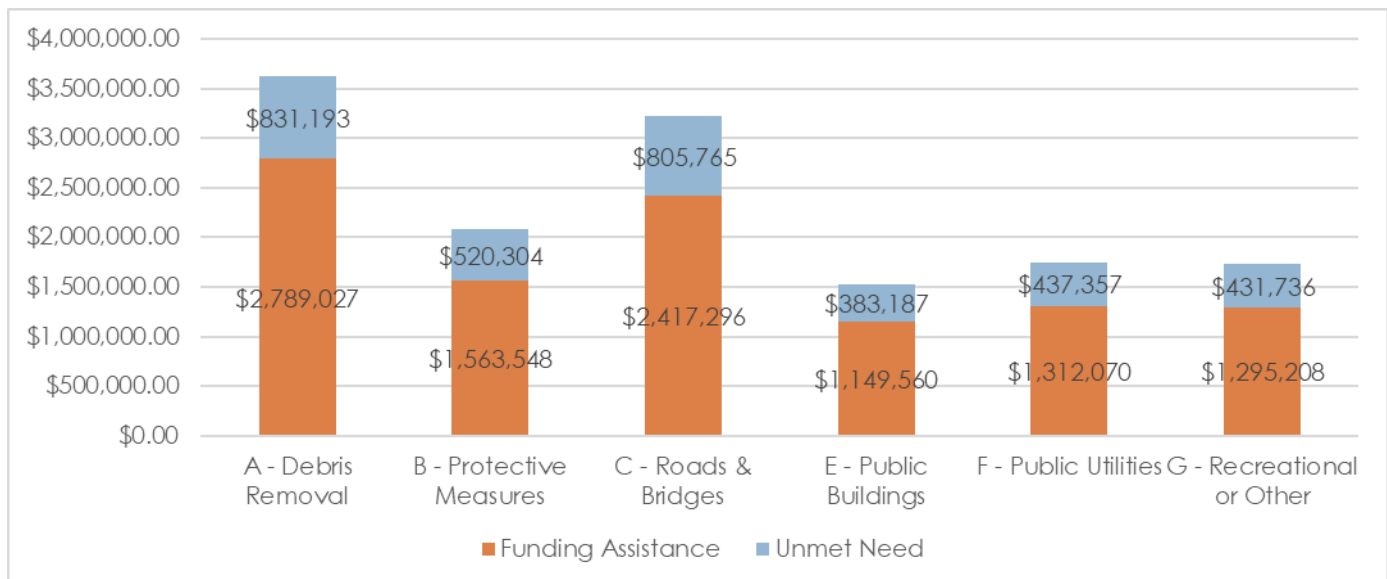
In addition to its assistance to individuals and households, FEMA offers assistance to local governments affected by disasters. There are seven categories of costs for which FEMA will provide assistance to local governments:³

- Debris removal
- Emergency protective measures to lessen threats to public safety or prevent damage to a facility or its contents
- Restoration of roads and bridges
- Work on water control facilities
- Work on public buildings and equipment
- Work on public utilities
- Work on parks, recreational, or other facilities

FEMA Public Assistance requires local jurisdictions file a Request for Public Assistance within 30 days of the federal disaster declaration date. The federal share of an approved project will always be at least 75 percent of the project cost and can exceed that rate in cases of severe disasters. Project costs borne by the local jurisdictions are referred to as “unmet need” in the following analyses.

The following figure presents public assistance and unmet need for public sector projects in the Capital Area associated with DR-4223. The “Water Control Facilities” category is omitted from the figure, as no public assistance projects for this category were submitted from the Capital Area.

Figure 15: FEMA Public Assistance and Unmet Need by Category in the Capital Area



Over \$10.5 million in public assistance was provided by FEMA, with another \$3.4 million expended by local governments in the Capital Area. Debris removal and repairs to roads and bridges represented the largest expenditure categories, accounting for \$6.8 million of the \$13.9 million in total public expenditures. The specific recipients of FEMA Public Assistance grants in the Capital Area are detailed in the following table.

³ Source: FEMA. Available at: [https://www.fema.gov/media-library-data/1496435662672-d79ba9e1edb16e60b51634af00f490ae/2017_PAPPG_2.0_508_FINAL\(2\).pdf](https://www.fema.gov/media-library-data/1496435662672-d79ba9e1edb16e60b51634af00f490ae/2017_PAPPG_2.0_508_FINAL(2).pdf)

Table 5: FEMA Public Assistance Recipients in the Capital Area (DR-4223)

Applicant Name	Federal Obligated Amount	Project Amount	Number Of Projects
Aqua Water Supply Corporation	216,359	288,478	9
Austin	1,916,585	2,519,668	27
Austin Community College	33,705	44,939	2
Austin Independent School District	692,872	923,153	3
Bastrop (County)	1,038,350	1,384,467	68
Bastrop County Water Control & Improvement District 2	209,871	279,827	5
Blanco	459,449	612,508	6
Blanco (County)	132,848	166,414	7
Blanco Emergency Medical Services	5,253	7,004	1
Blanco Volunteer Fire Department	4,907	6,543	1
Caldwell (County)	140,220	185,849	4
Elgin	50,743	64,160	4
Fayette (County)	252,676	334,199	12
Florence	20,022	26,696	1
Hays (County)	2,501,732	3,291,966	19
Hays County Emergency Services District #3	5,179	6,906	1
Hays County Emergency Services District #5	16,771	22,362	1
Hays County Emergency Services District #6	12,534	16,712	1
Housing Authority Of The City Of Taylor	22,858	30,135	2
Hutto	34,518	44,307	5
Johnson City	33,527	44,702	1
Lee (County)	164,263	217,070	28
Lexington	6,955	9,273	2
Luling	25,672	34,229	4
Martindale	36,904	46,439	3
Round Rock	34,325	45,766	2
Round Rock Independent School District	23,603	31,471	1
San Marcos	457,165	569,351	6
San Marcos Housing Authority	423,330	617,972	52
Smithville	40,234	53,645	4
Taylor	287,741	380,003	7
Travis (County)	119,406	158,462	10
Upper Brushy Creek Water Control & Improvement District	375,391	500,521	0
Williamson (County)	449,652	596,267	42
Wimberley	79,942	106,589	6
Wimberley Emergency Medical	15,283	20,377	1
Wimberley School District	166,734	222,312	3
Wimberley Volunteer Fire Department	19,132	25,510	1
Grand Total	10,526,710	13,936,251	352

Other Disaster Impact Data

In addition to federal assistance from FEMA, the U.S. Small Business Association (SBA) provides disaster assistance as well in the form of low-interest, long-term loans. Loans are made available to businesses, non-profit organizations, homeowners, and renters for the explicit purpose of repairing and replacing property damaged during a federally-declared disaster event. Businesses and non-profit organizations may borrow up to \$2 million, and homeowners and renters may borrow up to \$200,000.

The following table presents the total amount of SBA Disaster Lending to homeowners and renters in the Capital Area associated with DR-4223.

Table 6: Small Business Administration Home Disaster Loans

County	SBA Home Loans	Total Loan Amount
Bastrop	40	\$1,151,500
Blanco	13	\$684,900
Caldwell	29	\$1,040,300
Fayette	3	\$58,800
Hays	171	\$11,120,700
Travis	55	\$816,000
Williamson	31	\$707,200
Total	342	\$15,579,400

The following table presents the total amount of SBA Disaster Lending to businesses in the Capital Area. Much of the lending is concentrated in Hays County, and within Hays County, damages to businesses in the hospitality and recreation sectors was particularly prominent.

Table 7: Small Business Administration Business Disaster Loans

County	SBA Business Loans	Total Loan Amount
Bastrop	1	\$39,200
Blanco	1	\$52,500
Caldwell	0	\$0
Fayette	1	\$11,400
Hays	37	\$6,710,800
Lee	0	\$0
Travis	8	\$704,400
Williamson	2	\$395,500
Total	50	\$7,913,800

The Texas Department of Insurance is a component of the U.S. insurance regulatory framework and coordinates on issues with the insurance industry in the state of Texas. The following table presents data collected by the Texas Department of Insurance for vehicle insurance claims paid due to flooding during the Memorial Day weekend in the Capital Area.

Table 8: Texas Private Passenger Vehicle Incurred Losses Due to Flooding

County	Incurred Losses
Bastrop	\$424,329
Blanco	\$163,834
Caldwell	\$468,138
Fayette	\$26,468
Hays	\$4,311,584
Lee	\$69,054
Travis	\$2,584,068
Williamson	\$981,614
Total – All Listed Counties	\$9,029,089

Source: Texas Department of Insurance

In response to damaged infrastructure, the Texas Department of Transportation (TxDOT) also mobilized funding to repair several bridges along the Blanco River. The repaired bridges and the cost estimates of those repairs are presented in the following table.

Table 9: TxDOT Projects In Response to DR-4223

County	Description	Location	Cost Estimate
Hays	Replace Bridge And Approaches	Fischer Store Road At Blanco River	\$2,513,595
Hays	Bridge Replacement	Post Rd (CR 140) at the Blanco River	\$1,200,000
Blanco	Replace Bridge	Bridge on RM 165 outside of Blanco	\$2,700,000

Modeling Flood Vulnerabilities and Impacts Throughout the Capital Area

The Memorial Day flood event in 2015 that resulted in the DR-4223 Disaster Declaration in much of the Capital Area was disastrous, both in terms of economic loss and with regard to the loss of life. It was also a specific weather event that arose from specific conditions that resulted in heavy flooding along the Blanco River, most significantly.

However, it is possible that slightly different conditions would have produced flooding in other areas. To test what might have happened in these alternative scenarios, CAPCOG modeled vulnerability to flooding by using a software called, Hazus. Hazus is a nationally applicable standardized methodology that estimates potential losses in disaster scenarios. Hazus is administered by FEMA, and allows users to estimate and map the results of damage and economic loss estimates for buildings and infrastructure.

To test flood vulnerabilities and estimate potential losses in a flood scenario, CAPCOG performed the following modeling exercise on each of the counties included in the DR-4223 declaration:

- Assume a 100-year flood scenario for each stream in a county
- Compare the extent of the resulting flooding to building footprints and estimated values, based on appraisal district valuations
- Aggregate estimated loss data to the census block level to protect the personal information of individual property owners
- In the case of commercial and industrial properties, Hazus also estimates economic losses due to business interruption

HAZUS results are intended to be taken in aggregate form across a region, not necessarily at the unit of analysis level (i.e. Census Block) at any particular location. HAZUS may overestimate in some areas and underestimate in others. Estimated losses using the HAZUS model are not directly associated with the 2015 Memorial weekend flood event, but rather an approximated 100-yr flood scenario. Built-in HAZUS hydrologic and hydraulic (H&H) models were used for Bastrop, Fayette, Lee, Travis, and Williamson counties. However, more detailed H&H data from FEMA's RiskMAP program, namely flood depth grids, were used to delineate an approximated 100-yr flood boundary for Blanco, Caldwell, and Hays counties.

The resulting maps and summary tables present a sense for the scale of regional flood vulnerability, as well as a picture of where that flood damage would potentially be most economically severe. Map images are provided in the following section of this report, but digital versions in PDF format, as well as GIS data is available via CAPCOG's [Open Data GIS Portal](#). Interactive maps are also available via the [Project Map Portal](#).

Disaster Impacted Counties in the Capital Area

Bastrop County

Estimated losses for Bastrop County in a 100-year flood scenario amount to \$79.7 million, with \$79.47 million arising from damaged buildings and \$0.23 million resulting from business interruption. The most severe loss areas are in the western part of the county, along Cedar Creek and Maha Creek. There are also severe loss areas along the Colorado River near Upton and Smithville.

The largest expected category of loss is the loss of residential buildings, accounting for \$65.8 million, 83% of the total amount of expected losses in the scenario.

Figure 16: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Bastrop County

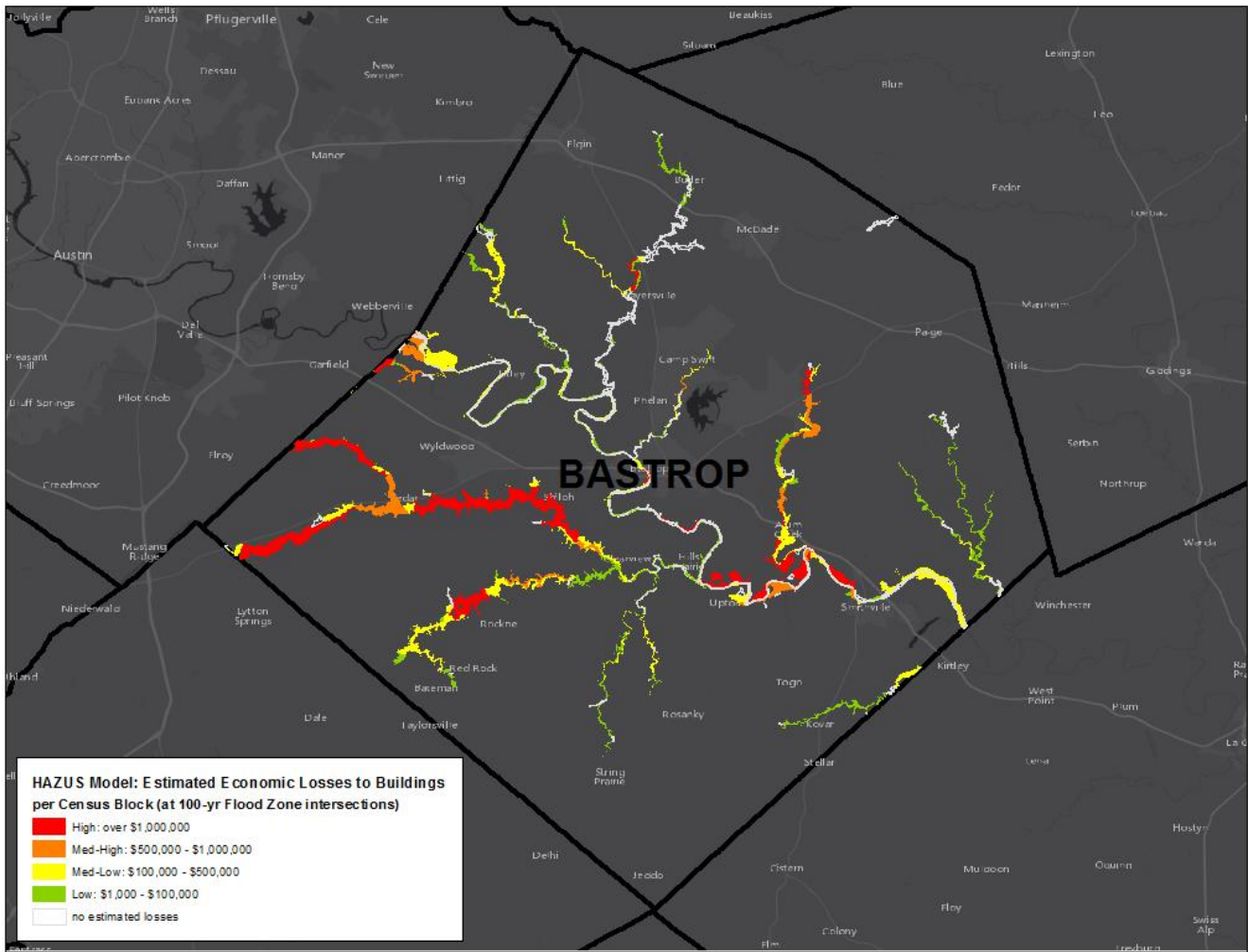


Table 10: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Bastrop County (Millions of Dollars)

	Residential	Commercial	Industrial	Other	Total
Building Losses					
Building	42.77	2.51	0.83	0.36	46.47
Content	23.03	6.59	1.48	1.41	32.52
Inventory	0.00	0.19	0.26	0.03	0.49
<i>Building Losses Subtotal</i>	<i>65.81</i>	<i>9.30</i>	<i>2.57</i>	<i>1.80</i>	<i>79.47</i>
Business Interruption Losses					
Income	0.00	0.03	0.00	0.00	0.03
Relocation	0.06	0.00	0.00	0.00	0.06
Rental Income	0.01	0.00	0.00	0.00	0.01
Wages	0.00	0.03	0.00	0.11	0.14
<i>Business Interruption Subtotal</i>	<i>0.06</i>	<i>0.06</i>	<i>0.00</i>	<i>0.11</i>	<i>0.23</i>
Total	65.87	9.35	2.57	1.91	79.70

Blanco County

Estimated losses for Bastrop County in a 100-year flood scenario amount to \$57.2 million, with \$57.03 million arising from damaged buildings and \$0.17 million resulting from business interruption. The most severe loss areas are in the southern part of the county, along the Blanco River and the Little Blanco River. There are also severe loss areas along Miller Creek east of the intersection of US 290 and US 281.

Figure 17: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Blanco County

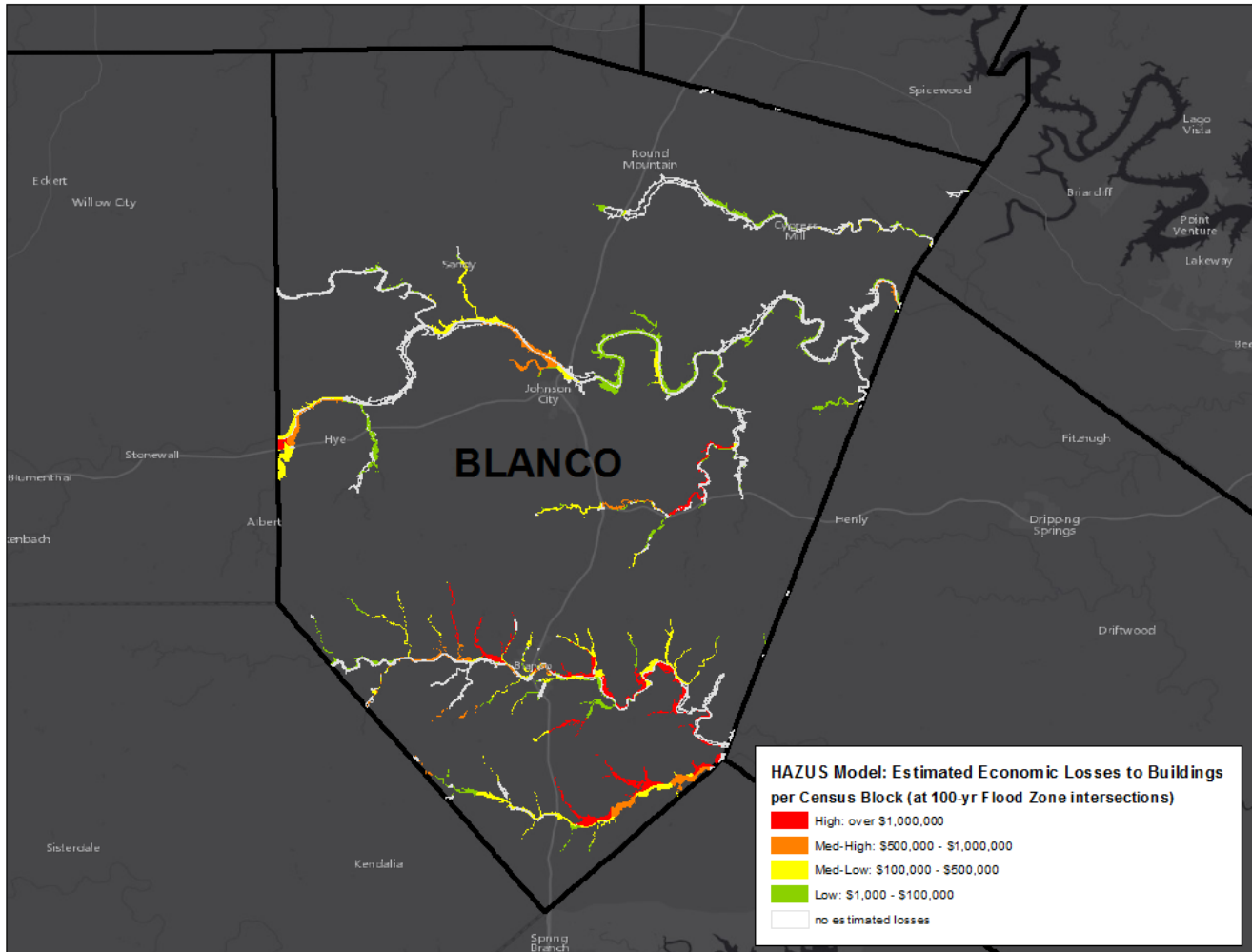


Table 11: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Blanco County (Millions of Dollars)

	Residential	Commercial	Industrial	Other	Total
Building Losses					
Building	21.32	1.90	0.80	3.18	27.20
Content	11.73	4.41	1.80	10.59	28.54
Inventory	0.00	0.12	0.32	0.86	1.30
<i>Building Losses Subtotal</i>	<i>33.05</i>	<i>6.44</i>	<i>2.91</i>	<i>14.63</i>	<i>57.03</i>
Business Interruption Losses					
Income	0.00	0.02	0.00	0.02	0.04
Relocation	0.02	0.00	0.00	0.01	0.03
Rental Income	0.00	0.00	0.00	0.00	0.00
Wages	0.00	0.01	0.00	0.08	0.10
<i>Business Interruption Subtotal</i>	<i>0.03</i>	<i>0.03</i>	<i>0.00</i>	<i>0.11</i>	<i>0.17</i>
Total	33.08	6.47	2.91	14.74	57.20

Caldwell County

Estimated losses for Caldwell County in a 100-year flood scenario amount to \$90.76 million, with \$90.74 million arising from damaged buildings and \$0.02 million resulting from business interruption. Because of the extensive cover of rivers and streams in Caldwell County, the spatial extent of flood damage in the modeled 100-year scenario is extensive. The most severe loss areas are in the southwestern part of the county, along the San Marcos River and along a series of creeks in the center of the county. There are also severe loss areas near Uhland and Mustang Ridge in the northwestern part of the county.

Figure 18: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Caldwell County

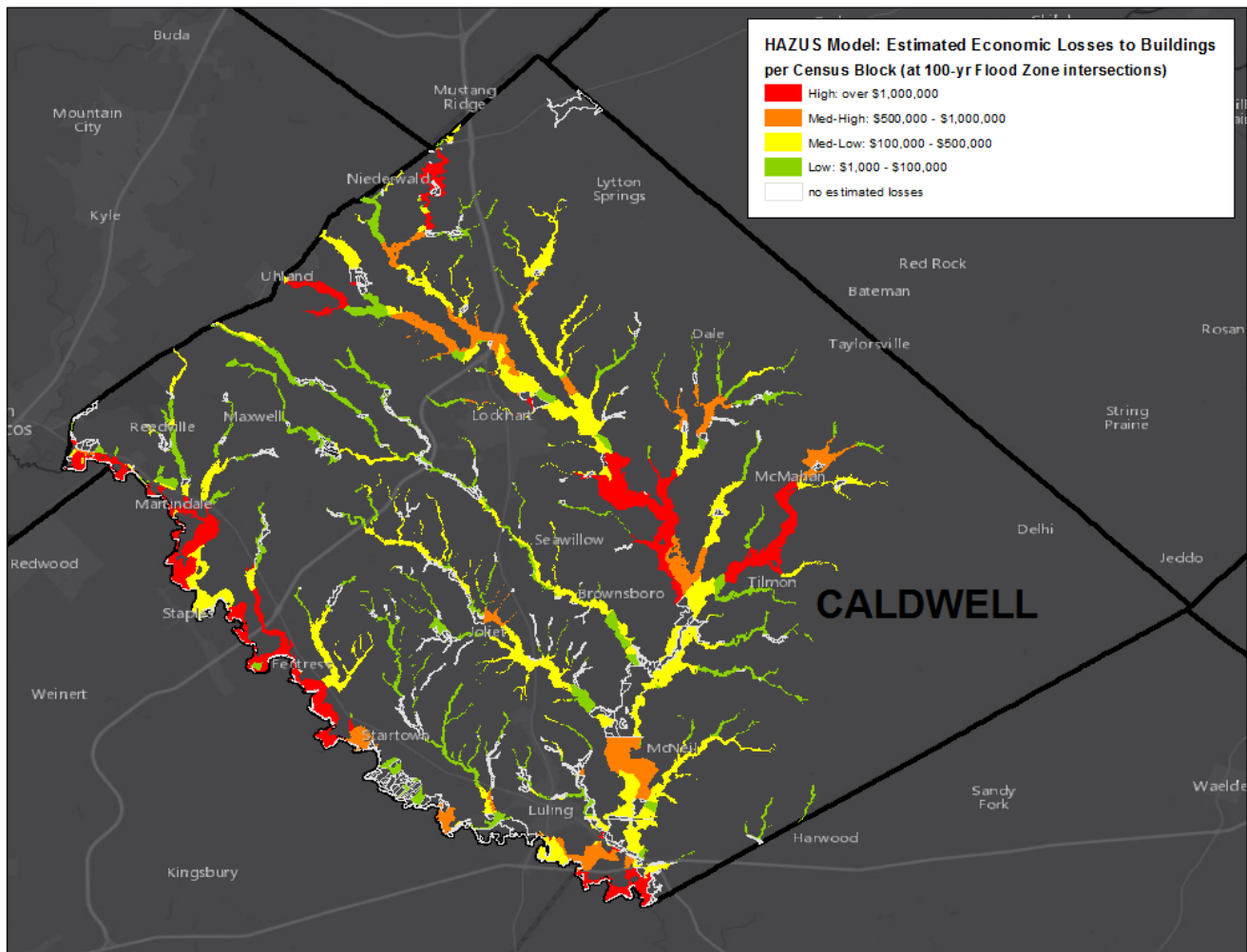


Table 12: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Caldwell County (Millions of Dollars)

	Residential	Commercial	Industrial	Other	Total
Building Losses					
Building	35.83	1.43	0.45	0.30	38.01
Content	19.01	4.23	0.85	1.28	25.36
Inventory	0.00	0.17	0.15	0.03	0.35
<i>Building Losses Subtotal</i>	<i>54.84</i>	<i>5.83</i>	<i>1.45</i>	<i>1.61</i>	<i>90.74</i>
Business Interruption					
Income	0.00	0.01	0.00	0.00	0.01
Relocation	0.04	0.00	0.00	0.00	0.04
Rental Income	0.00	0.00	0.00	0.00	0.01
Wages	0.00	0.01	0.00	0.01	0.03
<i>Business Interruption Subtotal</i>	<i>0.01</i>	<i>0.01</i>	<i>0.00</i>	<i>0.01</i>	<i>0.02</i>
Total	54.85	5.84	1.45	1.62	90.76

Fayette County

Estimated losses for Fayette County in a 100-year flood scenario amount to \$9.13 million, with \$9.13 million arising from damaged buildings and only \$0.01 million resulting from business interruption. Anticipated losses are heavily concentrated among residential properties, minimizing the losses to due to business interruption. Additionally, although there are spatially large flood zones shown on the map, sparser rural land use and lower real estate prices put downward pressure on the model's estimated losses. Modeled flood damage is most extensive along Buckner's Creek to the southwest of La Grange, along Rabbs Creek to the east of Warda, and along Cummins Creek through Round Top.

Figure 19: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Fayette County

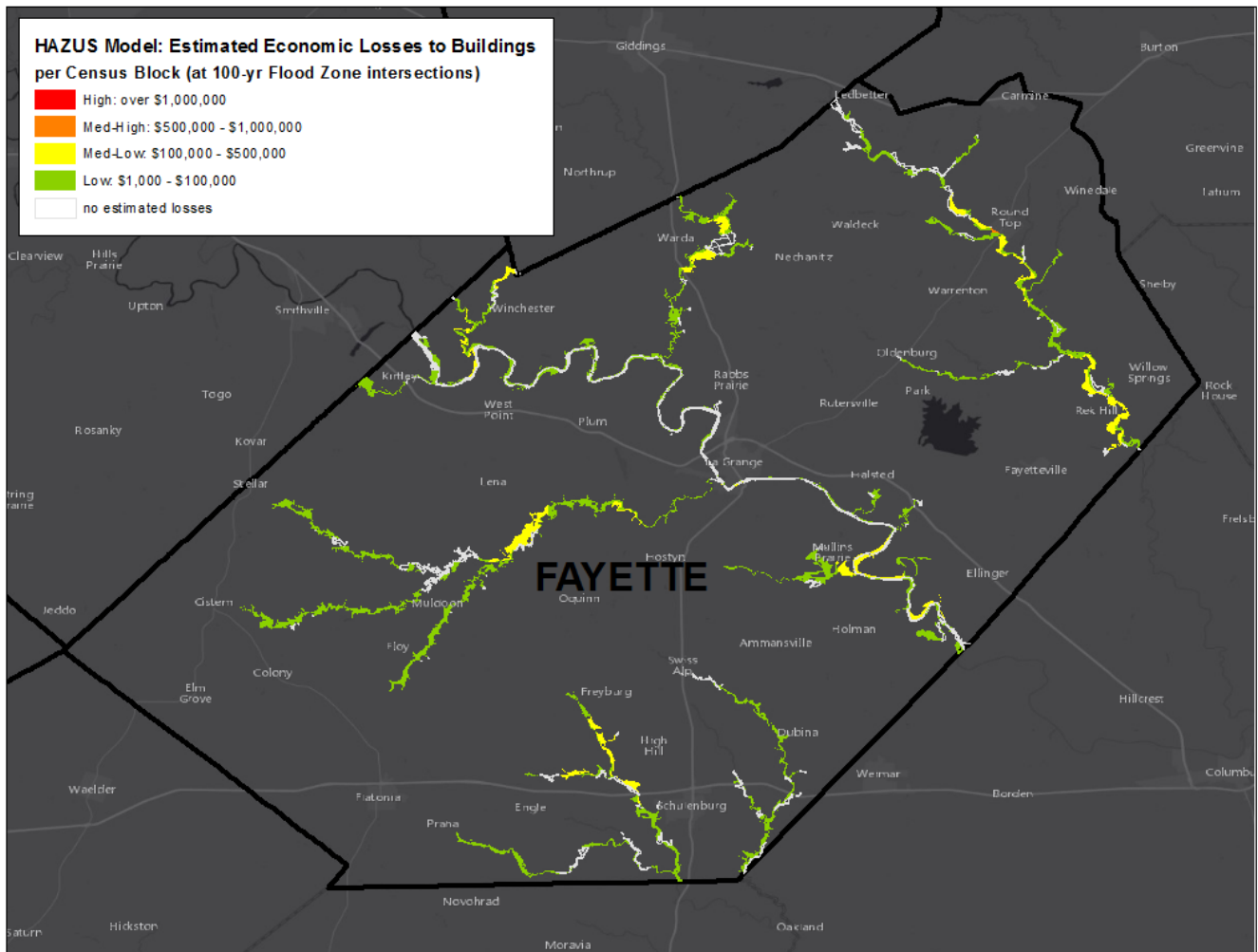


Table 13: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Fayette County (Millions of Dollars)

	Residential	Commercial	Industrial	Other	Total
Building Losses					
Building	5.01	0.16	0.06	0.04	5.27
Content	2.79	0.65	0.16	0.24	3.83
Inventory	0.00	0.00	0.02	0.01	0.03
<i>Building Losses Subtotal</i>	<i>7.80</i>	<i>0.81</i>	<i>0.24</i>	<i>0.28</i>	<i>9.13</i>
Business Interruption					
Income	0.00	0.00	0.00	0.00	0.00
Relocation	0.00	0.00	0.00	0.00	0.00
Rental Income	0.00	0.00	0.00	0.00	0.00
Wages	0.00	0.00	0.00	0.00	0.00
<i>Business Interruption Subtotal</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.01</i>
Total	7.80	0.81	0.24	0.28	9.13

Hays County

Estimated losses for Hays County in a 100-year flood scenario amount to \$275.07 million, with \$273.98 million arising from damaged buildings and \$1.09 million resulting from business interruption. Geographic coverage of rivers and creeks in Hays County is extensive, and in the 100-year flood scenario modeled, much of the county experiences severe damage. As was observed during the 2015 Memorial Day flood event, damage along the Blanco River is significant through Wimberley and San Marcos. Onion Creek, through Dripping Springs, Driftwood, and Buda also shows substantial estimated losses in the modeled event. Hays County also has a higher amount of commercial and industrial properties shown at risk in the model, with roughly \$45 million in estimated losses to those sectors.

Figure 20: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Hays County

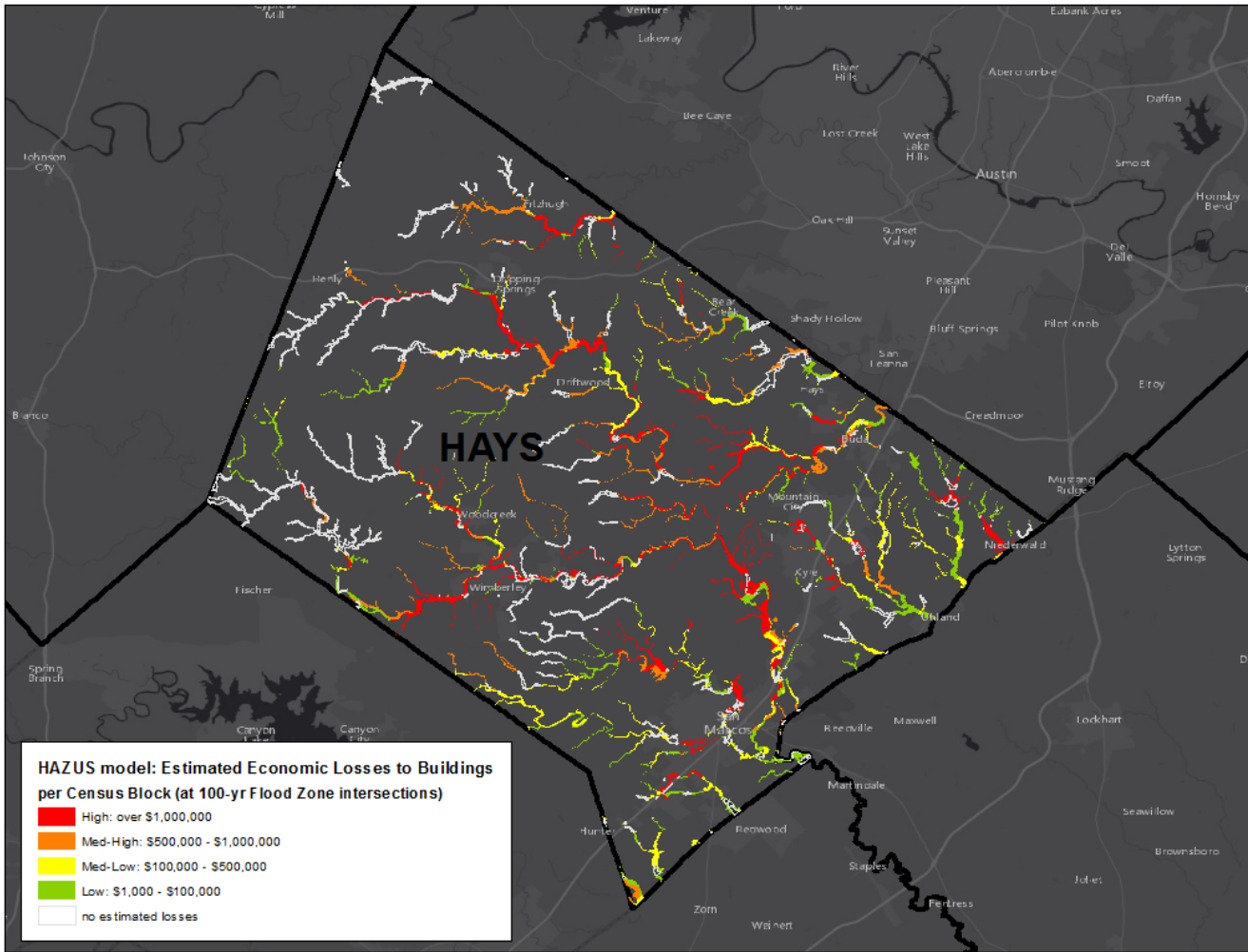


Table 14: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Hays County (Millions of Dollars)

	Residential	Commercial	Industrial	Other	Total
Building Losses					
Building	138.14	9.50	3.81	4.10	155.55
Content	75.69	23.17	7.3	10.29	166.45
Inventory	0.00	0.56	1.19	0.23	1.98
<i>Building Losses Subtotal</i>	<i>213.84</i>	<i>33.22</i>	<i>12.30</i>	<i>14.63</i>	<i>273.98</i>
Business Interruption					
Income	0.01	0.10	0.00	0.02	0.12
Relocation	0.19	0.01	0.00	0.01	0.21
Rental Income	0.04	0.01	0.00	0.00	0.05
Wages	0.02	0.11	0.00	0.58	0.71
<i>Business Interruption Subtotal</i>	<i>0.25</i>	<i>0.23</i>	<i>0.00</i>	<i>0.61</i>	<i>1.09</i>
Total	214.09	33.45	12.30	15.23	275.07

Lee County

Estimated losses for Lee County in a 100-year flood scenario amount to \$6.52 million, with all of the estimated losses million arising from damaged buildings. Much of Lee County's flooding occurs near Somerville Lake and along the creeks that feed into it. This area is not heavily developed, which minimizes the county's exposure to losses of buildings. West Yegua Creek, Middle Yegua Creek, and East Yegua Creek are the primary channels for flooding in the county.

Figure 21: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Lee County

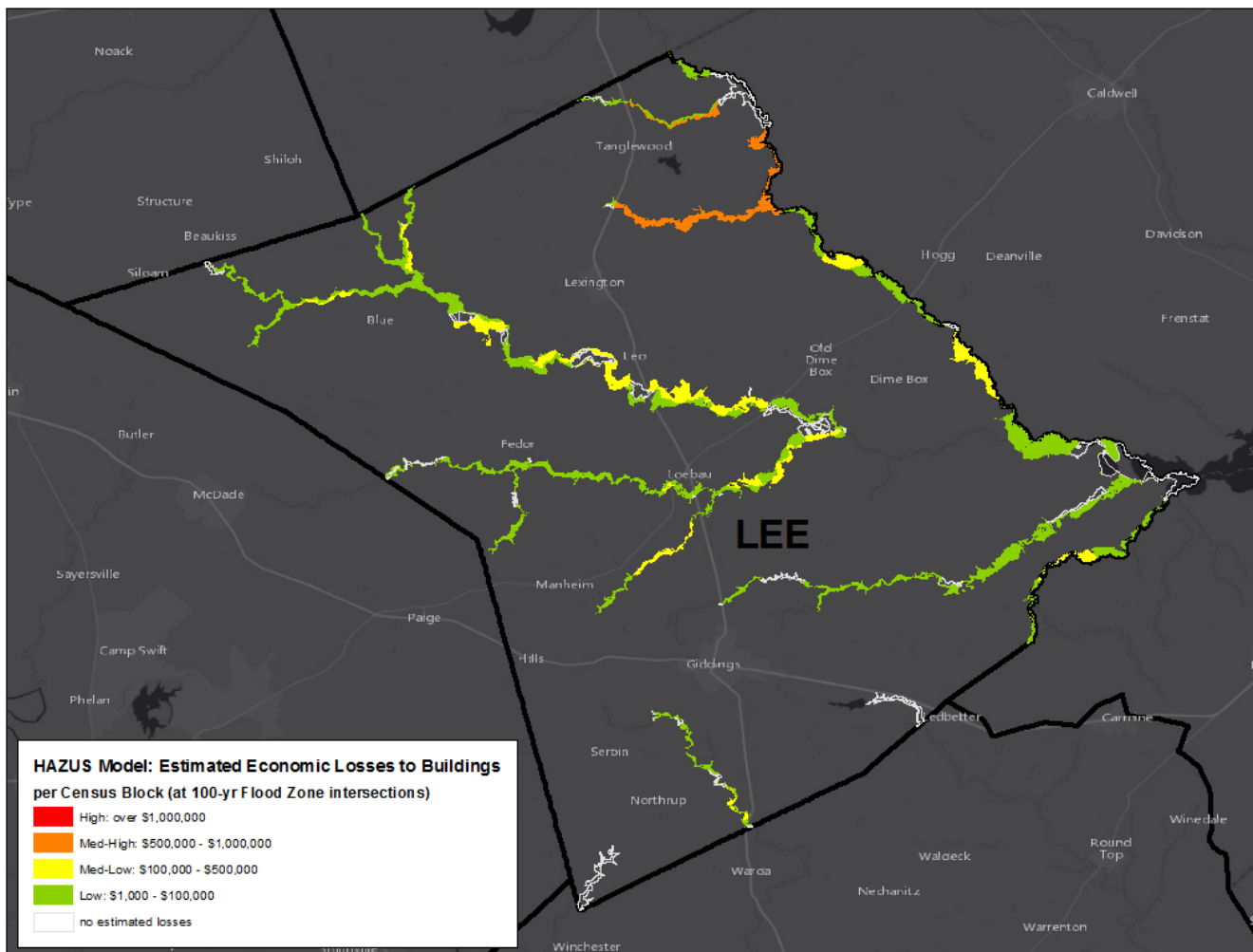


Table 15: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Lee County (Millions of Dollars)

	Residential	Commercial	Industrial	Other	Total
Building Losses					
Building	3.87	0.05	0.03	0.03	3.99
Content	2.06	0.19	0.06	0.21	2.52
Inventory	0.00	0.00	0.01	0.00	0.01
<i>Building Losses Subtotal</i>	<i>5.93</i>	<i>0.24</i>	<i>0.10</i>	<i>0.25</i>	<i>6.52</i>
Business Interruption					
Income	0.00	0.00	0.00	0.00	0.00
Relocation	0.00	0.00	0.00	0.00	0.00
Rental Income	0.00	0.00	0.00	0.00	0.00
Wages	0.00	0.00	0.00	0.00	0.00
<i>Business Interruption Subtotal</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>
Total	5.93	0.24	0.10	0.25	6.52

Travis County

Due to the density of development and the high land values, estimated losses for Travis County in a 100-year flood scenario far exceed those of any other county in the region. Estimated losses due to damaged buildings \$2.24 billion. Estimated business interruption losses are \$9.69 million, for a combined total of \$2.254 billion. Losses due to flooding are heaviest along the Colorado River through downtown Austin, along Onion Creek to the south of the county, and along Walnut Creek through Northeast Austin.

It is worth noting that this model uses the FEMA 100-year floodplain scenario, which includes significant high-value development in downtown Austin, resulting in very high estimated losses. Given that Lady Bird Lake is a constant level lake, it is worth evaluating how vulnerable some of these downtown properties actually are, but to be consistent, the FEMA 100-year scenario was used for this model run.

Figure 22: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Travis County

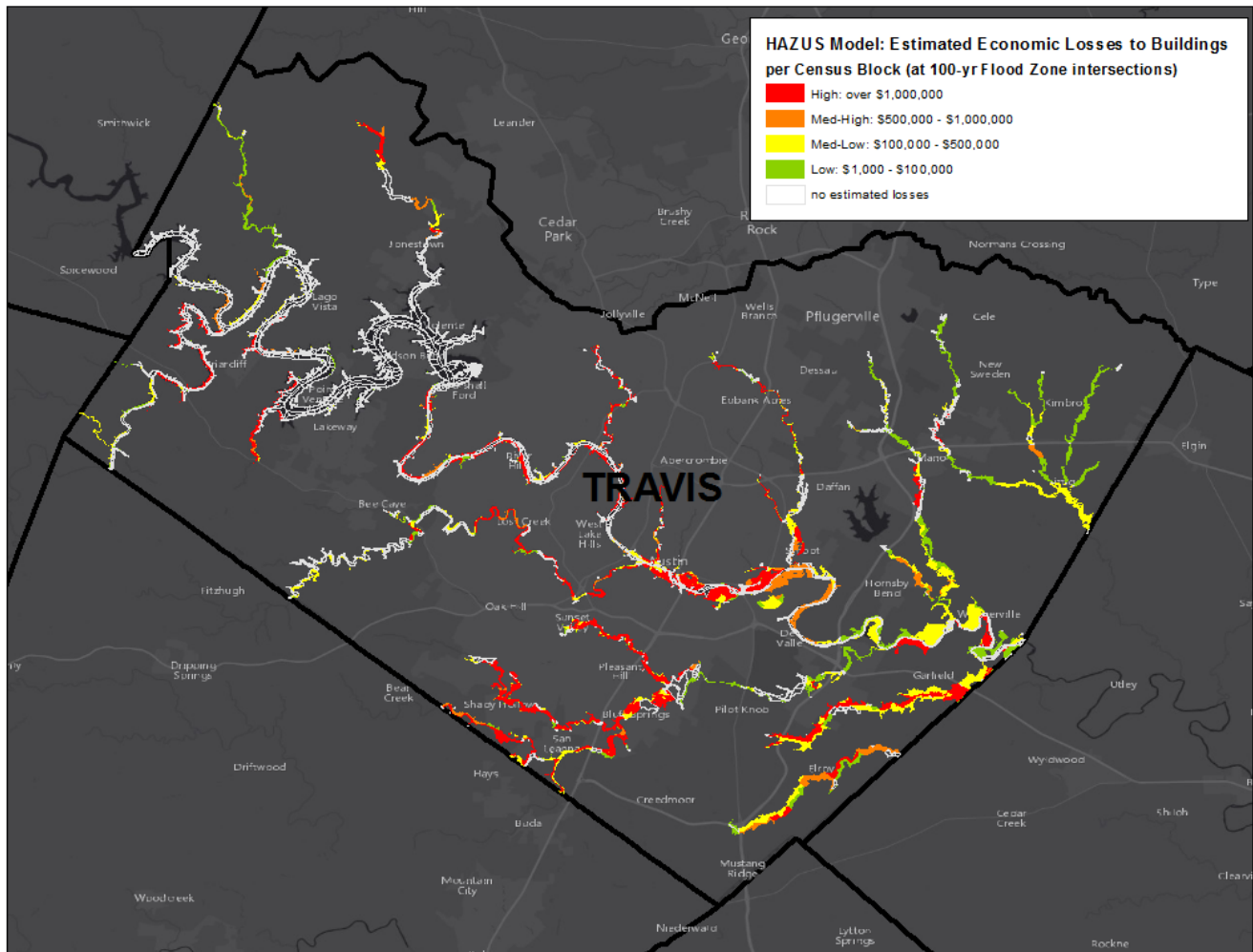


Table 16: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Travis County (Millions of Dollars)

	Residential	Commercial	Industrial	Other	Total
Building Losses					
Building	1,080.78	131.46	21.42	30.08	1,263.75
Content	609.16	234.27	43.94	84.05	971.41
Inventory	0.00	3.59	5.13	0.45	9.16
<i>Building Losses Subtotal</i>	<i>1,689.95</i>	<i>369.32</i>	<i>70.48</i>	<i>114.58</i>	<i>2,244.32</i>
Business Interruption					
Income	0.10	1.59	0.01	0.22	1.92
Relocation	1.57	0.25	0.00	0.14	1.97
Rental Income	0.73	0.18	0.00	0.03	0.94
Wages	0.26	1.24	0.01	3.37	4.87
<i>Business Interruption Subtotal</i>	<i>2.66</i>	<i>3.25</i>	<i>0.02</i>	<i>3.76</i>	<i>9.69</i>
Total	1,692.61	372.56	70.50	118.34	2,254.01

Williamson County

Estimated losses for Williamson County in a 100-year flood scenario amount to \$245.06 million, with \$244.38 million arising from damaged buildings and \$0.68 million resulting from business interruption. Williamson County's primary flood risks are along Brushy Creek to the south and the San Gabriel River to the north, though more development along Brushy Creek causes the modeled damage estimates there to be higher. A little less than three quarters of estimated building damages are to residential properties, at an estimated \$175 million, with another \$62 million in anticipated losses for commercial and industrial properties.

Figure 23: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Williamson County

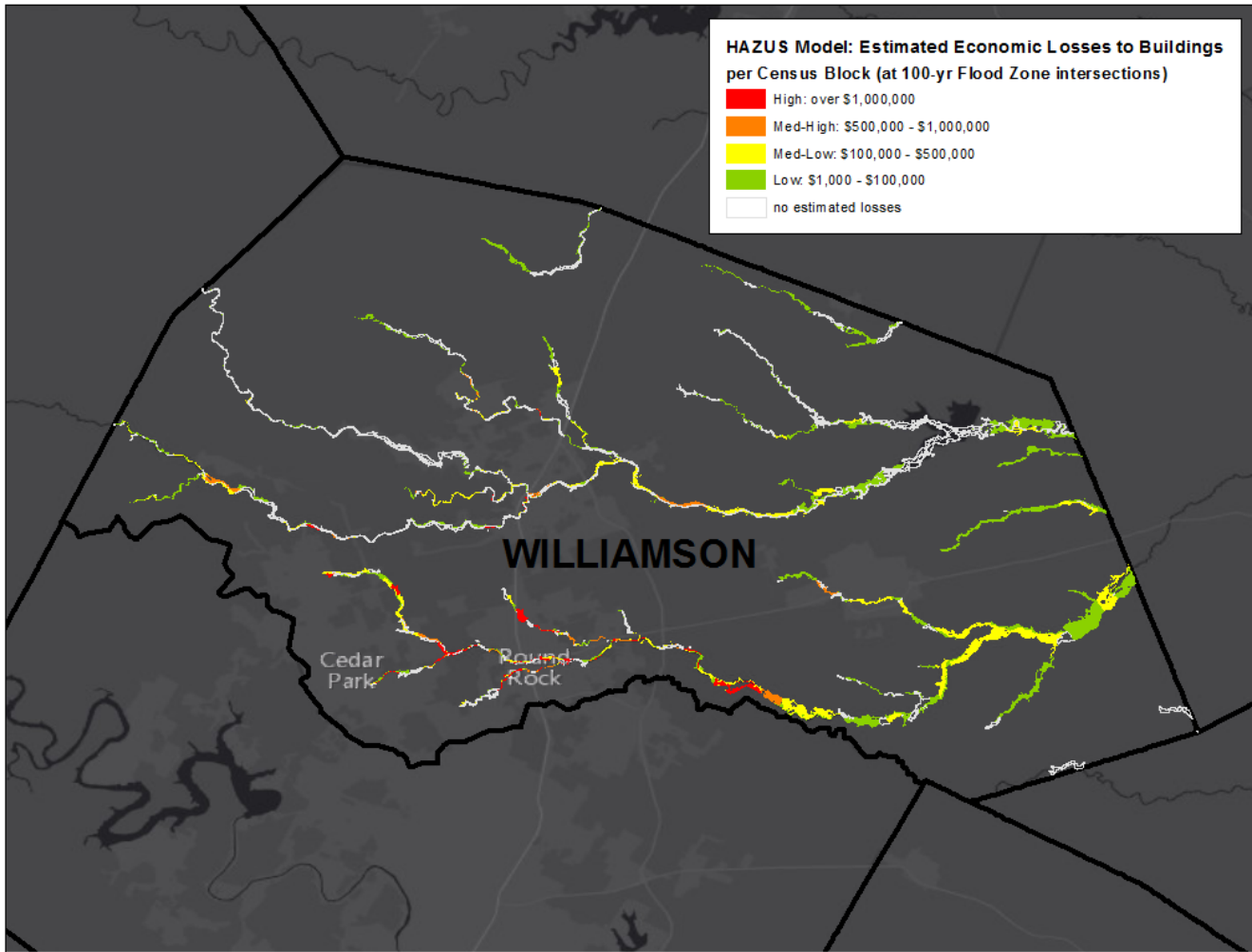


Table 17: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, Williamson County (Millions of Dollars)

	Residential	Commercial	Industrial	Other	Total
Building Losses					
Building	111.96	16.81	3.39	1.92	134.09
Content	63.38	33.82	6.82	4.65	108.67
Inventory	0.00	0.36	1.16	0.10	1.62
<i>Building Losses Subtotal</i>	<i>175.34</i>	<i>50.99</i>	<i>11.37</i>	<i>6.67</i>	<i>244.38</i>
Business Interruption					
Income	0.00	0.21	0.00	0.01	0.22
Relocation	0.14	0.03	0.00	0.00	0.17
Rental Income	0.03	0.02	0.00	0.00	0.05
Wages	0.00	0.17	0.00	0.07	0.24
<i>Business Interruption Subtotal</i>	<i>0.18</i>	<i>0.42</i>	<i>0.00</i>	<i>0.08</i>	<i>0.68</i>
Total	175.52	51.41	11.37	6.75	245.06

HAZUS Damage Estimates: Communities Along the Blanco River/San Marcos Watershed in Focus

As noted earlier, digital versions in PDF format, as well as GIS data is available via CAPCOG's [Open Data GIS Portal](#). Interactive maps are also available via the [Project Map Portal](#). However, given the extent of damage that took place along the Blanco River and San Marcos watershed during the 2015 Memorial Day flood event, there are a few communities that this report highlights with static Hazus maps.

It is worth restating that in this case, Hazus is not modeling the specific DR-4223 damage in these communities. Rather, the modeled scenario is a 100-year flood. However, even this modeled scenario is quite illustrative in showing the extent of estimated losses in such a scenario, the specific geographies most likely to be affected, and the composition of losses among types of properties.

The maps are also slightly different than the county-level maps. These community-level maps show flood zones in darker, more solid colors. Estimated damages are aggregated to the census block level, which is shown in lighter, more pastel colors. There are areas in these maps that show estimated losses that extend beyond or do not about the darker colored flood zones. These are cases where the model expects individual properties to flood, and that damage is aggregated to the census block level. In other words, the pastel-colored census blocks should not be interpreted as the flood extent, even if individual properties within that census block are expected to see flood damage.

Martindale

Martindale sits along the San Marcos River, near the border of Caldwell and Guadalupe counties. The estimated losses in Martindale for a 100-year flood scenario are \$4.75 million with almost all of the damage taking the form of residential property loss. The key point of vulnerability in the community is the portion of development along the river – River Road and Main Street to the north of the river, and several smaller communities to the south.

Figure 24: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, City of Martindale

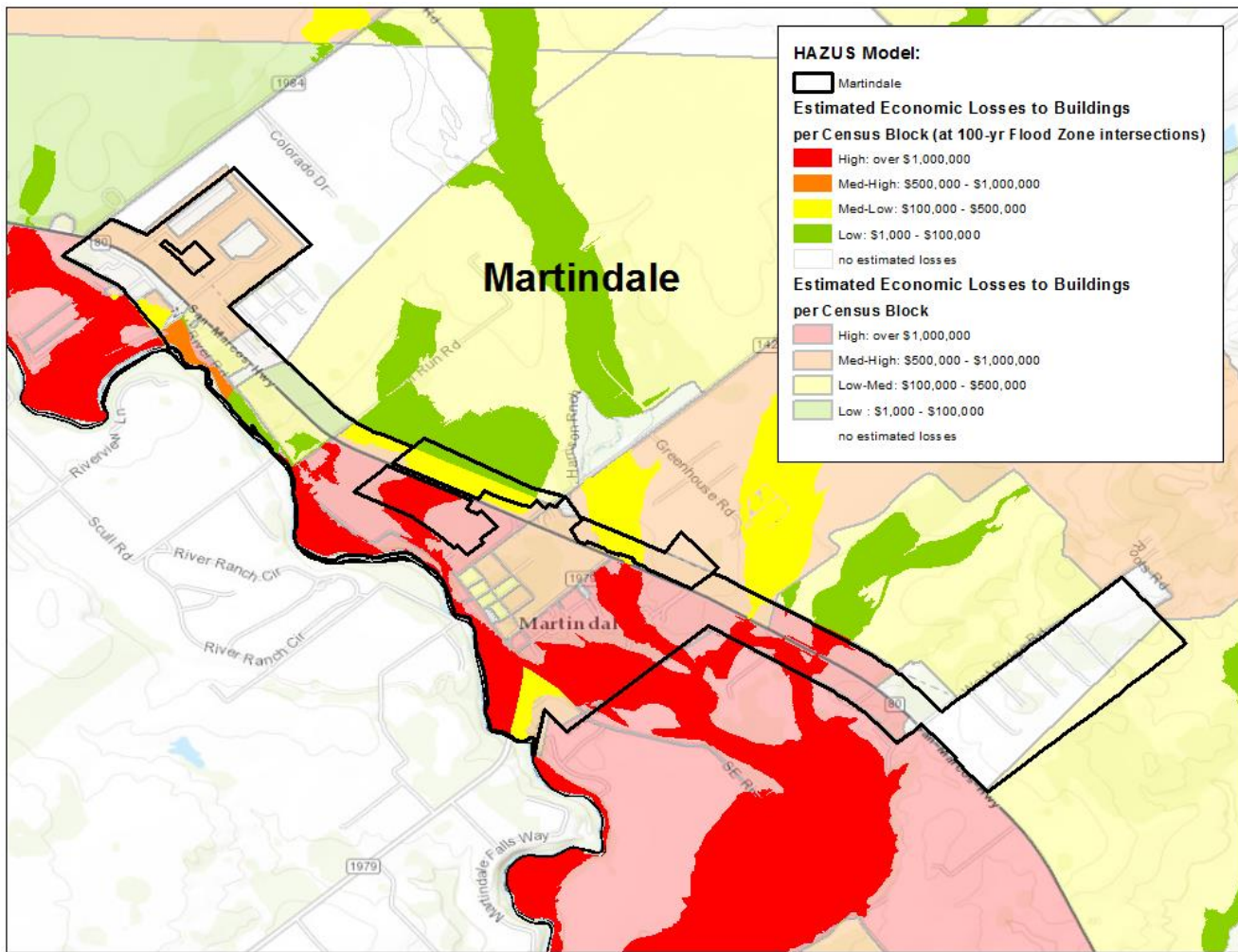


Table 18: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, City of Martindale (Millions of Dollars)

	Residential	Commercial	Industrial	Other	Total
Building Losses					
Building	3.04	0.02	0.00	0.00	3.07
Content	1.60	0.06	0.01	0.01	1.68
Inventory	0.00	0.00	0.00	0.00	0.00
<i>Building Losses Subtotal</i>	<i>4.64</i>	<i>0.09</i>	<i>0.01</i>	<i>0.01</i>	<i>4.74</i>
Business Interruption					
Income	0.00	0.00	0.00	0.00	0.00
Relocation	0.01	0.00	0.00	0.00	0.01
Rental Income	0.00	0.00	0.00	0.00	0.00
Wages	0.00	0.00	0.00	0.00	0.00
<i>Business Interruption Subtotal</i>	<i>0.01</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.01</i>
Total	4.64	0.09	0.01	0.01	4.75

San Marcos

The estimated losses for San Marcos in a 100-year flood scenario are \$43.12 million. Of note, the estimated losses for this 100-year scenario do not necessarily align with the flooding observed in the DR-4223 event. In particular, the Blanco Gardens neighborhood flooded badly during that event, but it does not show flooding in this Hazus scenario. This is an indication of just how far the DR-4223 event exceeded the 100-year flood scenario.

Figure 25: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, City of San Marcos

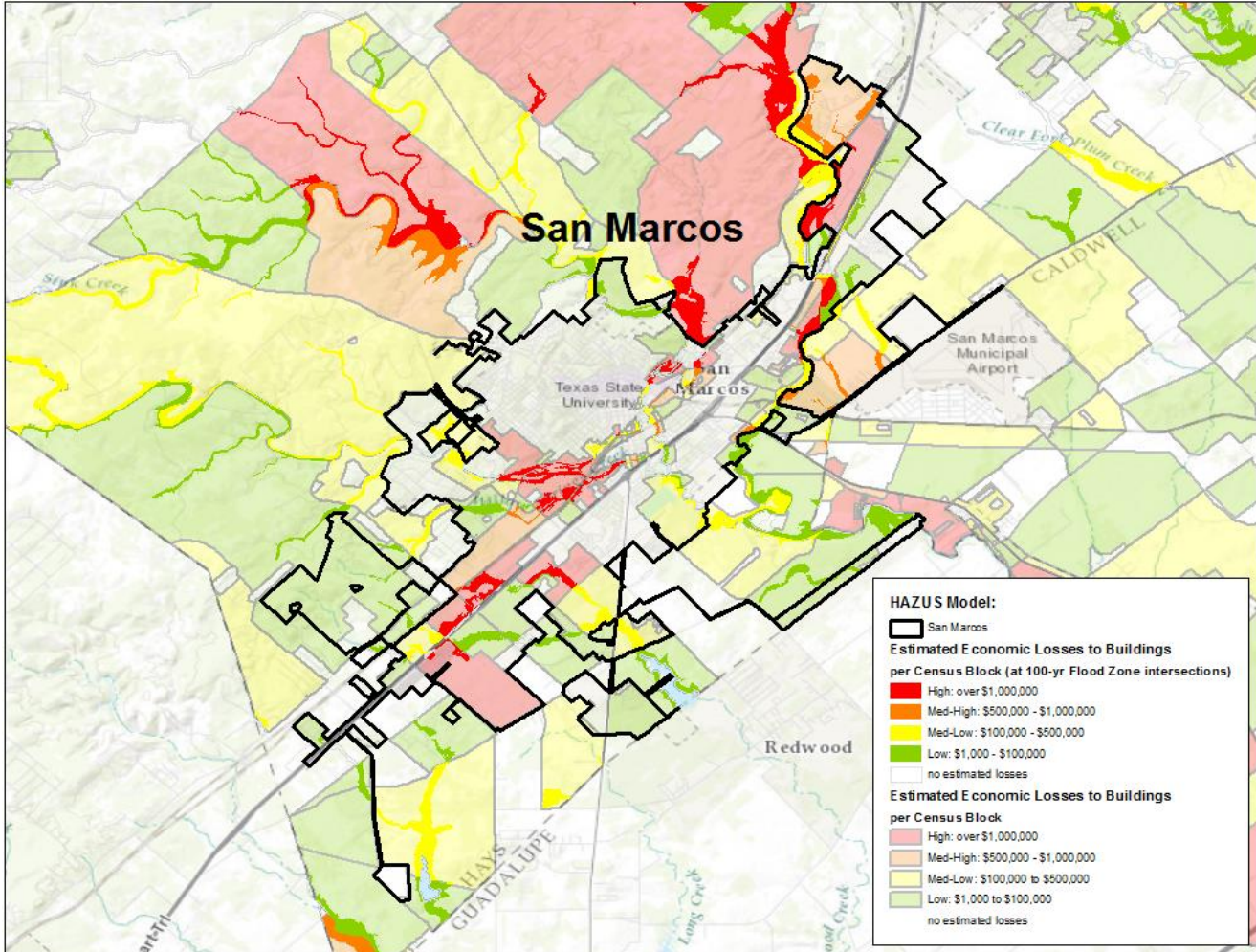


Table 19: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, City of San Marcos (Millions of Dollars)

	Residential	Commercial	Industrial	Other	Total
Building Losses					
Building	12.19	2.81	0.81	1.93	17.74
Content	8.16	9.18	1.98	4.66	23.97
Inventory	0.00	0.32	0.38	0.02	0.72
<i>Building Losses Subtotal</i>	<i>20.35</i>	<i>12.31</i>	<i>3.17</i>	<i>6.61</i>	<i>42.43</i>
Business Interruption					
Income	0.00	0.05	0.00	0.00	0.05
Relocation	0.01	0.00	0.00	0.01	0.03
Rental Income	0.01	0.00	0.00	0.00	0.02
Wages	0.01	0.06	0.00	0.52	0.52
<i>Business Interruption Subtotal</i>	<i>0.04</i>	<i>0.12</i>	<i>0.00</i>	<i>0.53</i>	<i>0.69</i>
Total	20.38	12.43	3.17	7.14	43.12

Wimberley

Estimated losses in Wimberley in the 100-year flood scenario are \$50.2 million. As was seen in the DR-4223 event, most the anticipated losses follow the Blanco River and are concentrated most heavily among riverfront residential property.

Figure 26: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, City of Wimberley

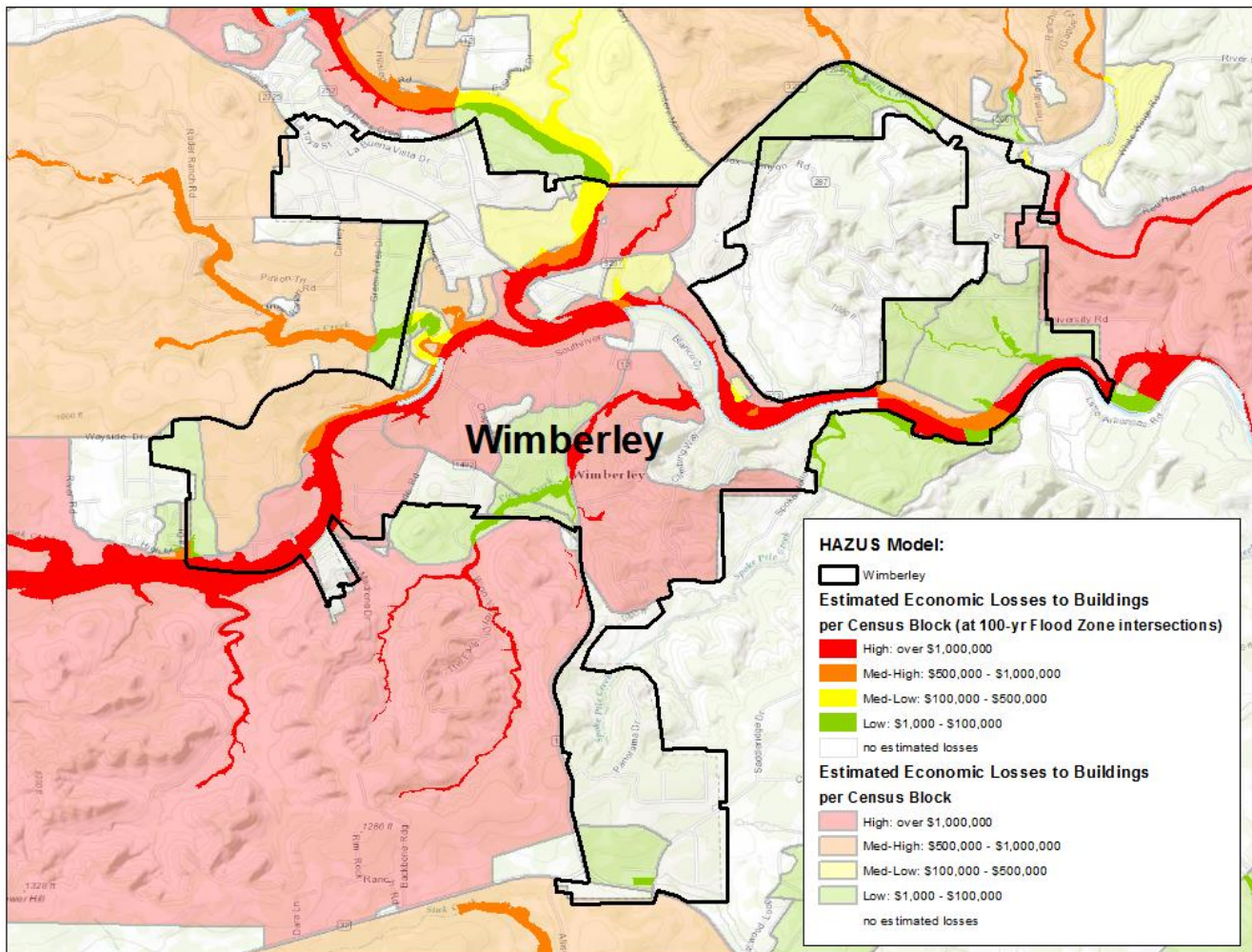


Table 20: HAZUS Economic Loss Estimates, 100-Year Flood Scenario, City of Wimberley (Millions of Dollars)

	Residential	Commercial	Industrial	Other	Total
Building Losses					
Building	26.30	1.75	0.60	0.93	29.57
Content	14.39	3.36	1.08	1.48	20.30
Inventory	0.00	0.06	0.13	0.00	0.19
<i>Building Losses Subtotal</i>	<i>40.69</i>	<i>5.16</i>	<i>1.81</i>	<i>2.40</i>	<i>50.06</i>
Business Interruption					
Income	0.00	0.02	0.00	0.01	0.02
Relocation	0.04	0.00	0.00	0.00	0.04
Rental Income	0.01	0.00	0.00	0.00	0.01
Wages	0.01	0.02	0.00	0.04	0.06
<i>Business Interruption Subtotal</i>	<i>0.06</i>	<i>0.03</i>	<i>0.00</i>	<i>0.04</i>	<i>0.14</i>
Total	40.75	5.20	1.81	2.45	50.20

Planning to Make the Capital Area More Disaster Resilient

With numerous high profile natural disasters in recent years across the country, disaster resiliency has become a cornerstone of community planning as a practice, and many communities have taken great strides to become more resilient. CAPCOG staff met with many communities in the region affected by DR-4223 to learn more about the resiliency issues and challenges in the region, as well as the steps that have been taken to make the region more disaster resilient.

Regional Resiliency Issues

Emergency Notification

In the case of the Blanco River flooding, one key issue for recovery and mitigation centered simply on the difficulty of disseminating information quickly and completely. For example, in both of the case studies of businesses along the Blanco that were profiled earlier in this report, an advanced warning about the rising river levels was provided through informal networks that included contacts further upstream.

Formal disaster notification systems were in place, and communities along the Blanco River used the existing notification system to send out warning messages to constituents. However, these warning systems face a number of challenges, specifically:

- Mobile phones must be manually enrolled in the warning system by the user
- Alerts targeted to a specific geography refer to a person's home address, not current location
- Calls to land lines are ignored by some households because of the dominance of mobile phone use
- Some number of users may receive notifications but choose not to heed advice included in the alert

In addition to these issues, the properties along the Blanco River have another challenge in that many of those homes are used as vacation rentals. In these cases, visitors are highly unlikely to be signed up for a notification system, and they are also unlikely to answer a land line phone in a rental property.

The Capital Area uses a single region-wide notification system called, Warn Central Texas. The hope in using a single regional system is to realize efficiency gains while also strengthening the visibility of the service to residents. Marketing campaigns on traditional and social media are in place, with an eye on growing user registrations throughout the region. This would help make emergency notifications more effective. Increased registrations however, cannot overcome the other limitations of notification systems, and as such, additional resiliency measures are needed.

Land Use and Development

The Capital Area has seen rapid growth over the past several decades. Currently, the region grows at a rate of about 50,000 new residents per year. The region's largest city is Austin, but increasingly, growth is taking place in the communities. Austin only accounted for 30 percent of new growth in 2016, the smallest share of growth in the region in recent history.

One impact of this rapid growth has been the rapid expansion of impervious cover in the region. Though many of the communities in the area include limits on the amount of impervious cover allowed in new developments, the rapid growth of new developments overall has significantly increased the impervious cover overall. This puts significant additional strain on the region's drainage systems and makes flooding much more likely.

Stemming the expansion of impervious cover is more difficult in Texas than in other places because in Texas, counties do not have broad land use authority. This means that counties do not have the ability

to regulate development outside of incorporated cities. This tends to result in developments that provide only the minimal amount of regulatory consideration for resilience.

Additionally, many developments in the Capital Area have built homes which are very close to the 100-year flood plain, though not in it. However, the expansion of impervious cover means that flood plains are expanding. So for example, a home that was outside of the flood plain when it was constructed may now find itself in the more current flood plain. This is one of the primary forms of flood risk exposure in the Capital Area.

This increased flood risk poses economic problems for communities and property owners alike. Property owners now face the likelihood of a flood event, as well as either the added cost of flood insurance or the financial exposure they face without insurance. For communities, declining property values due to flood risk results in declining property tax revenue, the primary source of funds for the public sector in Texas.

The following figures illustrate land use and flood risk issues in the Capital Area. Figure 27: Lost Property Tax Valuation Due to the Memorial Day Flood Event in San Marcos shows estimated lost property tax valuations in Blanco Gardens, a neighborhood in east San Marcos that flooded during the 2015 Memorial Day event. Figure 28 shows properties along the Blanco River that are included in the current Advisory Based Flood Elevation (ABFE), a precursor to an updated official FEMA floodplain. Put another way, Figure 28 shows homes that are not yet in the floodplain, but will likely be in the floodplain when it is next updated.

Figure 27: Lost Property Tax Valuation Due to the Memorial Day Flood Event in San Marcos

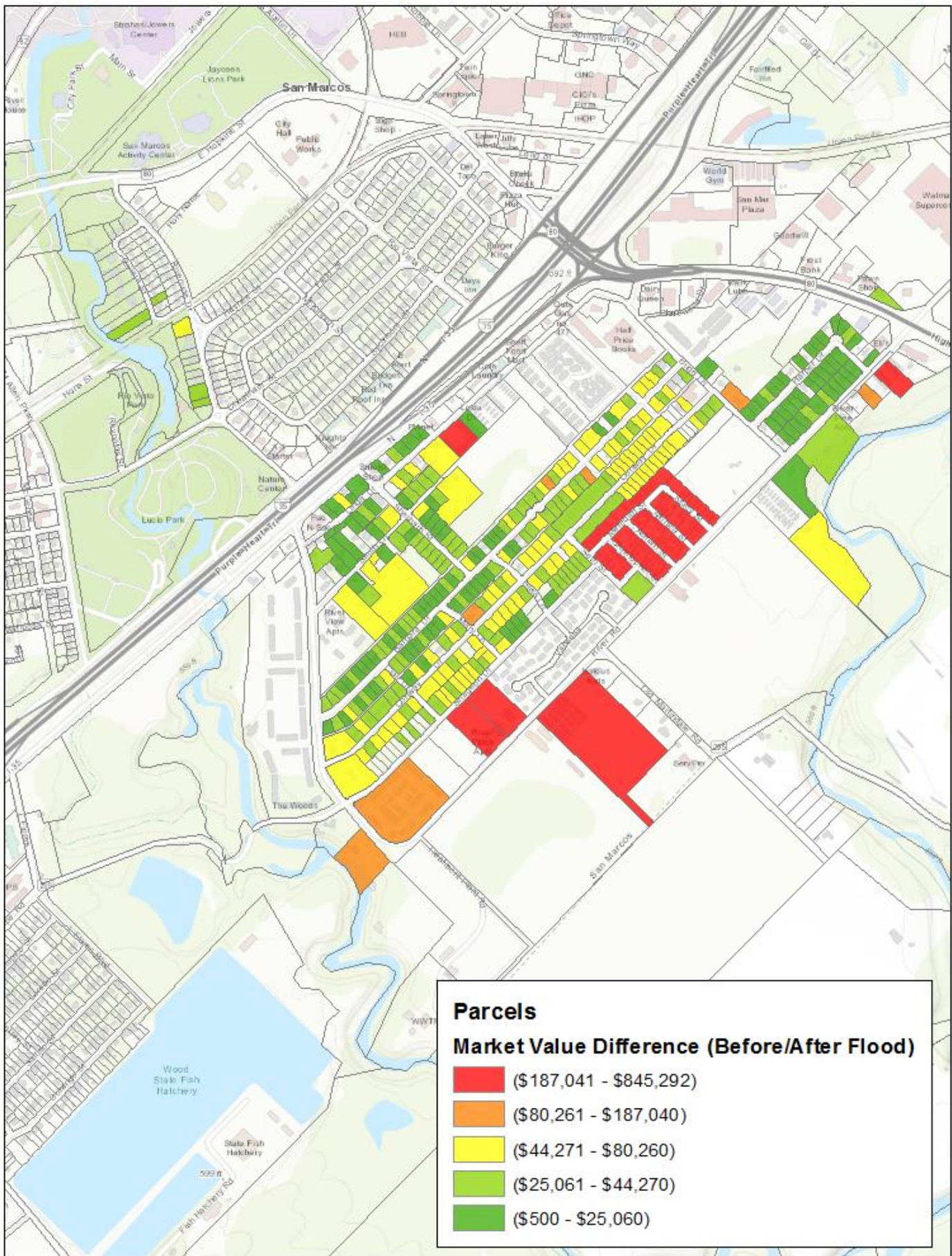
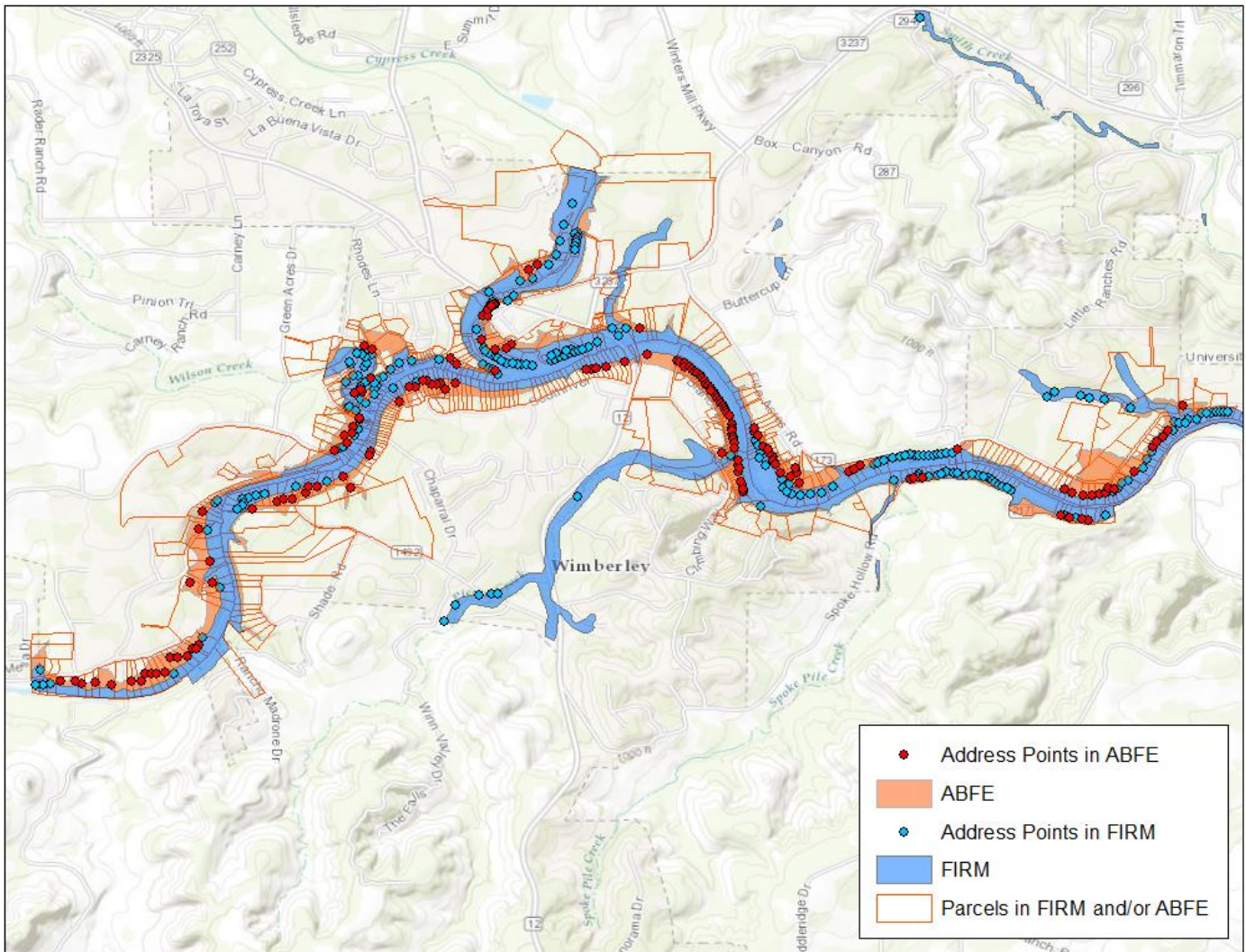


Figure 28: Addresses Along the Blanco River Currently in the Flood Insurance Rate Map (FIRM) and Advisory Based Flood Elevation (ABFE) Zones



Business Liquidity

Another challenge for resiliency in the region relates to the need for businesses that might be affected by a disaster to have access to liquid capital that can quickly be spent on recovery. Many of the local officials CAPCOG spoke to during this project mentioned the challenge that small businesses have in maintaining operations or quickly accessing the goods and services needed to get back online.

Most small businesses do not retain enough savings to fund their own recovery activities in the event of a disaster. And although federal resources are available for affected businesses, these resources are not rapidly accessible. In Austin, the City of Austin provided workshops that assisted small businesses to develop recovery plans and to stress the importance of saving for the purpose of disaster recovery. However, more effort is clearly needed to gain greater adoption of this idea throughout the region. More resources could also be made available, to give local businesses access to a local stream of funding that could accelerate the pace of recovery after a disaster.

Regional Preparedness and Mitigation Actions

Communities in the Capital Area have worked diligently to improve the resiliency of the region with programs that both precede the Memorial Day 2015 disaster and those created in response to it. Several of the more prominent responses in the region are highlighted in the subsections that follow.

Warn Central Texas

Administered by CAPCOG, Warn Central Texas is a free emergency alert system. Local residents register their phone number to receive alerts from Emergency Management Coordinators in the event of a disaster. Registrants are asked to provide their address when signing up for the service, so alerts sent from the system can be targeted to specific geographic areas. The Warn Central Texas system also offers information in Spanish and with TDD for those that are deaf or hard of hearing.

CAPCOG engages in several marketing activities, including radio advertisements, web messaging and with fliers to encourage Central Texas residents to register for the service. Online content was also created for use by local jurisdictions, who could host content on their websites and social media accounts to point residents to the Warn Central Texas site.

Figure 29: Warn Central Texas Flier (Spanish Version)



Manténgase informado — Inscríbese para avisos de emergencia en su vecindario por voz, texto o correo electrónico.



Protéjase Oficiales de seguridad pública pueden alertar a toda la comunidad, o vecindarios específicos que utilizan el sistema de WarnCentralTexas. WarnCentralTexas alertará a todos los residentes registrados que pudieran ser afectados por el mal tiempo.

Tipos de Alertas Los mensajes de WarnCentralTexas pueden incluir desde avisos para hervir el agua, personas desaparecidas, evacuaciones, o avisos de rutina que no requieren acción inmediata; dependiendo del criterio de la autoridad local. Las alertas se envían automáticamente momentos después de que el Servicio Meteorológico Nacional emite una alerta de tormenta, tornado o inundación repentina. Sólo los residentes del área impactada serán notificados.

Identificador de Llamadas: Las alertas de WarnCentralTexas se enviarán de los siguientes números. Asegúrese de ingresar estos números en su lista de contactos. Si deseara escuchar el último mensaje enviado a su teléfono, solo tiene que regresar la llamada al número de teléfono.

Alerta de Emergencia 866-419-5000
Alerta de la Comunidad 855-969-4636
Alerta del Tiempo 800-566-9780

REGÍSTRESE HOY

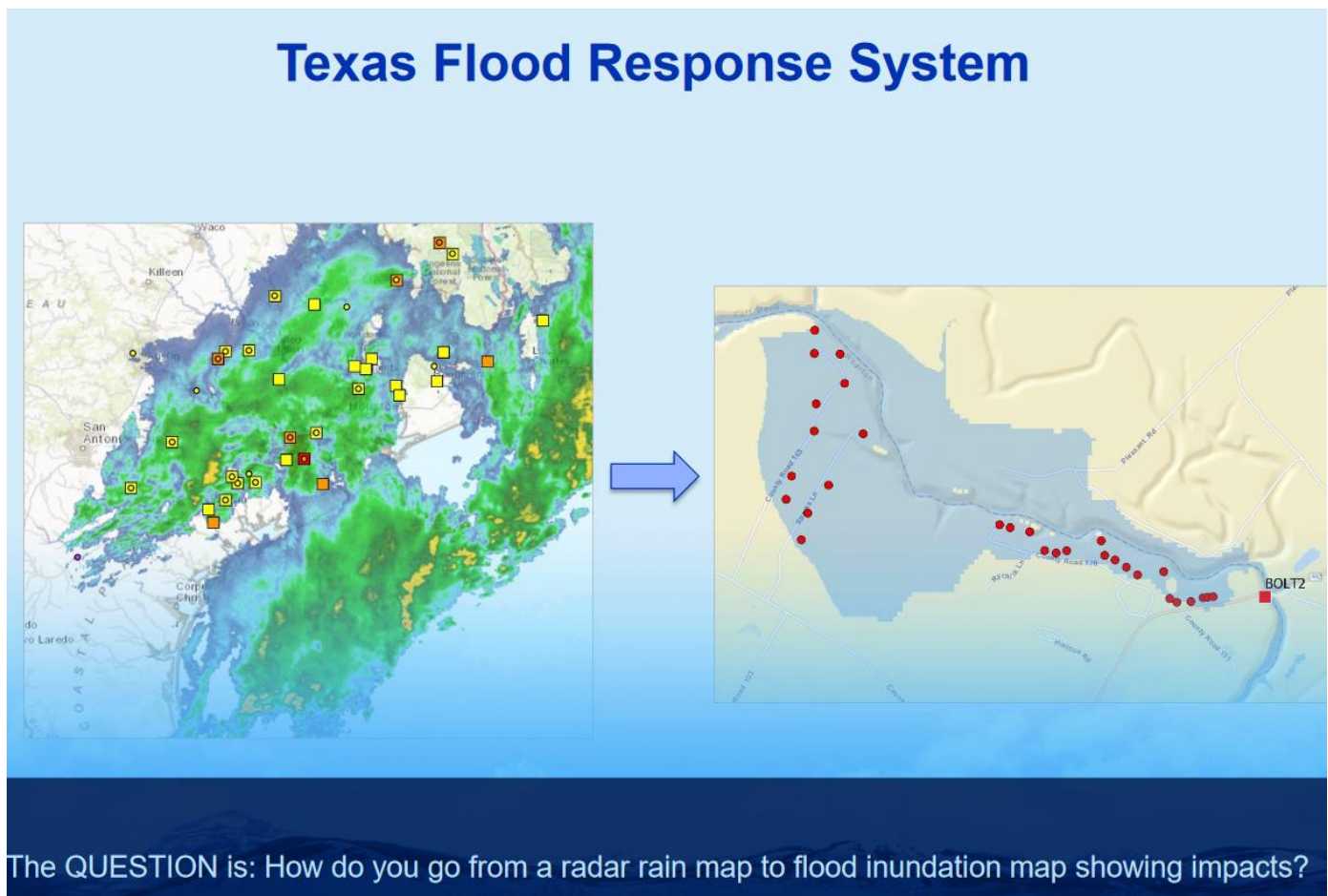
Es muy importante que no asuma que usted ha sido registrado automáticamente.
Registre su teléfono de casa, teléfono celular, números del trabajo y direcciones de correo electrónico, visitando WarnCentralTexas.org.

Texas Flood Response System

One project currently underway that could have significant ramifications for disaster response and recovery in the region is a project initially developed at the University of Texas at Austin's Center for Research in Water Resources. The project involves the development of a real-time flood forecasting tool that would give responders better information about floods as they develop and happen. Such information would help first responders to more efficiently allocate staff, assist with evacuations, and provide guidance to residents.

As it has grown, the project has expanded to involve a consortium of stakeholders, including the Texas Division of Emergency Management; the National Weather Service; and numerous other local, state, and federal partners. Now called the *Texas Flood Response System*, the tool uses elevation data, weather radar, and other information to model flood depths to identify at-risk addresses.

Figure 30: Texas Flood Response System



Source: *PreparingTexas.Org*

Disaster Ready Austin and Get Back in Business Austin

The City of Austin developed two primary efforts for improving disaster resilience in the city. The first, *Disaster Ready Austin*, is a collaborative initiative intended to educate and empower residents to be prepared for emergencies and disasters. The program is managed by the city's Homeland Security and Emergency Management division, and it employs a "whole community" approach to educating the city about disaster preparedness.


The *Disaster Ready Austin* website provides a range of materials and information, from basic preparedness guides to tailored guides for small businesses, to the City's Hazard Mitigation Plan. The site also provides contact links and phone numbers for resources and points of contact within the city for additional disaster support.

Figure 31: Readiness Postcard Promoting Disaster Ready Austin

CREATE AN EMERGENCY PLAN
SMALL BUSINESS PREPAREDNESS

- Make a disaster supplies kit for immediate use.
- List emergency steps for your employees and designate a safe place to meet.
- Maintain a list of critical phone numbers (employees, key customers, suppliers, banking and insurance agents, etc.).
- Leave extra keys and alarm code with trusted employee.
- Keep fire extinguishers in visible places with certifications up to date.
- Maintain a first aid kit and certify employees in first aid and CPR training.
- Owner and key employee should know how to forward calls on business line.
- Keep current list of inventory and store critical supplies or equipment in a safe place.
- Install emergency, battery-powered lighting and purchase additional backup power, if needed.
- Train employees in how to shut off utilities (where appropriate).
- Visit WarnCentralTexas.com to sign up for emergency warnings in your neighborhood by voice, text or email.
- Review insurance policy & needs regularly with agent to ensure adequate coverage for your business risks.

VISIT DisasterReadyAustin.com FOR MORE INFORMATION



Source: City of Austin

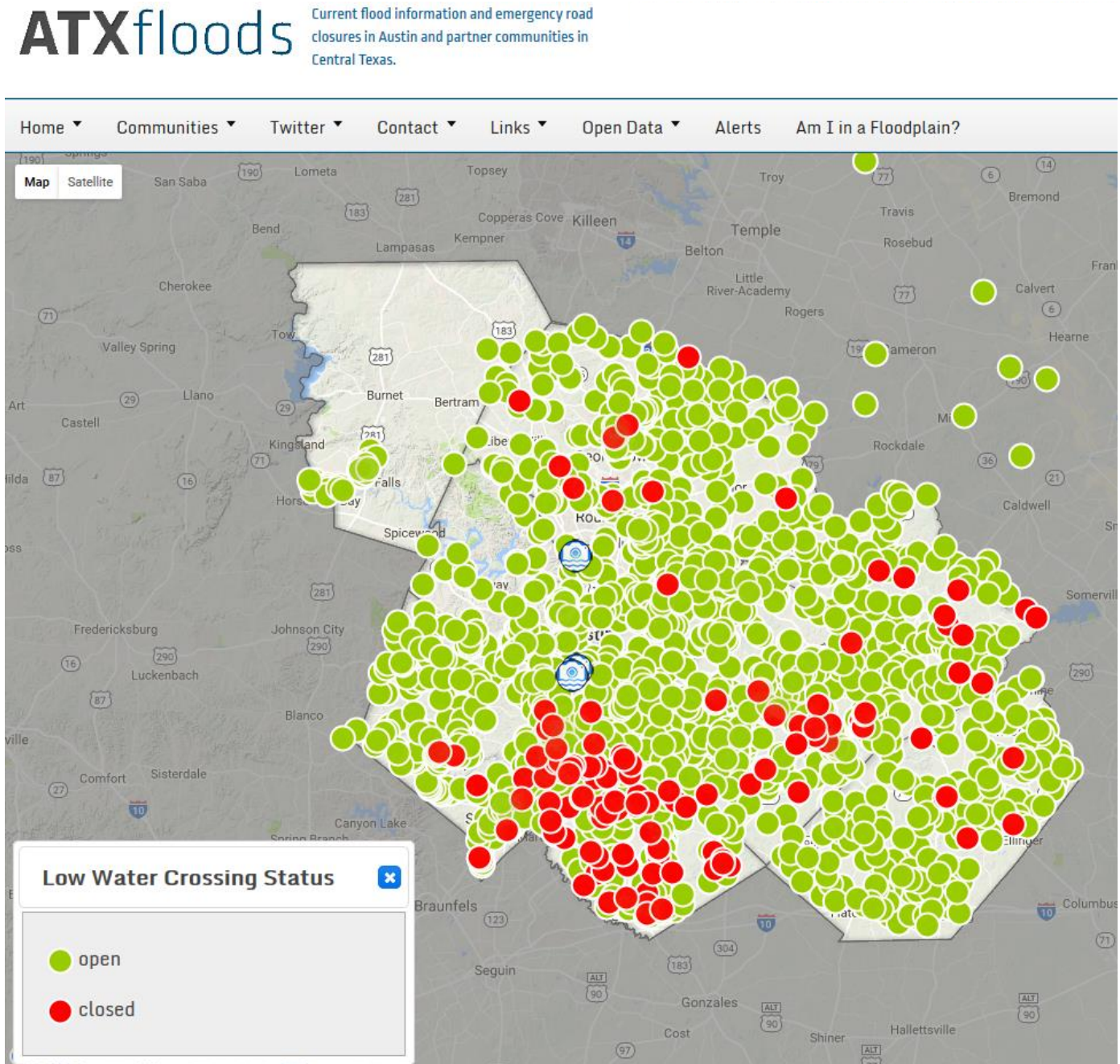
In addition to *Disaster Ready Austin*, the City of Austin developed *Get Back in Business Austin*, a series of workshops and complementary resources for helping small businesses prepare for a disaster. The program included a television advertising campaign that showed footage of a local business that was completely flooded but returned to operation in 5 days. That advertisement, available in both English and Spanish, is found now at <http://www.austintexas.gov/page/get-back-business>.

ATX Floods

ATX Floods is a tool maintained by the City of Austin's Flood Early Warning System (FEWS) and partially funded by the Texas Water Development Board. The tool provides real time information about the status of 1,942 low-water crossings in Blanco, Burnet, Caldwell, Fayette, Hays, Lee, Travis, and Williamson counties.

The City initially launched the website in 2012, and it has now expanded in both geographic scope and functionality. Moreover, a concerted awareness campaign has resulted in strong take-up of the tool by local news organizations. The tool provides an important single point of information about flooding extents for the general public, and strong social media outreach helps to make this information available to a larger number of users during a disaster event.

Figure 32: ATX Floods Website

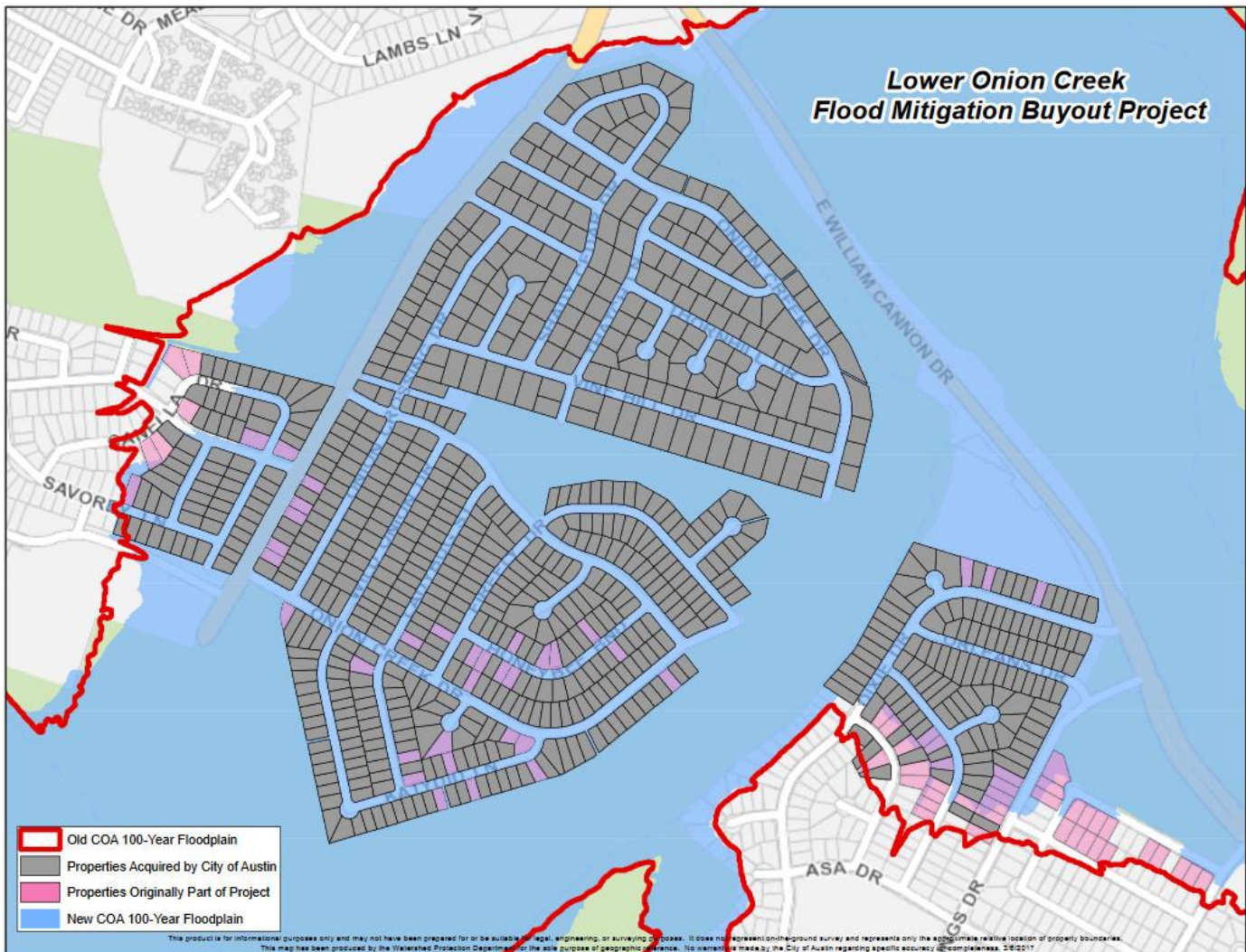


Source: ATXfloods.com

Buyout Programs in Flood-Prone Areas

In order to reduce exposure to flood vulnerability, several buyback programs have been launched by Capital Area communities. The City of Austin has been buying back properties along Onion Creek since 1999, though the pace of buybacks increased significantly in 2015. The City also has a buyback program along nearby Williamson Creek. As of March 2017⁴, the City of Austin had spent \$148.5 million in a combination of forced and voluntary buyback purchases of 821 properties. The significant cost highlights the importance of incorporating resiliency planning in land use planning – preventing development in flood-prone areas is much cheaper than buying those properties back after development.

Figure 33: Map of Lower Onion Creek Flood Mitigation Buyout Project



Source: City of Austin

The City of San Marcos and Hays County have also considered home buyback programs in flood-prone areas, but as of yet, neither has committed to buyout programs.

⁴ Source: Memo to Mayor and Council: Update on Flood Hazard Mitigation Buyout Projects. Available at: http://www.austintexas.gov/sites/default/files/files/Watershed/flood/03-14-07_Memo_to_M_C_re-Update_on_Flood_Hazard_Mitigation_Buyout_Projec....pdf

Flood Mitigation in San Marcos, TX

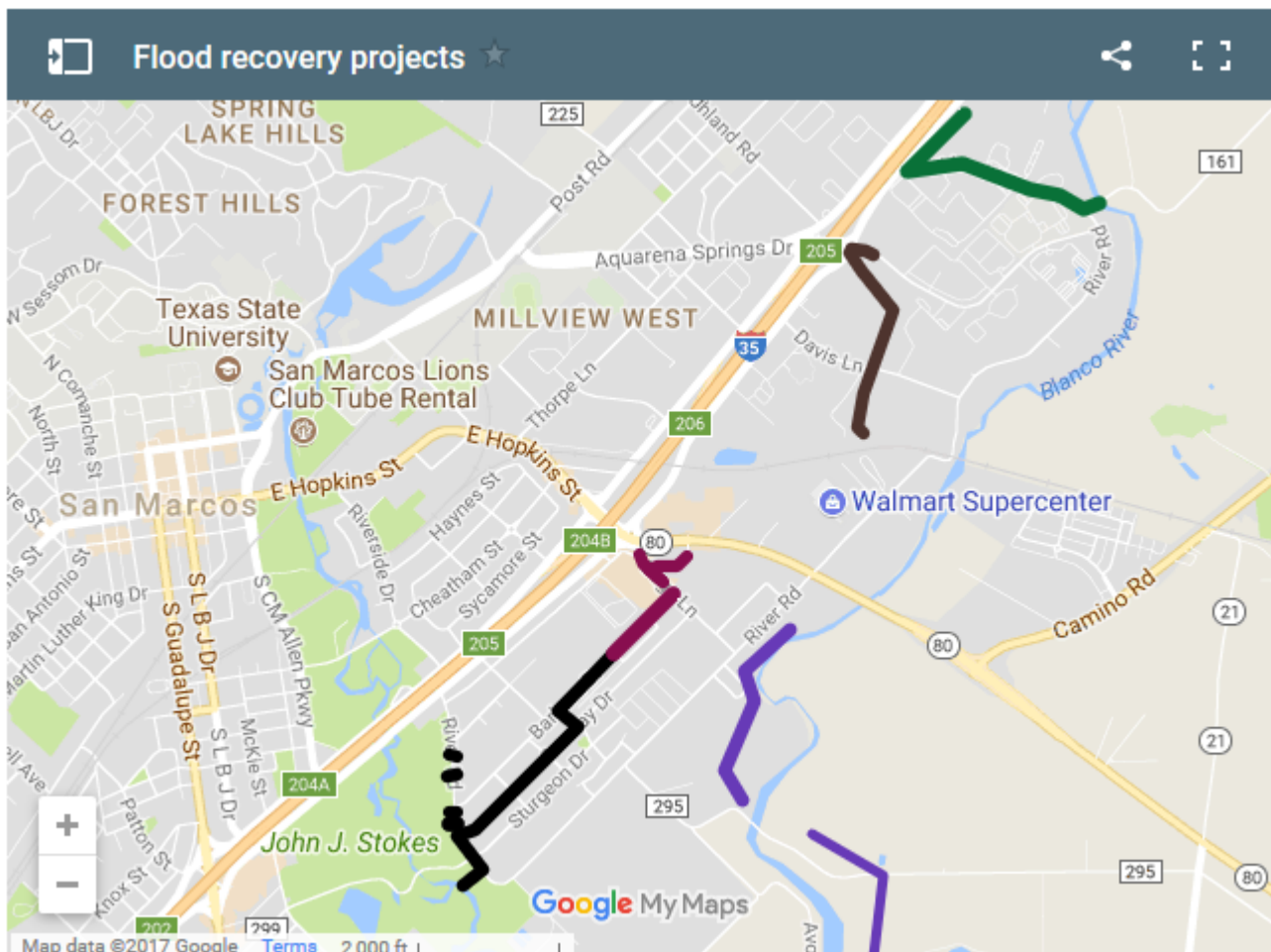
Flooding in San Marcos was particularly severe during DR-4223, and the city was awarded \$25 million from U.S. Housing and Urban Development (HUD) through its Community Development Block Grant Disaster Recovery (CDBG-DR) Program. The funds were awarded for the purpose of addressing unmet housing, economic, and infrastructure needs following the disaster.

To date, there are five specific mitigation projects that have been approved by San Marcos City Council for use of the HUD funding. They include:

- Improved drainage ditches along IH-35
- New storm sewer in Blanco Gardens, a neighborhood east of IH-35
- New storm sewer on Clarewood Drive and regrading of Barbara Drive
- Elevated hike & bike trail and drainage channel along the Blanco River
- Regrade of Uhland Road north of Aquarena Springs Drive

The total cost of those five projects is an estimated \$24.05 million and benefit approximately 744 structures.⁵

Figure 34: Approved Flood Mitigation Projects in San Marcos, TX



Source: Community Impact

⁵ Source: Community Impact Newspaper. Available at: <https://communityimpact.com/austin/san-marcos-buda-kyle/city-county/2017/04/25/5-projects-san-marcos-hopes-will-improve-flood-resiliency/>

Opportunity Identification

Given the resiliency challenges that exist in the region, there are a number of opportunities for resiliency enhancement in the region, even within the context of the programs currently in place.

Regional Hazard Mitigation Plan

A hazard mitigation plan refers to the process of identifying key risks and hazards in a given area, and codifying strategies for reducing the risks these hazards present to loss of life and property.

FEMA has established a set of requirements and regulations that a hazard mitigation plan must comply with to be approved by the federal government, at which point, a community can gain access to federal Hazard Mitigation Assistance grant funds.

There are several local-level hazard mitigation plans in the Capital Area. The City of Austin and Travis County have both completed federally-approved hazard mitigation plans. However, there is not a region-wide hazard mitigation plan. Such a plan would have the following benefits:

- It would create a consolidated list of risks and threats facing the region as a whole
- It would help to prioritize regional mitigation strategies, allowing for a more efficient allocation of resources
- It would expand access to FEMA's Hazard Mitigation Assistance funds, as more communities in the region would be operating under an approved Hazard Mitigation Plan

The Upper Brushy Creek Water Control and Improvement District, which includes portions of Austin, Cedar Park, Georgetown, Hutto, and Leander adopted a Hazard Mitigation Plan in August of 2017⁶. Adoption of hazard mitigation plans by regional entities is a welcome indication of interest in a regional perspective to hazard mitigation. Even still, there is much more room to take a broader approach to hazard mitigation planning, both in terms of geographic scope as well as in considering hazards beyond water management.

Figure 35: Components of Hazard Mitigation Planning



Source: American Planning Association

⁶ Available at: <http://www.upperbrushycreekwcid.org/DocumentCenter/View/1183>

Proactive Regional Business Stability Activities

One of the best ways to accelerate the recovery of economic activity following a disaster is to have prepared in advance for that disaster. In the case of business interests, there are a few key activities that can dramatically enhance regional disaster resiliency.

First, many of the region's economic development organizations already collect information from businesses, such as their industry classification, number of employees, revenue, utility suppliers, and so forth. Compiling this information into geospatial data can help economic development organizations, local governments, and emergency management officials quickly identify which businesses are likely to need support in the event of a disaster.

Secondly, as noted earlier in this report, one of the key needs in economic recovery is a source of quickly available capital for businesses to get back on their feet, as most (particularly small) businesses do not keep sufficient cash on hand to recover from a disaster. While federal aid can often help, it is often not disbursed rapidly enough to quickly get a business back in operation.

There are numerous examples in nearby regions of private funds that have been created to provide quickly obtainable stabilization funding for local businesses. Some of these funds are even industry-specific. Successful funds typically fill a void not being met by private or public actors in the community already. This can be achieved by offering solutions, such as:

- Immediately available funds for recovery – typically smaller amounts with low credit thresholds and a delay on when repayment begins
- Longer term business recovery loans – typically larger amounts with longer repayment terms but higher credit requirements

Following Hurricanes Katrina and Ike, funds were established in both Louisiana and Texas, respectively to provide niche funding to serve the specific purpose of business recovery. Central Texas could learn from these examples and adopt a similar program to serve the needs of businesses in the Capital Area.

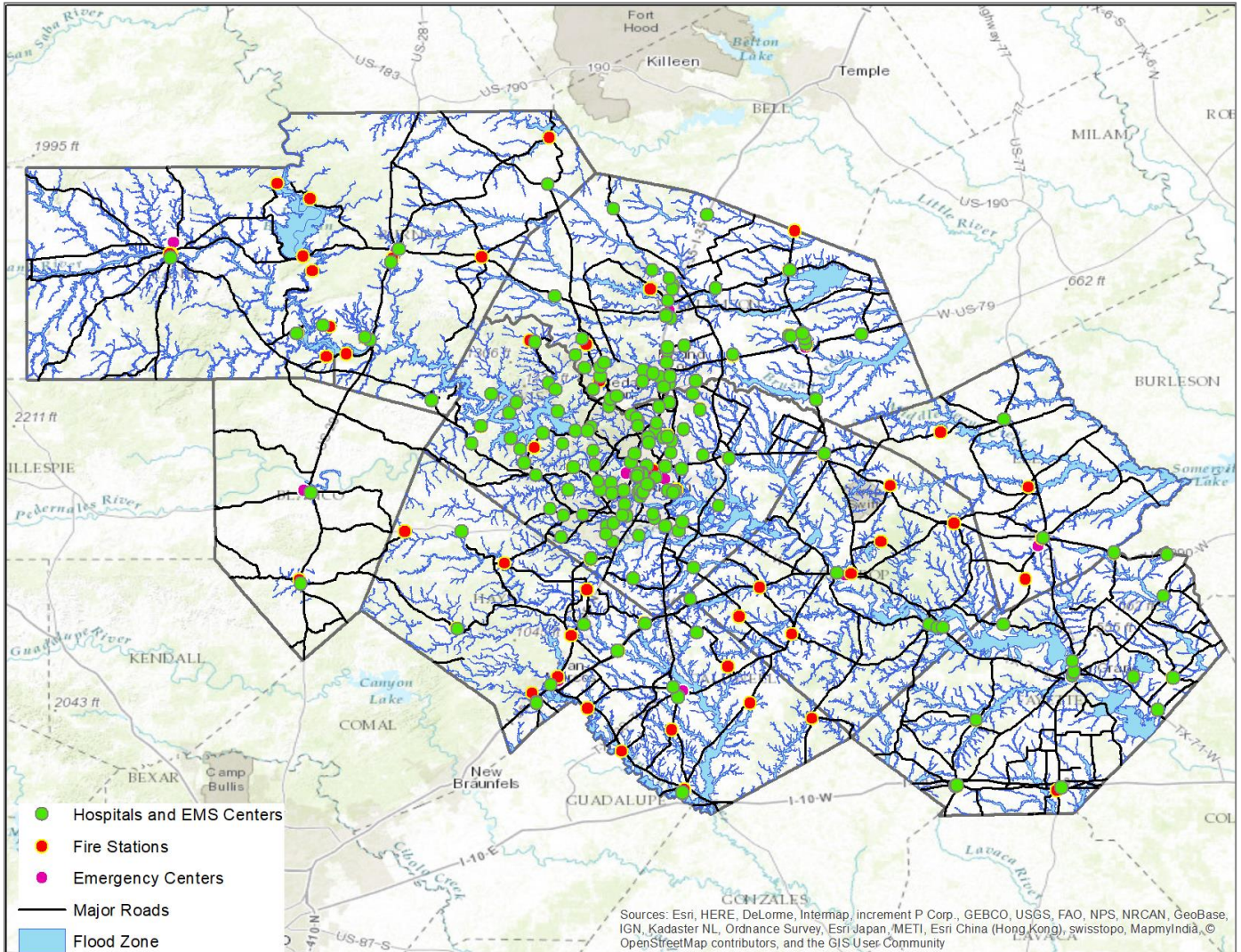
Figure 36: Sample Organizations That Offer Unique Disaster Funding for Businesses



Ensure Critical Facilities Are Protected

One of the key lessons learned in recent years is that flood extents are expanding in Central Texas, and what was once deemed a 100-year floodplain may have much higher flood probability now. One of the most important responses local governments can have to this information is to ensure that those facilities that are critically important in times of disaster are resilient to a flood themselves. The following figure provides an example of critical facilities in the region mapped alongside the 100-year floodplain.

Figure 37: Critical Disaster Facilities and the 100-Year Floodplain (FIRM)



Looking at the map, there are critical facilities that are at least near the current 100-year floodplain. A region-wide effort to identify if any particular facilities are at risk because of this proximity, and developing mitigation strategies for such an event, would be a worthwhile preparedness activity.

Conclusion

The 2015 Memorial Day disaster event had far reaching and severe impacts on Texas' Capital region. Flooding and severe winds destroyed buildings and infrastructure across the region, resulting in costly damage and loss of life. Some of the economic losses include:

- 858 insurance claims filed through the National Flood Insurance Program, with a total of \$62.9 million in losses paid
- 2,454 households that filed for FEMA assistance with total damages assessed of \$18.2 million
- 1,144 households approved for FEMA assistance for a total of \$9.7 million.
- Over \$10.5 million in FEMA assistance to local governments, with an additional \$3.4 million spent by local governments from their own resources
- 342 loans from the Small Business Administration to homeowners for a total of \$15.6 million in disaster financing

Furthermore, Hazus modeling shows that a 100-year flood scenario presents substantial potential losses for counties throughout the region. As impervious cover has expanded throughout the region and floodplains have expanded, each of the counties in the region shows development in floodplain areas. Many of the estimates shown could be interpreted as conservative estimates for damage in a severe flood event. The region has seen multiple 500-year floods in the past decade. At the same time, the detailed Hazus modeling can help to focus priorities for where mitigation efforts can be most effective.

There are also encouraging opportunities in the region, particularly in collaboration across jurisdictions to address mitigation issues. Cross-regional initiatives, like *Warn Central Texas* and *ATX Floods* have made it much easier for residents to get information about disaster and flood events during the event itself. Similar efforts on the planning and mitigation side could also bear fruit. For example, a regional hazard mitigation plan would help to take stock of specific actions and infrastructure that would strengthen the region's resilience overall. It would allow the region to prioritize mitigation efforts and allocate resources according to where they would be most effective. Likewise, the region would benefit from coordination on regulation of impervious cover, and flood mitigation ordinances. As has been seen, water disregards jurisdictional boundaries.

In short, the 2015 Memorial Day disaster event was a costly reminder for the region of the importance of disaster preparedness. It triggered and galvanized support for further efforts to strengthen disaster resiliency throughout the region. This report hopes to further catalyze those efforts.

This page intentionally left blank.

Produced by the Capital Area Council of Governments with funding from the Economic Development Administration

