

The Center for Environmental Studies  
Brown University  
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# **Reducing Risks from Natural Hazards in Central Falls, Rhode Island**

## **Contributions towards a 2012 Update**



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## **Executive Summary**

This report builds on the latest version of Central Falls' Hazard Mitigation Plan, the August 2005 report titled "Strategy for Reducing Risks from Natural Hazards in Central Falls, RI," prepared by Resource Specialist Inc. and the Central Falls Natural Hazard Mitigation Committee, which included the city's former mayor, schools superintendent, Public Safety Commissioner, Fire and Police chiefs, Code Enforcement, Public Works and Planning Directors, and two businessmen. That report was adopted by the Central Falls City Council on August 15, 2005, but expired in 2010.

This report is organized as follows. The report first reviews historical trends in disasters, including hurricanes, Heavy Rains and Flooding, Snow Storms, Hail Storms, Significant Wind Events, Lightning, Earthquakes, Heat Waves. It reviews current weather trends and some of the current science on what we can expect in the near and longer-term future in terms of expected changes in average temperatures and precipitation and the expected intensity and frequency of extreme weather events. It reviews difficulties in climate modeling, but suggests some possible types of impacts of climate change upon property, public health, and safety issues in Central Falls. This includes important impacts of a region-wide 30% increase in precipitation, worse flooding, and warmer summers with longer heat waves.

The report identifies five groups of high-risk populations in Central Falls who will need special attention to reduce risks of residents to natural hazards: incarcerated individuals in the Wyatt Detention Facility, Residents who don't own vehicles, Older adults, homeless, non-English speaking residents. Public Health elements of disaster risks focus on extreme heat, flooding, hurricanes, and nor'easters. A section on capability assessment asks the question: what resources does Central Falls have to address disaster risks? Section 4 provides a prioritization of risks and a set of action items to be considered, in three priority areas: Flooding, Heat Waves, and Electrical Outages. The report ends with an extensive discussion of the value of outreach to community organizations, who can help improve trust and cooperation during a crisis, can ease burdens on health and safety agencies, and provide emergency plans that are feasible because they reflect community values, economic realities and collective judgment. A series of steps to improve community engagement in reducing risks from natural hazards are suggested.

## **Section 1 – Introduction**

Our changing climate and resulting natural hazards present critical risks to the health and property of the residents of Central Falls. This report assesses the current status of Central Falls and outlines adaptation and prevention strategies that can help mitigate these hazards.

A number of different hazards put the residents and property of Central Falls at risk. Events such as flooding from direct rainfall or the Blackstone River can damage property and imperil lives. High winds from hurricanes and nor'easters pose threats to residential, commercial, and industrial structures as well as other public facilities. Heat waves can cause major spikes in respiratory illnesses, especially for people who have preexisting conditions like asthma or allergies. Heat waves may also be fatal for individuals such as small children or the elderly.

Sufficient planning and action at the community level can mitigate such hazards and their consequences. Rather than spending huge amounts of funds after destructive storms, heat waves, etc., preventative actions taken before hazards occur can greatly reduce risks and economic disruption. By adopting this report and implementing the suggested actions Central Falls can apply to receive funds from the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Assistance program. FEMA hazard funds and grants are only available to communities who have approved Hazard Mitigation Plans because the agency uses Hazard Mitigation Plans, among and other evaluations, to rate communities' efforts to reduce risks. FEMA provides thousands of dollars in Pre-Disaster Flood Mitigation Assistance (FMA) and Post-Disaster Hazard Mitigation Grants (HMBP) to well-qualified communities. Should Central Falls qualify for Pre-Disaster FMA funding, the city would be able to finance a variety of hazard mitigation activities, including plans to purchase, relocate, and retrofit buildings in the highest risk areas. The completion of this plan also speeds access to funding from FEMA's substantial Post-Disaster funds.

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August 15, 2005, but expired in 2010.

In 2011, the Receiver's Office gave Central Falls Fire Chief John Garvey and Steve Larrick from Planning the task of producing an updated the plan. In the fall of 2011, five Master's students at Brown University's Center for Environmental Studies reviewed the 2005 plan and suggested directions for possible revision. In spring 2012, a class of 31 undergraduate students in the program reviewed the plan and those of other communities in order to broaden the plan to include more consideration of high-risk populations, and to consider possible risks with measured and predicted changes in Central Falls' weather. Historical patterns of storm damage were updated and a number of new areas were researched. While revising the plan in spring 2012, city staff considered these inputs.

The City of Central Falls recently completed and updated version of the Central Falls Emergency Operations Plan which is a critical companion to this report. That plan addresses details of the city's procedures to respond to disasters and recover, but also how to reduce risks of disasters and better prepare for them. That plan was promulgated by the Emergency Management Director and the Office of the Receiver on 1 March 2012.

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The report identifies five groups of high-risk populations in Central Falls who will need special attention to reduce risks of residents to natural hazards: incarcerated individuals in the Wyatt Detention Facility, Residents who don't own vehicles, Older adults, homeless, non-English speaking residents. Public Health elements of disaster risks focus on extreme heat, flooding, hurricanes, and nor'easters. A section on capability assessment asks the question: what resources does Central Falls have to address disaster risks? Section 4 provides a prioritization of risks and a set of action items to be considered, in three priority areas:



Flooding, Heat Waves, and Electrical Outages. The report ends with an extensive discussion of the value of outreach to community organizations, who can help improve trust and cooperation during a crisis, can ease burdens on health and safety agencies, and provide emergency plans that are feasible because they reflect community values, economic realities and collective judgement. A series of steps to improve community engagement in reducing risks from natural hazards are suggested.

[These elements will need to be filled in by the City staff: When the draft plan was completed, community input was solicited and engagement encouraged through XYZ. The plan was forwarded to the city's Receiver and approved on XXXX, 2012. ]

## Section 2 – Historical Review of Hazardous Events

### 2.1 Historical Data

The first steps in assessing and reducing risks from disasters are to review past hazardous events. However, looking to the past is not a perfect method for predicting the future. To identify necessary preparations for future hazards, we also assessed expected climatic changes for the regions, which could bring significantly worse extreme events.

#### 2.1.1 Hurricanes

Although a severe, category 4 or 5 hurricane has never hit Rhode Island, the state has experienced major hurricanes that caused extensive damage. In the sixteen-year period from 1938 to 1954, Rhode Island experienced three major hurricanes that caused property damage and resulted in almost 300 deaths across the state. The great unnamed hurricane of 1938 devastated Rhode Island and resulted in \$100 million in property damage and 262 deaths. Hurricane Carol in August of 1954 caused similar financial damage and 19 deaths. Because Rhode Island's four hundred miles of coastlines are vulnerable to storm surges and sea level rise, even the smaller hurricanes of the past 50 years have caused millions of dollars of property damage. Wind and rain from hurricanes can also cause severe damage to inland communities including Central Falls. In September of 2011, Hurricane Irene brought winds of 62 mph and widespread power outages to the state. Some Central Falls residents experienced flooding of their homes, and many were left without power for days. Therefore, the community needs to consider the threat of a hurricane and the resulting wind and rain damage.

Table 2.1.1: Hurricanes				
Date	Name	Property Damage (\$K)	Deaths	Comments
3/14/2004	Charley	0	1	
6/4/2007	Barry	0	0	Tropical Storm, ~3 inches of rainfall
9/5/2008	Hannah	0	0	Tropical Storm, ~4-5 inches of rainfall
9/28/2011	Irene	25	0	Tropical Storm, 62 mph winds
SOURCE: National Hurricane Center, NOAA				

### 2.1.2 Heavy Rains and Flooding

As the 2005 mitigation plan states, Central Falls is not located in a severe flooding hazard zone. While the National Oceanic and Atmospheric Administration (NOAA) predicts an overall increase in storm activity and average precipitation, it does not predict an increase in Central Falls' risk of flooding. However, flooding from the Blackstone River does threaten the

<b>Table 2.1.2: Heavy Rains and Flooding</b>				
<b>Date</b>	<b>Type</b>	<b>Injuries</b>	<b>Property Damage (\$K)</b>	<b>Comments</b>
3/31/2005	Flood	0	17	
8/14/2005	Flash Flood	0	10	
9/15/2005	Flash Flood	0	15	
10/15/2005	20 to 50 year flood category	0	533	Pawtuxet River flood dues to tropical storm Tammy. (8.3 feet of rain recorded for one month)
6/7/2006	Flood	0	20	Runnins River flooding
10/29/2006	Flood	0	5	
3/2/2007	Flood	0	25	
4/15/2007	Coastal Flood	0	2.5	
4/16/2007	Coastal Flood	0	2.5	
4/17/2007	Flood	0	30	
2/13/2008	Flood	0	30	
3/9/2008	Flood	0	30	
7/23/2008	Flash Flood	0	15	
12/12/2008	Flood	0	50	Heavy raining
3/31/2010	River Flood	0	2664	Overflow of Blackstone River. Major rise and flooding of residences and business
7/14/2010		0	30	
<i>Sources: NOAA, NCDC, SHELDUS, RIRMC</i>				

city. In March, 2010, a 50-year flood (which has a two percent chance of occurring each year) of the Blackstone River caused hundreds of thousands of dollars in damage to the surrounding areas. The river rose several feet above flood levels, affecting homes and businesses. However, Central Falls is not at major risk with 'A' and 'V' flood zones. An 'A' zone is one that would be affected by a 100-year flood event and a 'V' flood zone is a velocity zone that would be affected by breaking wave action (Mitigation Plan 2005).

The main areas in the city prone to flooding are on the east side of the city along the Blackstone river. These streets include River St., Crown St., Courtland Ave, New Haven Ave, and Roosevelt and High St. businesses. On the west side of the city Higginson Ave can be affected by flooding due to topography and poor drainage (Chief Garvey, Central Falls). The city should improve drainage and sewage systems, to better protect its residents during flooding when currently storm water can overflow into sewage pipes. This could lead to a back up in the piping system and flooding in the buildings they route to. Several dams run along the Blackstone River as well and these could pose significant flooding if they break down. Both Valley Falls and Elizabeth Webbing Mills Dam could impact the city. According to the Narragansett Bay Estuary Program, both dams will be undergoing renovations and inspections to make sure they are up-to-date within the year in an attempt to improve salmon migration.

### **2.1.3 Snow Storms**

Historically, nor'easters, snowstorms, and ice have resulted in hazardous road conditions, power outages, the closing of schools and businesses, minor accidents, and highway travel disruptions in Rhode Island. Nor'easters are winter storms that are born and get their energy from the convergence of the warm air currents of the Gulf stream and the northeasterly winds that give the phenomenon its name (NOAA, 2006). Over the past few decades the Jet Stream has become more curved - dipping further south so that warm air rises above the cold air to create instability above and low pressure zones down below - creating the potential for more powerful Nor'easter storms (Ocean-Beach.com 2009). Nor'easter events are most often accompanied by harsh winds and heavy snow fall.

One of the more recent severe snowstorms in Central Falls occurred on January 12, 2011, where the city received 24 inches of snowfall. Ice accumulations, usually associated with snowstorms during periods of freezing rain, are also a problem for this community because the

accumulated ice can down trees and power lines and cause roads to become slick. This can create hazardous driving conditions which make both personal and public transportation dangerous.

<b>Table 2.1.3: Snow Storms</b>				
<b>Date</b>	<b>Snowfall (inches)</b>	<b>Property Damage (\$K)</b>	<b>Character of Storm</b>	<b>Comments</b>
1/27/2004	3-8	0		
11/4/2004	4-8	0	Heavy snow	
12/26/2004	6-10	0	Winter storm	
1/5/2005	5-7	0	Winter storm	
1/22/2005	15-25	0	Winter storm	Wind at 60 mph
2/25/2005	5-8	0	Heavy snow	
3/1/2005	4-8	0	Winter storm	
3/8/2005	2-5	150	High wind	Wind at 70 mph
3/12/2005	1-3	0	Winter storm	
2/23/2012	1-3	0	Heavy snow	
2/12/2006	9-14	10	Winter storm/ blizzard	
2/26/2007	2-4	0	Winter storm	
3/16/2007	7-8	0	Winter storm	
12/13/2007	~12	0	Heavy snow	
12/19/2008	8-12	5	Heavy snow	
3/2/2009	7-12	0	Heavy snow	
12/19/2009	18-20	0	Heavy snow	
12/26/2010	8-15	15	Winter storm	
1/12/2011	~24	0	Winter storm	
2/1/2011	0	0	Winter storm	Snow and ice, rainfall
<i>SOURCE: NCDC</i>				

#### 2.1.4 Hail Storms

Hailstorms are associated with severe thunderstorms accompanied by high winds, and occur mostly in summer. The National Climate Data Center reports several hailstorms that have affected this area in the past with hail ranging from 0.75”-1.75”. Hailstorm damage can affect vehicles and property depending on the size of the hail.

Table 2.1.4: Hail		
Date	Size (inches)	Comments
5/26/1998	1	Marble-size hail fell during a thunderstorm
8/7/2001	1.5	Dime size to ping-pong size hail fell
8/11/2004	1.75	Golf ball sized hail fell
7/3/2008	0.75	Severe thunderstorms dropped quarter sized hail in Coventry, Johnston, Providence, and North Kingstown. Dime sized hail was reported in Warwick and Barrington.
4/16/2010	0.75	
5/22/2010	0.88	
6/21/2010	0.75	A severe thunderstorms brought down large branches in Woonsocket. Later in the afternoon, another severe thunderstorm brought down wires in Providence, and blew down scaffolding at the state capitol building. Penny sized hail was reported with another storm in Cumberland. In Smithfield, lightning struck a house and ignited a fire in the attic.
7/19/2010	1.75	
6/18/2012	0.88	Penny to nickel size hail fell in a swath from the Federal Hill area of Providence to Allens Avenue near the power plant to East Providence. A cold front moved across Southern New England setting off isolated showers and thunderstorms that produced penny to nickel sized hail.
6/25/2012	1 .00	A slow moving cold front provided a focus for severe thunderstorms. These thunderstorms produced very heavy rain that resulted in flash flooding, hail, and damaging winds.
	1.75	Quarter to golf ball sized hail damaged several windshields, dented cars and smashed windows in the area surrounding the Pawtucket YMCA. In addition, the amount of hail piled up on the roof of a bank, caused a portion of the roof to collapse. Hail had to be shoveled off the remaining portion of the roof.
7/3/2012	0.75	An upper level trough approaching Southern New England set off showers and thunderstorms across much of the area. With cold temperatures aloft, hail was the main threat experienced. However, thunderstorm winds and heavy rainfall also produced some damage and complications, with portions of a few roads closed due to fallen trees or flooding.
	0.88	Penny to nickel sized hail fell in a swath from Lincoln to Smithfield.
	0.88	Penny to nickel size hail fell in Cumberland.
7/24/2012	.75-1.75	
7/4/2013	0.75	
4/23/2014	0.75	Penny sized hail was reported in North Providence.
	1	Quarter sized hail fell in Providence near Route 10. Penny sized hail fell in Cranston.
Sources: NCDC, SPC		

### 2.1.5 Significant Wind Events

Wind events in Rhode Island are the result of high gale winds, thunderstorms, hurricanes, nor'easters, tropical storms, and low-pressure systems. Tornadoes are not a problem in Rhode Island. Wind events are responsible for property and vehicle damage from fallen trees, as well as power outages (Central Falls Natural Hazard Mitigation Committee).

<b>Table 2.1.5: Significant Wind Events</b>			
<b>Date</b>	<b>Magnitude (knots)</b>	<b>Property Damage (\$K)</b>	<b>Injuries</b>
3/8/2005	62	150	0
4/2/2005	50	35	0
5/7/2005	50	25	0
9/29/2005	58	25	0
10/16/2005	58	40	0
10/25/2005	60	35	0
1/18/2006	58	110	0
1/21/2006	58	50	2
10/29/2006	50	10	0
12/1/2006	50	25	1
4/16/2007	52	15	0
2/10/2008	58	5	0
3/8/2008	51	4	0
1/25/2010	52	40	0
<i>SOURCE: National Climatic Data Center</i>			

### 2.1.6 Lightning

According to the NOAA, lightning storms are not a major concern in Central Falls, RI because minor incidents in the past have not caused significant damage. The most recent incident involved the lightning strike of a Central Falls house in September 2000. Lightning strikes may cause power outages due to the downing of struck tree limbs. The state is taking more precautions (e.g. earlier sensing, and data collection and warning systems) (Rhode Island Resource Management Council) to protect citizens from lightning storms and prevent power surges to ensure no houses are affected.

### 2.1.7 Earthquakes

Major earthquakes are not typical in Rhode Islands and there have been few in recent years. The largest earthquake in the state was on March 11, 1976 near Newport, with a

<b>Table 2.1.6: Lightning</b>			
<b>Date</b>	<b>Injuries</b>	<b>Property Damage (\$K)</b>	<b>Comments</b>
6/17/2001	0	150	Hit 2 houses but caused relatively little damage there and elsewhere
5/31/2002	0	100	
6/20/2006	0	50	
7/18/2006	0	25	
5/29/2001	0	20	
9/15/2000	0	15	
7/28/2006	0	15	
7/23/2008	0	15	
7/23/2011	0		Lightning hits houses and caused fires
6/11/2001	0	10	
7/19/2005	0	10	
8/2/2002	0	8	
7/19/2005	0	5	
1/11/2008	0	5	
4/3/2002	1	0	
6/22/2002	1	0	
7/15/2001	4	0	
<i>Sources: NOAA, SHELDUS, RIRMC</i>			

magnitude of 3.50 on the Richter Scale of 1 to 10 (10 being most severe). Most earthquakes in and around Rhode Island are felt only as a slight rumble lasting several seconds or fewer. The most recent earthquake centered in Rhode Island occurred on August 26, 2011 near Kingston. This quake had a magnitude of 0.9 (Boston College Weston Observatory). Most quakes that are felt in Rhode Island are not centered in the state, but in surrounding states. Therefore,

<b>Table 2.1.7: Earthquakes</b>		
<b>Date</b>	<b>Point of Origin</b>	<b>Magnitude</b>
3/11/1976	Newport, RI	3.5
11/22/2007	12.9KM W of Warwick	1.4
8/26/2011	3KM W of Kingston	0.9
<i>SOURCE: Boston College Weston Observatory</i>		



earthquakes represent a low priority hazard to the community. Old masonry buildings and high-rise structures such as extended-care facilities are most vulnerable to earthquake damage (Central Falls Natural Hazard Mitigation Committee).

### 2.1.8 Heat Waves

Heat waves are a very large threat to the health of residents (see section 3.3.1 for more information on the public health risks of heat waves), but do not pose major risks to most property or infrastructure. There is no universal definition of a heatwave, but in Rhode Island it can be defined as three days or more over 90 degrees, which is typically accompanied by a high level of humidity. Because of the heat trapping nature of cities, people in urban areas are more frequently affected by heat waves than those in rural regions. Citizens of Central Falls have died during heat waves in the past. Heat waves are expected to become more frequent and intense due to the increase in temperature associated with climate change, as described in section 2.2 below.

<b>Table 2.1.8: Heat Waves</b>			
<b>Date</b>	<b>Fatalities</b>	<b>Temperature</b>	<b>Comments</b>
7/2/2004		High of 100, over 4 days above 90	Major damage was done to the National grid system which left thousands without power. On average the season experienced 4.1 degrees hotter than normal
9/2/2012	Over 30, 2 in Central Falls	High of 102, 4 day Heat Wave	An elderly couple was found dead in their apartment in Central Falls as a direct result of the high heat. Over 30 other people were killed during this heatwave (not limited to Central Falls)

### 2.1.9 Secondary Hazards Matrix

Natural and man-made hazards often lead to the occurrence of additional secondary hazardous events. For instance, some of the secondary hazards linked to hurricanes are widespread flooding, electricity and commodity disruptions, and the formation of tornadoes. These secondary hazards occur as a predictable but relatively rare consequence of the primary hazard but can cause far-reaching and costly levels of damage. Thus, when devising effective hazard mitigation strategy, it is crucial to plan for all secondary hazards that may arise in a

primary hazard's wake. Identifying and preparing for potential secondary hazards will help to eliminate surprise and to bolster overall hazard mitigation following the arrival of a primary hazard.

Some particularly important secondary hazards to include in a hazard assessment of Central Falls are the displacement and release of chemical hazards following a major flood, significant rain storm event, dam failure, hurricane, or earthquake. Central Falls houses many active and retired industrial buildings, some of which could contain hazardous materials that could be released to air or water during a major hazard event. These same properties could also be privy to the spreading of urban fires, a primary hazard that should also be considered a secondary hazard induced by lightning storms or wildfires.

**Table 2.1.9: Secondary Hazards Matrix**

Primary Hazards	Secondary Hazards	Structure Damage	Utility Outage	Chemical Release/Spill	Commodity Disruption	Food Shortages	Compromised Water Quality	Extreme Temperatures	Emergency Communication Failure	Erosion	Structural Fire	Mold Outbreaks	Carbon Monoxide Poisoning	Disease	Vulnerable Population Impacted	Flooding	Landslide	Dam Failure	Tornado	Wildfire	Hail
Dam Failure			X	X	X	X	X			X					X	X	X				
Drought					X	X	X	X			X				X					X	
Earthquake		X	X	X	X	X			X				X		X			X			
Epidemic/Widespread Disease					X										X						
Intense Thunder/Lightning Storm			X				X		X		X				X	X			X	X	X
Hurricanes		X	X	X	X	X	X		X	X		X		X	X	X	X	X			
Ice Jams		X													X	X		X			
Inland Flooding		X	X	X	X	X	X		X	X		X		X	X		X	X			
Tornado		X									X				X						
Urban Fires		X									X				X					X	
Wildfires		X													X						
Winter Storms		X	X		X	X	X	X	X	X					X			X			

## 2.2 Climate Modeling

Most local and state Hazard Mitigation Plans look only at past disasters when considering actions that might be taken to reduce risks of future ones. However clear trends are emerging in Rhode Island's weather, and it would be exposing Central Falls' population to unnecessary risk to not acknowledge these trends and account for projected climate changes. Recent sea level rise in Narragansett Bay, increase in air and ocean temperatures in the state,

and intensification of storms and precipitation events is quantifiable evidence that Earth's climate is changing and that Rhode Island has already experienced measurable impacts (URI/Sea Grant 2011). In Rhode Island, average annual air temperature rose 1.7 degrees Fahrenheit and precipitation increased 32% between 1905 and 2006. Narragansett Bay sea surface temperatures has risen 4 degrees Fahrenheit since the 1960s, and the mean sea level at Newport is rising at a rate of 3.6 mm per year (URI/Sea Grant 2011). These observed changes cannot be attributed to natural climate fluctuations alone; but instead are most likely explained by human combustion of massive amounts of fossil fuels ("anthropogenic forcing" of the climate system). With the current and expected levels of emissions of billions of tons of carbon dioxide, methane, and other greenhouse gases to the Earth's atmosphere, the global climate will change significantly for decades to come (Roberts et. al 2010).

While looking at historical data provides an indisputable record of warming and overall positive precipitation trends thus far, projecting these trends into the future is a much more complicated process. Climate models seek to predict what may happen in the future given historical data, future emissions scenarios, and the best available climate science. Climate models provide estimates for the climatic variables (temperature, precipitation, sea level, etc.) that have important social implications, creating a framework through which we can assess the possible impacts and hazards posed by climate change (NERA 2001:1). Due to the limitations posed by natural climate variability and uncertainty about future emissions, climate models are inherently uncertain, and can therefore provide only estimates of possible future climates (NERA 2001:1). Uncertainty aside, however, they are powerful tools in forming a minimum basis for future hazard assessment.

The majority of existing climate models are global in scale. Because climatic factors interact with distinctive geographic and geologic characteristics of individual regions to produce unique regional climates, a need has emerged to evaluate climate change at spatial and temporal scales relevant to local and regional populations (Hayhoe et. al 2008: 426). In 2001, the New England Regional Assessment (NERA) was published with the purpose of identifying and evaluating the potential impacts of climate change on New England. Further downscaling has been conducted to evaluate changes relevant to Rhode Island populations. For the City of Central Falls, we have identified rising temperatures, which have serious implications for human health, and increased precipitation, which may cause severe flooding and property

damage, as the two major risks posed by climate change.

### **2.2.1 Climate Model Projections for New England**

Two Global Climate Models have been scaled down to the New England level for use in the New England Regional Assessment: the United Kingdom's Hadley Centre for Climate Modeling and Analysis's model (HadCM2, or the Hadley Model), and the Canadian Centre for Modeling and Analysis's Canadian Global Coupled Model (CGCM1, or the Canadian Model). With the assumption that greenhouse gas emissions will continue to rise 1% per year (NERA 2001:4), both models predict considerable increases in temperature and changes in precipitation for the New England region.

### **2.2.2 Temperature**

Of the two models, the Hadley model predicts a more modest increase in temperature. The model predicts a 1.8 degree F increase in the annual minimum temperature by the year 2030 and a 5.6 degree F increase for the long-term future (by the year 2100). The model also predicts increases in annual maximum temperature, by a margin of 2.7 degrees F by 2030 and 3.6 degrees by 2100. The Canadian model predicts a more extreme increase in temperature, with a predicted annual minimum temperature increase of 1.8 degrees F in the short-term and 9.5 degrees F in the long-term. Average annual maximum temperatures are predicted to increase 2.7 degrees F by 2030 and 9 degrees F by 2100.

Regardless of which model is used, substantial increases are expected for both average annual minimum and maximum temperatures increases in the short and long term future. (Hurt and Hale 2001:2) Averages taken over many days and locations hide the most extreme events, which are the causes of the worst natural disasters. Climate change is increasing the number and intensity of those events.

### **2.2.3 Precipitation**

The Hadley model predicts a fairly steady increase in precipitation for the future, while the Canadian model predicts an overall increase, but with many fluctuations throughout. The models measure precipitation change relative to the 1961-90 mean precipitation. The Hadley model predicts a 10% increase by 2030 and approximately a 25% increase by 2100. The

Canadian model predicts approximately a 2% decrease by 2030 and a 5-10% increase by 2100, with many fluctuations and possible droughts.

In comparison to historical fluctuations, the New England region has had varied precipitation patterns over the past 100 years, but with a long-term increase of approximately 4%. (Hurtt and Hale 2001:3). The Northeast River Flooding Forecast Center reports a 30 percent increase in precipitation in the region over the past thirty years, with a trend of shorter, compressed winters and fast-moving, rain-heavy storms. With increased development in watersheds, flooding is becoming more frequent.

#### **2.2.4 Seasonal Variation**

Models predict that climate change will affect each season differently. Temperatures will increase more in the winter than in the other seasons. Minimum temperatures for the long-term are expected to rise anywhere from +3.6 to +10.8 degrees in the spring and summer, +5.4 degrees in the fall, and +7.2 to +12.6 degrees in the winter. (NERA 2001:5). The Hadley model predicts precipitation to increase drastically in every season except spring, and the Canadian model has no significant trend for seasonal precipitation changes. (Hurtt and Hale 2001:4).

#### **2.2.5 Heat index/Heat waves/Temperature extremes**

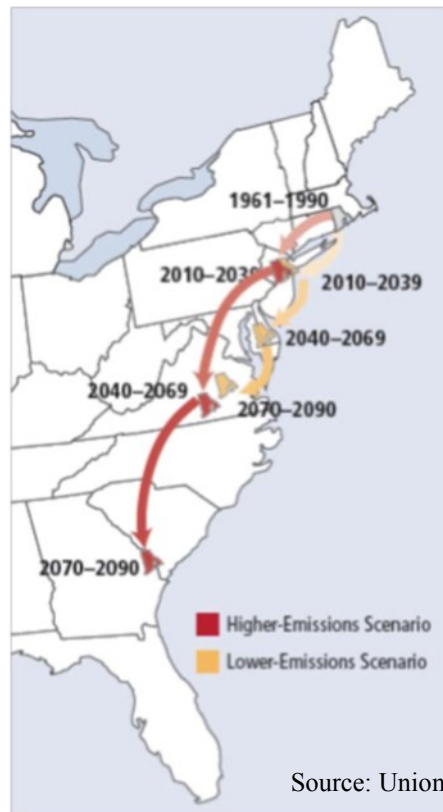
Heat index is the measure of how hot or cold it actually feels, and incorporates humidity and wind effects in addition to temperature. Because of increases in temperature and precipitation, by the end of the century, Rhode Island is expected to have a climate and heat index similar to that of Georgia's current levels (Frumhoff et al. 2007) (See figure 2.2.1).

With the rising temperature, the annual number of 'hot days' (over 90 degrees) is expected to increase drastically for Rhode Island. Currently Rhode Island has about 5 hot days annually, and by the end of the century some models predict as many as 50 or 60 hot days per year. (Frumhoff et al. 2007).

#### **2.2.6 Downscaling Techniques**

Several New England climate change predictions have been published by taking coarse-resolution global climate models (GCMs), which typically predict at a resolution of 90-180 square miles, and *downscaling* them to a regional (<35 square mile resolution) level (Bader,

**Figure 2.2.5: Rhode Island's Migrating Climate**



Covey, and et al 31-38). Downscaling may either be *statistical*, which assesses statistical relationships between observed small-scale (often station level) variables and past GCM-scale variables, and then uses the future GCM-scale variables to drive these relationships and obtain regional-scale predictions; or *dynamical*, which uses a limited-area, high-resolution regional climate model driven by boundary conditions from a GCM to derive smaller-scale information.

### **2.2.7 Downscaling Effectiveness**

Downscaling approaches appear to exhibit significant skill in taking GCM simulations and producing both spatial and temporal distributions in the northeast USA that are relatively close to observed climatology for the 1990s. In terms of temperature, the statistical and dynamical approaches are relatively close in terms of both past and future simulations. However, for precipitation, and especially daily precipitation statistics, the dynamical approach is superior, as current statistical downscaling methods cannot project changes in extreme precipitation, nor can they resolve projected changes in dynamics that are likely to result in shifting spatial patterns of precipitation across the region (Heyhoe, Wake et al 434).

### 2.2.8 Downscaling Predictions

Over the coming century, temperatures across the Northeast are projected to continue to rise. Significantly greater temperature increases are expected in summer as compared to winter temperatures (Heyhoe, Wake et al 433). Both statistical and dynamical approaches indicate ~20–40 more days per year above the 1990 90th percentile temperature threshold by the 2090s (which represents an effective doubling of the number of days that exceed the 1990 threshold), with Rhode Island tending in the upper range.

Precipitation has been predicted to increase as well, but the inverse of the seasonal conditional for temperature is true; dynamical downscaling projects a 25-50% increase in *winter* precipitation by the end of the century for Northern Rhode Island, where summer precipitation is actually predicted to *decrease* (albeit only in the order of a few percent).

## Section 3 –Vulnerability/Risk Assessment

This section assesses risk and vulnerability in Central Falls - examining which areas are at risk, how vulnerable they are, and the likely impacts if they are hit by a natural disaster. Four maps show high risk areas in Central Falls, map Land Use change in the city, food accessibility, and hazardous sites.

### 3.1 High-Risk Populations

The identification of high-risk populations is critical for reducing risks in Central Falls, and five groups have been identified as being particularly so through conversations with community members and social service organizations. These include: incarcerated individuals, community members without access to transportation, older adults, homeless individuals, and non-English speaking residents. Apart from these five groups, a key aspect that the 2005 Hazard Mitigation Plan addressed was the access to emergency shelters during a hazard. The use of mass care facilities is dependent on a variety of factors, including warning time, public awareness of the hazard, levels of encouragement from public officials, and the availability of shelters. There are several approved mass care facilities located within the City that are adequate to support the population that may seek shelter during an emergency. Several back-up locations have also been identified in the event that further shelter is needed.

**Table 3.1: Mass Care Facilities**

Locations	Address
Harold G Hunt School	Kendall Street
Central Falls Jr. Sr. High School	24 Summer Street
Calcutt Middle School	112 Washington St
Veterans Memorial Elementary School	150 Fuller Ave

All five of these high-risk populations are critical to connect with. Plans need to take into account the particular aspects of hazard impacts that will be exacerbated for each of their memberships. Furthermore, many of these groups have overlapping populations. As mentioned previously, it is critical that the identification of these high-risk populations is accompanied by



engagement that will allow these communities to have a strong voice in determining the best solutions for their particular memberships.

These are initial suggestions and further investigation into other high-risk populations could serve an important function to ensure the safety of the entire Central Falls community in the event of a hazard. Further, the identification of high-risk populations should be paired with specific community outreach to these populations, because studies have shown that strong community input in hazard plan creation is critical for strong implementation (Schoch-Spana: 2007). Additionally, it is important to recognize that poverty is an overarching risk factor in Central Falls – especially because the percentage of people living in poverty is 27.8% (US Census 2010) and the unemployment rate is 14% (Department of Labor 2011).

### **3.1.1 Incarcerated Individuals**

Incarcerated individuals at the Wyatt Detention Center are a particularly high-risk population in the event of a natural or human-created hazard. The Wyatt Detention Center building is physically vulnerable due to its location in the Blackstone River flood plain. Incarcerated individuals are unable to leave the city via their own will, and their ability to evacuate during an emergency rests at the discretion and capacity of decision makers, ultimately, the facility's private contract operators. Past tragedies in other cities as a result of inadequate action on the part of prison operators (for example, the Orleans Parish Prison during Hurricane Katrina) raise concerns about the safety of the Wyatt Detention Center's population during an emergency (ACLU 2008). In addition, the history of abuse allegations at the Wyatt Detention Center raises additional concerns regarding the safety of Central Fall's incarcerated population (NY Times 2008). Overall, it is critical that the City prioritizes evaluating the current evacuation and hazard response plan at the prison and ensure that it is compatible with the evacuation plans for the city.

### **3.1.2 Residents Who do not Own Vehicles**

Lack of access to personal transportation is a risk factor for many Central Falls residents. Residents that do not own vehicles will be forced to rely on public transportation during an evacuation. These transit options are normally limited to a small number of Rhode Island Public Transportation Association (RIPTA) bus routes passing through the city. Central

Falls residents without access to a vehicle will be stranded if RIPTA service becomes unreliable, or even temporarily suspended, in the event of a hazard in Central Falls. In addition, bus stops are less likely to be accessible during an emergency. Furthermore, Central Falls residents without access to personal transportation are less able to gather and purchase the necessary materials to *prepare for* an emergency prior to its occurrence.

The Central Falls Emergency Operations Plan states that one of its key purposes is that it "Acts as a liaison with the Resources and Public Information Officers to ensure that any places of assembly are marked and arranges for bus transportation for those without cars." However, it is clear that this plan need to be more detailed to most effectively address the needs of the population.

### **3.1.3 Older Adults**

Older adults in Central Falls are another higher risk population living in the city. 8.7% of the Central Falls population is over the age of 65. Those residents living in older adult care facilities are at particular risk; the evacuation of these residents is in the hands of the facility operators. Like the Wyatt Detention Center, the Blackstone Falls elderly low-income housing center is located in the river's flood plain, just below the Valley Forge dam. Parts of the old mill building regularly have to be evacuated during major floods. Furthermore, the Central Falls Emergency Operations Plan states, "The special needs of the handicapped and elderly must be met by the city of central fall's officials and emergency personnel. The Rhode Island Departments of Human Services and Elderly Affairs maintain current listings of disadvantaged groups and citizens. In the City of Central Falls, the Emergency Management Agency and the Fire Department also maintains a confidential list of special needs individuals known to the community and has also identified facilities that house such groups. Additional information is included in ESF 8: Public Health and Medical Services." Therefore, similar to the *Residents Without Vehicles* there is a plan put in place, but it would benefit from more input from the community.

### **3.1.4 Homeless Individuals**

There is an unknown number of homeless individuals in Central Falls. The city's homeless make up another higher risk population in the event of an emergency: even relatively

minor hazards can pose a risk for individuals that do not have permanent shelter. Although many hazard mitigation plans cite homelessness as an outcome of poor hazard mitigation planning, it's critical to assist those who are already homeless since they do face some of the most severe impacts of environmental and man-made hazards (Cutter 2003: 245).

### **3.1.5 Non-English Speaking Residents**

Future hazards will put the non-English speaking residents of Central Falls at higher risk if the city does not enact proper precautions. 72.7% of households in Central Falls speak a language other than English as their primary language (US Census 2010), but nearly all official communications are in English. It is imperative that these individuals receive the same communications as English-speaking residents regarding disaster situations, information about available resources before, during, and after the disaster, as well as knowledge of evacuation routes. See table 5.2.a for community organizations who can assist with outreach to non-English speaking residents. The Central Falls Emergency Operations Plan does state that non-English speakers should get alerts about evacuations, but does not outline a method for this alert. Therefore, it is important to work with the non-English speaking community to create a plan that will work most effectively for this community.

### **3.2 Food Aid and Food Security**

Central Falls' high rate of food insecurity may increase the vulnerability of populations to climate events and other disasters (Bueno 2012). On a short term basis, developing a cohesive emergency food distribution plan is an important part of preparing for climate events. On a long term basis, initiatives to increase Central Falls' food security will serve as adaptation strategies against climate change as well as increasing self-sufficiency.

During Hurricane Irene in 2011, the Red Cross or other donation agencies made food available for the initial days following the storm. However, as power outages forced the closure of food assistance programs like Progreso Latino's food pantry, residents were left without assistance and many reported their own perishable food spoiling without refrigeration (Carter 2012). These concerns call for a community food aid response plan in the wake of climate events, which can be created using the USDA Community Disaster Action Framework ([www.fns.usda.gov/disasters/pandemic/framework.pdf](http://www.fns.usda.gov/disasters/pandemic/framework.pdf)) as a template. Community

organizations, food pantries, and soup kitchens have the local knowledge and relationships to develop an aid response plan that takes into account issues like language, disability, and immigration status. Such organizations may include Progreso Latino, which expressed interest in developing such a response plan, as well as The Blackstone Valley Community Action Program (BVCAP) and the Salvation Army, both of which currently have food assistance programs (Carter:2012).

While the Rhode Island Emergency Management Agency may recommend that residents keep specific food reserves in anticipation of a disaster, many lower-income residents do not have the financial means to purchase food in advance (Carter:2012). Central Falls should consider enrolling in the national Disaster SNAP (D-SNAP) program, which allows residents to apply for emergency food stamps. However, given that SNAP enrollment is dependent on immigration status and is often a long process, working through community based organizations ensures that the needs of the most are addressed in a way that ultimately acts to strengthens community ties as well.

**Table 3.2: Food Pantries and Soup Kitchens Close to Central Falls**

Name	Address	Phone	Hours	Requirements
BVCAP Emergency Food Center	402 Dexter St. Central Falls	401-724-7170	M, W, F 9- 11:30 am; Thursdays working residents (bring pay-stub) 4-6:30pm.	Picture ID; Rent receipt; proof of income; social security card and birth certificates and Medicaid cards for children in home
Progreso Latino Food Pantry	626 Broad St Central Falls	401-728-5920 Ext. 324.	M, W, F 1:30-3:30pm	Suggested call ahead
Salvation Army	102 High St. Pawtucket	401-723 - 9533	Call for hours	Photo ID
St. George's Church - soup kitchen	12 Clinton St Central Falls	401-722-9449	W, F 9am-12pm	

### Government Resources to support food security

- USDA Community Disaster Action Framework
- USDA's D-SNAP - FNS Disaster Assistance Programs

*[http://www.fns.usda.gov/disasters/response/disaster\\_handout.pdf](http://www.fns.usda.gov/disasters/response/disaster_handout.pdf).*

The "2008-2009 Disaster Lessons Learned and Best Practices Report" is also useful.

- USDA's Fresh Fruit and Vegetable Program

*<http://www.fns.usda.gov/cnd/ffvp/>*

### **3.2.1 Food Access and Local Agriculture**

Central Falls residents face many issues resulting from food insecurity, especially converging issues of poverty and lack of access to healthy and inexpensive fresh foods. 75% of adults in Central Falls do not get the recommended daily servings of fruit or vegetables (Nolan, 2011:2). Residents reported that stores or markets with fresh produce are often prohibitively costly or inconvenient to get to, while local grocery stores have a limited and low quality selection of produce (Lester:2012). As a farmers' market previously organized by Farm Fresh Rhode Island was closed because of low participation, increased outreach and partnership with community organizations would be important in future projects (Lester:2012).. Subsidizing a community supported agriculture program in partnership with Farm Fresh RI, or collaborating with urban agriculture groups such as the Pawtucket New Urban Farmers or the Southside Community Land Trust are potential ways to localize food systems, reduce carbon emissions, and increase health. Additionally, elementary schools in Central Falls can receive government funds to provide fruit and vegetables to students through the USDA's Fresh Fruit and Vegetable Program. Measures such as these will increase community health and thereby resilience to climate change.

### **3.3 Public Health and Disaster Risks**

A number of public health concerns are directly tied to natural hazards, and if the frequency of these events increases, then some issues worsen and some new ones arise. Each disaster type--heat events, flooding, wind storms, Nor'easters and earthquakes--brings its own health risks, and suggests its own approach at reducing these risks.

### **3.3.1 Extreme Heat Events**

As climate change continues throughout the 21st century, extreme heat events will increase in prevalence (Moser et al 2007:650). Certain segments of Central Falls will face elevated health risks. Infants and small children, elderly people over 65 years old, and people who are ill and/or on medication face the highest vulnerability to extreme heat (Kalkstein and Greene 2009:1-2, Moser et al 2007:651). General poverty and urban residency, especially through dense communities with poor housing conditions and few trees or green space, represent additional health vulnerabilities to heat events. Over 20% of the Central Falls population fits such age and health vulnerabilities, while 77% of the city's residents live in tightly packed rentals at a density of 15,341 people per square mile. Moreover, over 25% of the city lives below the federal poverty level (CityData 2011, Moser et al 2007:650). In this way, heat risks are extremely pertinent to the Central Falls community.

Short-term risks associated with heat include increased prevalence of heat-related illnesses, such as heat stroke, sunstroke, heat cramps, heat exhaustion and heat rash. These conditions may require serious medical attention and can be fatal (NIH 2011). Longer-term risks include increases in ground-level ozone, which leads to lung damage through toxic smog inhalation. The increasing numbers and length of extreme heat events will cause drastic declines in air quality for the Central Falls community, increasing asthma risks among other respiratory diseases. This risk is exacerbated by automobiles and other vehicles (Roberts et al 2009:7,13; CityData 2011). A series of actions to improve precautions and responses to heat waves are presented in the final section of this report--common ones adopted around the country are an emergency heat alert system to warn the sick and elderly, emergency cooling centers during heat waves, prohibiting utilities from turning off service during heat emergencies, and supporting poor citizens in purchasing fans and air conditioners (Moser et al. 2007: 651; Roberts et. al 2009: 13, 18). These interventions have been shown to save lives.

### **3.3.2 Flooding**

Flooding results in numerous negative health impacts to Central Falls, which can affect residents and significantly strain city service provision. Among these impacts are widespread basement flooding, surface flooding in areas of poor drainage, disruption of utility service due to flooded mechanical infrastructure, and disruption of transportation due to flooded roadways.

City services can be overwhelmed due to the need to pump out basements, divert traffic, and deal with problems that result from power outages.

Once flooding begins, citizens should be urged to not travel and to instead seek refuge in upper levels of homes. Walking through moving water of more than six inches can be dangerous, and driving in floodwaters can be deadly as it causes stalling and loss of control (RIEMA, 2011).

Short-term health risks of flooding include a potential for increased transmission of communicable diseases in flood waters, potentially including water-borne diseases like diarrheal diseases, cholera and hepatitis A, as well as vector-borne diseases like West Nile virus (WHO, 2012). The risk of these diseases is low unless there is significant population displacement, or water sources are compromised through sewage contamination. The latter is a significant risk due to the Combined Sewer Overflow (CSO) system that is present in Central Falls. In the event of flooding, runoff from streets can overload the sewage treatment system, allowing raw, untreated sewage to be released into waterways. If flooding contaminates drinking-water facilities, the provision of clean water must be a priority, with immediate short-term chlorination of water (WHO, 2012).

After flood cleanup, failure to remove contaminated materials or to reduce moisture and humidity can present serious long-term health risks. Specifically, standing water and wet materials are breeding grounds for viruses, bacteria and mold which may cause disease, trigger allergic reactions, cause infection in immune-compromised persons, and continue to damage belongings long after a flood (EPA, 7 March 2011). Mold is a particular cause for concern in buildings with flooded basements, since these often get little ventilation and may incubate molds. Mold is known to cause upper respiratory tract symptoms, cough and wheezing in otherwise healthy people. In addition, it may exacerbate asthma symptoms in those who have asthma and may cause hypersensitivity pneumonitis in individuals with immune disorders (Institute of Medicine, 2004).

Because flooded areas often have significant air quality problems, the EPA (2008) has published a booklet ([http://www.epa.gov/iaq/flood/flood\\_booklet\\_en.pdf](http://www.epa.gov/iaq/flood/flood_booklet_en.pdf), available in English and Vietnamese) designed for residents and business owners to learn how to clean up their buildings after a flood. This booklet emphasizes the need to use protective equipment during flood cleanup, including an N-95 respirator, goggles without ventilation holes, and gloves. In

the case of widespread flooding, the city should advise and assist residents in taking these precautions during clean up efforts.

Flooding can also cause serious damage to structures, including hospitals and health facilities, which can endanger human health. Downed power lines in flooded areas are electrical hazards, and power outages may be hazardous by nature. All critical facilities, including designated emergency evacuation shelters, should be supplied with a backup generator to ensure continued access to vital sanitation and other resources in the case of a power outage.

Finally, flooding has the capacity to mobilize industrial toxins from storage, such as the underground fuel tanks typically utilized by gas stations (Euripidou and Murray, 2004, 376). The city of Central Falls contains three Brownfield sites with hazardous waste on their properties, at 50 Pacific Street, 81 Pacific Street and 618 Broad Street. Because these sites are not sufficiently studied or remediated, it is unclear how hazardous the waste may be. In addition, Osram Sylvania Products (1193 Broad Street) currently releases upwards of 20 pounds annually of barium compounds as reported under the Toxic Release Inventory Program (Homefacts.org, 2010). Health risks from ingestion of barium include changes in heart rhythm, paralysis, vomiting, diarrhea, damage to kidneys and more (Agency for Toxic Substances and Disease Registry, 2007).

### **3.3.3 Wind events**

High wind events may be generated by a variety of weather, including hurricanes, tornadoes, severe thunderstorms, coastal storms and strong frontal systems (Barnes 2010, East Providence HMP). Wind events can be dangerous, especially to poorly constructed structures or mobile homes. Debris such as signs, roofing materials and small objects left outside can become veritable missiles in hurricane-grade winds. During high wind events, buildings that are not code-compliant can become very dangerous for residents; making inspection of structures a clear priority for officials (National Hurricane Center, 2009). Abandoned buildings are also at a significantly higher risk for damage and breakage as they are less likely to be actively maintained. Debris from these abandoned buildings can become dangerous to all sectors of the community. In Central Falls, it is estimated that 7.9% of homes are currently vacant (Homefacts.com, 2010), making this an important issue for consideration.



High winds are also a leading cause of car accidents. When sustained winds reach 40 mph or gusts reach over 58 mph, they can seriously compromise drivers' ability to maintain control of their vehicle. Drivers of larger vehicles including buses, trucks, camper and even emergency vehicles are especially at risk during high wind events. High winds can cause decreased vehicle performance and stability, as well as lane obstruction on highways due to blown debris (US Dept. of Transportation, 2011). It is important that in such events there exists signage to warn drivers of the potential hazards.

### **3.3.4 Tropical Storms, including Hurricanes**

Tropical storms, including hurricanes, present a serious threat to the entirety of southeastern New England, including the city of Central Falls. While August and September are considered the peak months for hurricane activity in the region, hurricanes have been known to strike Rhode Island as late as December. Hurricanes present a multitude of major hazards to the city, including tidal flooding and storm surges, damaging winds (section 3.3.3), riparian flooding (section 3.3.2) and accumulation of debris.

Health risks related to high winds and flooding are discussed extensively in this report, but hurricanes can present a uniquely difficult disaster as they combine many hazards in a short time frame. Because of this characteristic, it is important that preparation occurs well before any tropical storm hits land. At the onset of hurricane season, officials should encourage and enable residents to prepare their homes. This includes determining safe evacuation routes, learning the locations of official shelters, stocking non-perishable food and clean drinking water and preparing an emergency kit including flashlights, first aid kits and more (National Weather Service, 2011). Emergency information will be available during tropical storms from the National Weather Services at the frequency 162.400 megahertz (RIEMA, 2010). When evacuation is indicated, evacuation centers and vital emergency facilities must be connected to emergency generators to ensure that people are able to access power as needed.

As a community, state and local hurricane response plans should be reviewed regularly to ensure that all participants know their roles and that the plan is updated as needed. For information about phased hurricane messages and advice for communicating vital information to the public, see figure 3.15.5 (Lundgren, 324).

**Table 3.3.4: Health Impacts of Hurricanes**

<b>Period of dissemination</b>	<b>Topics</b>
Immediately preceding landfall through first 24 hours after the storm	Hurricane readiness, preparation for power outages, preparation related to prescription medications, evacuating the area of a hurricane, staying safe in your home during a hurricane, worker safety in a power outage, carbon monoxide poisoning prevention, flood readiness, electrical safety, prevention of heat-related illnesses, hand hygiene in emergency situations, coping with a traumatic event, emergency wound care, protecting your pets, animals in public evacuation centers
1–3 days after the storm	Re-entering your flooded home, how to clean a flooded home safely, worker safety after a flood, preventing chainsaw injuries during tree removal, preventing injuries from falls (ladders/ roofs), personal protective equipment and clothing for flood response, managing acute diarrhea after a natural disaster, cleaning and sanitation after an emergency, keeping food and water safe after a natural disaster or power outage
3–7 days after the storm	Protection from animal- and insect-related hazards, electrical safety and generators, infection control and prevention in evacuation centers, impact of power outages on vaccine storage and other medicines, preventing violence after a natural disaster, animal disposal after a disaster
2–4 weeks after the storm	Rodent control after hurricanes and floods, trench foot or immersion foot, environmental health needs and habitability assessments, protection from chemicals released during a natural disaster, respiratory protection for residents
1 month and after the storm (emphasis is on long-term health consequences)	Suicide prevention, issues surrounding school-age hurricane evacuees attending new schools, mold removal from flooded homes, mold allergies related to flood clean-up

Source: Lundgren et al. 2009

### **3.3.4 Nor'easters and Snowstorms**

Central Falls' location on the east coast puts it in the direct path of many Nor'easters, and the short-term health risks of Nor'easters and snowstorms are mostly composed of dangerous road conditions and power outages brought by wind and snow. Icy conditions, slippery roads, low visibility and out of control vehicles can lead to minor or major accidents on roads, particularly on highways. In the past, Central Falls has faced health vulnerabilities during heavy snowstorms. Longer-term vulnerabilities include the same potential health effects seen with massive flooding, wind events, and extreme rainfall. Moreover, the downing of power lines can exacerbate health issues by preventing people from heating their homes. Extended exposure to cold can lead to weakened immune systems, increased spreading of viruses and other cold-related health problems, including fatalities. (Moser et al 2007:652-653 and Strategy

for Reducing Risks Report:7-8).

The possible adaptations associated with Nor'easters include flood proofing and insurance, creating standards for post-storm rebuilding, and development land-use changes in expectations of storms such as hard protection surfaces for storm surges (Moser et al 2007:653). Other potential adaptation measures include accessible public transit alerts for citizens of Central Falls on highways and city streets, and the availability of emergency public transportation to limit road traffic. In all, rapid public dissemination is the most important adaptation measure for Central Falls in the event of serious storms.

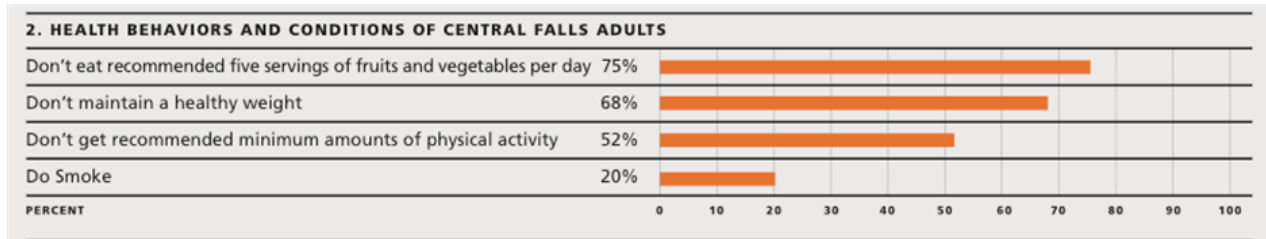
### **3.3.5 Earthquakes**

Earthquakes are not a major issues of concern in Rhode Island. However, some effects of these events have been felt in Central Falls, causing light damage and falling objects. Short-term health risks for residents of Central Falls include the potential of being injured by unhinged objects or shifting furniture within a residence. The major longer-term risk is the possible destabilization of buildings, which could face structural failure in the event of an earthquake, causing serious injury and death. Due to the largely rental nature of Central Falls, it is possible that many of these structures have faced a historical lack of inspection, so there may be a larger than expected earthquake health risk for many city residents. (Strategy for Reducing Risks Report:10 and CityData:2011).

### **3.3.6 Public Health**

A healthy community is likely to emerge from a disaster ready to rebuild quickly and effectively. For example, Louisiana consistently ranked among the worst states in the country in public health, with epidemic proportions of obesity and cancer prior to Hurricane Katrina (Fernandez 2011). These chronic conditions impeded individuals who were rebuilding their homes, fighting insurance companies, and getting back to work in the hurricane's aftermath (Fernandez 2011). The most vulnerable areas had particularly unhealthy diets and a lack of physical activity was prevalent. Once these conditions compromised an individual's health, anxiety and distress became additional post-disaster burdens (Fernandez 2011).

**Table 3.3.6: Central Falls Adult Health**



Source: Nolan 2011: 2

Central Falls reports high rates of poor health, poor health behaviors, and serious health conditions. According to a 2011 RI Department of Public Health study, 30% of adults in Central Falls are in poor health, compared to 11.5% across Rhode Island's other major cities. 68% of residents do not maintain a healthy weight (Nolan 2011:2).

Therefore as good risk reduction in the broader sense, Central Falls should focus on helping adults and families achieve a healthy weight and reduce chronic disease. Adults who eat at least five servings of fruits and vegetables per day and participate in moderate physical activity almost every day lower the risk chronic disease (Nolan 2011:2). Physical activity is one the simplest, most inexpensive ways to improve health conditions and should be made more accessible. The south central section of Central Falls could be most improved by creating more marked bicycle lanes and crosswalks. The community should also consider investing more in improving existing green spaces and playground, in creating more of them, and perhaps attracting more public or private gyms to the area. Central Falls could further promote active lifestyles with its current infrastructure. The good news is that almost every street in Central Falls has sidewalks, and the southern end of the community offers space for exercise and community events (Nolan 2011:2).

Central Falls could help more adults get screened for health conditions before they start to have symptoms. The earlier the detection of a chronic illness, the more effectively it can be treated. Only 74% of Central Falls women have been screened for breast cancer and a mere 40% of men age 50 and older have received a PSA test to screen for prostate cancer (Nolan 2011:2). Only 73% of adults have been screened for high cholesterol and 59% have been tested for diabetes in the past three years (Nolan 2011:2). Advertising on billboards and RIPTA buses and increased access in the community can help bring these screening rates closer to 100%.

The adult smoking rate, 20%, is relatively high compared to other RI cities (Nolan

2011:2). Central Falls can implement school education programs and make more smoke-free spaces to curtail the number of young adults who start smoking. Non-smokers are more likely to live longer and with less risk of serious disease than smokers (Nolan 2011:2).

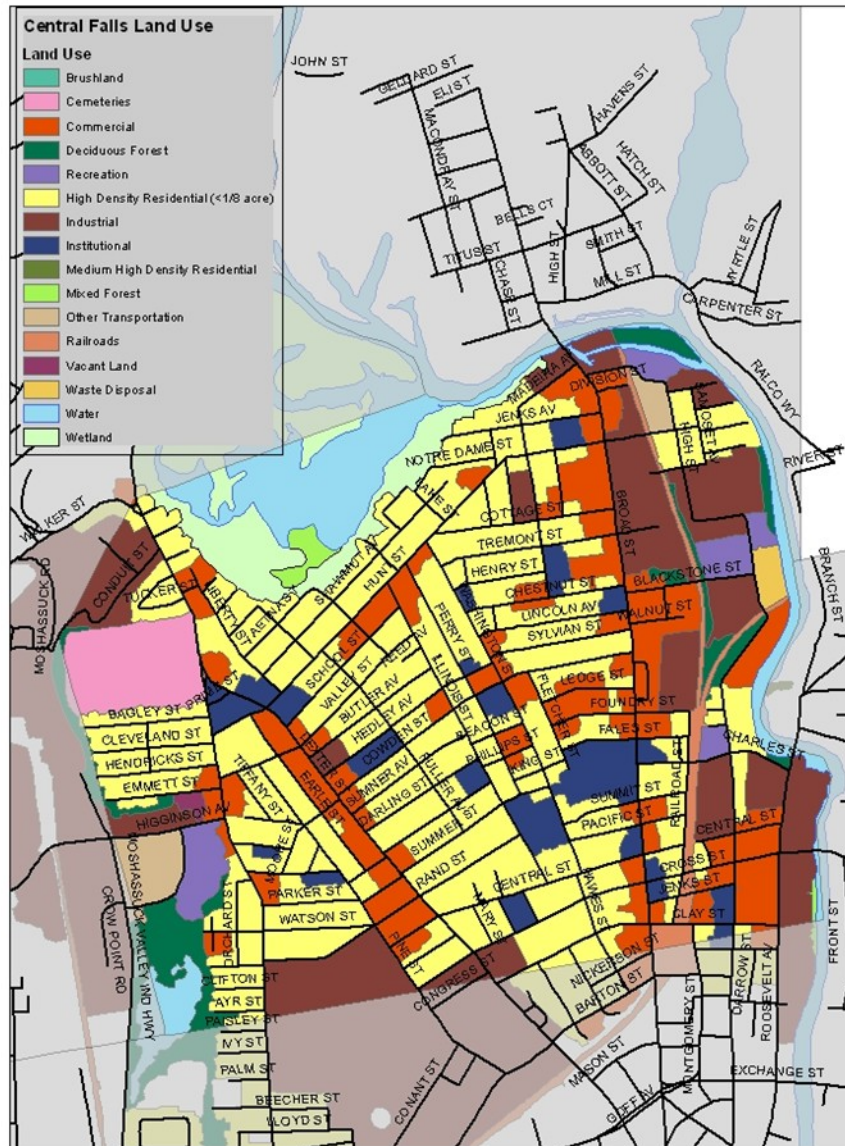
### **3.3.7 Health Care Centers During Disasters**

Health care centers with the highest percentage of patients from Central Falls are Lifespan (34%), Memorial Hospital (33%), Care New England (23%), and Charter CARE (7.6%) (Zimmerman 2). However, none of these centers are directly located in Central Falls. In the event of a disaster limiting transportation, access to these hospitals may be limited. Blackstone Valley Community Healthcare, with an average patient volume of 500/day, is the main site of primary care within Central Falls (HealthGrades 2012) and may be made into an emergency site in limited- transportation scenarios. Priority should be given to individuals needing emergency treatment and those with special needs such as dialysis patients. Several helicopter services are available to Medevac these patients when transport on the ground is limited. These services include International Life Flight, RI Medevac service, and RI Air Ambulance (Zimmerman 4).

### 3.4 Property and the Economy at Risk in Central Falls

#### 3.4.1 Property and Land Use

Figure 3.4.1: Central Falls Land Use



The amount of land allotted for residential and industrial use has changed in Central Falls in recent decades. Continued increases in residential use and decreases in industrial use have resulted in more at-risk residential properties over the years (RI Statewide Planning Program 2007). Among other changes, some floodplain locations along the Blackstone river have shifted from industrial to residential use. The following charted information was collected from the February 1986 Community Planning and Area Development Land Use Survey, for an

updated version please refer to Appendix A.

**Table 3.4.1: Land Use, Single Use Parcels, by Acreage and Percent**

**Of Area, Central Falls 1986**

<b><u>Land Use</u></b>	<b><u>Acres</u></b>	<b><u>% of Total Area in Single Use</u></b>	<b><u>% of Total Area</u></b>
<b>Residential</b>			
Single Family	59.95	7.88	7.32
Two Family	82.93	10.90	10.14
Three Family	93.74	12.31	11.46
Multi-Family	52.88	7.00	6.47
<b>Total Residential</b>	<b>289.50</b>	<b>38.09</b>	<b>35.39</b>
<b>Industrial</b>	<b>64.30</b>	<b>8.43</b>	<b>7.86</b>
<b>Transportation &amp; Utilities</b>	<b>18.78</b>	<b>2.47</b>	<b>2.30</b>
<b>Commercial</b>	<b>30.64</b>	<b>4.02</b>	<b>3.74</b>
<b>Services (Office)</b>	<b>13.34</b>	<b>1.75</b>	<b>1.63</b>
<b>Public Institutions</b>	<b>54.14</b>	<b>7.12</b>	<b>6.62</b>
<b>Recreation</b>	<b>9.42</b>	<b>1.23</b>	<b>1.15</b>
<b>Roads</b>	<b>167.67</b>	<b>22.04</b>	<b>20.51</b>
<b>Vacant Land</b>	<b>113.01</b>	<b>14.85</b>	<b>13.82</b>
<hr/>			
<b>Total</b>	<b>760.80</b>	<b>100.00</b>	<b>93.02</b>

Source: University of Rhode Island, Community Planning and Area  
Development Land Use Survey, February, 1986.



**Table 3.4.1.2: Mixed Land Used By Primary Use**

**MIXED LAND USE BY PRIMARY USE**

		%of Total Area	%of Total Area
<u>Mixed Land Use</u>	<u>Acres</u>	<u>of Mixed Parcels</u>	<u>of Central Falls</u>
Residential	31.15	54.57	3.81
Industrial	22.19	38.88	2.72
Commercial	3.63	6.36	0.44
Services	.11	.19	0.01

The 1986 University of Rhode Island inventory data was compared to inventory data previously developed in 1961 and 1975.

Source: University of Rhode Island Community Planning and Area Development Land Use Survey February, 1986.

**Table 3.4.1.3: Land Use Change, Central Falls, 1961-1986**

	Percentage of Total Area		
<u>Land Use</u>	<u>1961</u>	<u>1975</u>	<u>1986</u>
Residential	37.20	38.52	39.20
Commercial	5.20	5.70	4.18
Industrial	13.70	12.38	10.52
Roads	20.50	20.50	20.50
Other	23.20	22.90	25.60

From this table on Land Use Change in Central Fall, one can see the City has become increasingly residential (2% increase between 1961-1986), and there has been a decrease in industrial and commercial land use (3.18% and 1.02% respectively between 1961-1986) (RI Statewide Planning Program, 2007). This suggests that while the population of the city is increasing, the availability of jobs is not rising with it. Much of the housing in Central Falls is multi-family houses, which are know to have problems with over-crowding (J. Garvey, pers. comm., March, 14, 2012). Also, many of these homes are rented out to tenants, and the land owners are absent. This can lead to problems in the upkeep of the properties, an increase in the likelihood of slow reparations of damage (RI Statewide Planning Program, 2007; City of New Haven 2005).



**Table 3.4.1.4: State and Area Comparison of Owner-Occupied Units and Single**

OWNER OCCUPIED UNITS	
Rhode Island	54.2%
Providence County	49.8%
Central Falls	21.5%
SINGLE FAMILY HOUSES	
Rhode Island	55.5%
Providence County	44.6%
Central Falls	8.2%

(Source: 1998 Rhode Island Housing and Mortgage Finance Corp.)

### **Family Houses**

#### **3.4.2 Property and Flooding**

A “100-year flood” (base flood) is an event that has a 1.0% chance of occurring in any given year. This storm is used to identify the flood zones, which impact zoning and building requirements throughout Central Falls. Flood ordinances have regulated development in flood plains and mandated structures lowest floor elevation to be about the 100-year base flood elevation. The 500-year flood is an event that has a 0.2% chance of occurring in any given year. These flood lines help set flood insurance rates around the Blackstone River and its tributaries. There is not perfect agreement on whether to “build to” the 100- or 500-year floodplain, but some experts in insurance argue that with changing weather patterns, businesses need to focus on the latter.

Although the City has a new zoning ordinance that provides for a buffer zone around the Blackstone River where buildings cannot be placed, there are still many homes and businesses that are located in this buffer zone because they were built before the zoning ordinance took effect (see Table 3.4.4 and Figure 3.4.2). As a result of their close proximity to the river, these properties run a high risk of flood damage. As described earlier, post-flood damage, such as mold and mildew, can also pose significant problems (Fang et al., 2010) .



**Table 3.4.2 List of streets, some notable buildings/facilities, and the number of properties in 100-year floodplain; list of additional streets, businesses, and properties in**

<b>Streets (100 year)</b>	<b>Notable Buildings</b>	<b># of Properties affected on 100- year flood plane</b>	<b>Additional Properties affected on 500-year flood plane</b>
River St	The railroad tracks	5	3
High St (southern end, near Blackstone St. and railroad bridge)	-Central Falls Provision -Broadway Transmission & Auto -Wyatt Detention Center	4	5
Courtland St		10	2
Roosevelt Ave (bridge)	Central Falls Historic Mill District	0 (only bridge flooding)	(noted below)
Broad St (bridge)		3	1
Cross St (bridge)		2	0
Crown St		6	1
New Haven St		4	3
Samoset Ave		2	9
High St. (northern end)		2	6
<b>Additional Streets (500 year)</b>	<b>Notable Buildings</b>		<b>Properties affected (500-year FP)</b>
Roosevelt Ave	Storage America		6
Blackstone St (west end)			2
Charles St			2
Chase's Lane			1

**the 500-year floodplain**

Inland flooding accounts for the majority of flooding problems within the city of Central Falls. It stems from street flooding in poor drainage areas and flooded parking lots in low-lying areas. This is due to a combination of factors, including the inability of the Combined Sewer Overflow (CSO) system to handle the runoff during heavy rainfall. The East side of the city, along the Blackstone River is most affected by these inland floods (J. Garvey, pers. comm., March, 14, 2012). Both private businesses and residences are located in these high risk areas. Some notable buildings affected by a 100 year flood are the Wyatt Detention Center and the Central Falls Historic Mill District (Table 3.4.5). Because of topography, Higginson Ave (on the west side) is another area that experiences major inland flooding problems; this affects one of the City's biggest taxpayers (J. Garvey, pers. comm., March, 14, 2012).

FEMA lists five properties in Central Falls that are insured by the National Flood Insurance Program with a total value of over \$800,000 as of December 31, 2003. From 1978 through 2003, there were 15 losses in Central Falls through the NFIP with over \$371 thousand in total payments to policyholders (CFHMP 2005). This information needs to be updated through FEMA to give a more accurate picture of the costs that Central Falls is facing from property damage.

### **3.4.3 Wind Events / Storms / Tornadoes / Hail**

Property in Central Falls is at risk from storm and wind damage. Wind events are common in Rhode Island and occur regularly each year (Jayachandran et al., 2008). These events can topple trees, break windows, and blow around potentially harmful debris, causing power outages, property damage (houses, cars, etc.), and death.

Hurricanes and other summer storms periodically hit Central Falls. Since the City is located near the coast, hurricanes can cause violent wind damage and flooding -- both inland and along waterways (University of Illinois). Historically, hurricanes in Rhode Island have been known to produce as much as 8 inches of rain within only a few days, and this is likely to increase in future years. In 2011, as a result of Hurricane Irene, Central Falls received \$26,000 in reimbursement for overtime compensation, as well as equipment use and damage (J. Garvey, pers. comm., March 14, 2012). There were undoubtedly further costs not covered by this

reimbursement.

As described above, Nor'easters are most often accompanied by harsh winds and heavy snow fall, which can cause wind damage and dangerous driving conditions. This can lead to vehicle collisions and damaged road-side property. Historically snowfall has reached 24" in one storm. Sometimes hurricane remnants, specifically warm, moist air, can feed into Nor'easters, making them even more dangerous. Sudden warm spells following a major snow storm can also result in flood damage (Patchogue Village, 2006).

Tornadoes (mostly small, F0-F1 on the Fujita scale) have affected Rhode Island. On August 7, 1986, the only multiple-tornado day ever recorded injured 20 people and caused around \$2.5 million in damages. The most recent tornadoes have caused only minor wind damage (as described above), mostly causing damage to trees and power outages.

Hail stones can cause damage to cars, roofing, and other outdoor property such as lawn furniture, mailboxes, and gardens. Auto-repair and roof-repair businesses should be equipped to deal with such damage (NOAA, 2010).

#### **3.4.4 Dam Collapse Risk**

The probability of the major dam at Broad Street "Valley Falls" collapsing catastrophically is considered by the state to be quite low. If such an event does occur, however, the damage would be significant. Computer modeling by the Northeast River Forecast Center predicted a six foot wave surging downriver, fueled by high water and the vast amount of water stored in the Lonsdale Marsh (David Valee 2011). Continued monitoring of the Valley Falls Dam's condition should be undertaken to protect the properties downstream.

#### **3.4.5 Current Housing Stock**

Of the 7275 housing units included in the 2000 census, 47% were built prior to 1939, 79% were built prior to 1959 (RI Statewide Planning Program, 2007). These older houses often have antiquated plumbing, heating and electrical systems that are relatively expensive to maintain. Due to the old housing stock, space heaters are common, which create additional fire hazards (RI Statewide Planning Program, 2007). During a natural disaster these structures, and their residents, will have to contend with these additive risks.

### **3.4.6 Property protection**

Information on protecting property is available from FEMA, including design and construction guidelines for creating and identifying community shelters, and recommendations to better protect from tornado damage for businesses, community, and homes. Property owners are encouraged to use storm windows and shutters. Cities are encouraged to place utilities underground, install storm water backflow valves in the sewers, implement a City-wide tree limb inspection program to ensure that the potential for downed power lines is minimized, and to replace vacant parking lots with permeable surfaces to reduce flood water accumulation. Cities are also encouraged to create programs to support more owner-occupancy of multi-family residential buildings, since buildings with absentee landlords are more susceptible to overcrowding and maintenance issues. The City should encourage businesses and households to consider moving out of the riverfront flood buffer zones; these zones can then be utilized for recreation, conservation and open space, all of which are under-supplied in Central Falls. The Blackstone bike path, for example, could be brought close to the river, rather than following sometimes hazardous city streets.

## **3.5 Capability Assessment: What Resources Does Central Falls Have to Address Disaster Risks?**

### **3.5.1 Overview of Capability Assessment**

The ability of a community to develop an effective hazard mitigation plan depends upon the local governmental departments and agencies that are involved in hazard mitigation, existing policies and programs, and ability to execute new plans. Though not required by the Disaster Mitigation Act of 2000, a capability assessment adds context to a mitigation plan by providing an inventory of a jurisdiction's programs and policies and a review of government capacity (Section 104: 8-9). The assessment highlights the measures in place for mitigation that require continued support and enhancement. It also identifies existing gaps, conflicts, and weaknesses that may need to be addressed through future mitigation planning goals, objectives, and actions. The capability assessment is a review of Central Falls' resources that have been or are being implemented within the city to reduce losses. It also identifies the framework that is in

place for the realization of new mitigation strategies.

### **3.5.2. Central Falls Mitigation Capability**

Central Falls currently has the capacity and sufficient resources, if fully employed, to prevent or limit damage in the event of a major disaster. Central Falls has the following mitigation resources: City Administration, Law Enforcement, Fire Districts (4), City Emergency Medical Services, Public Works, and Emergency Management Agency. An Emergency Operations Center (EOC) has been established at the Central Falls Police Department. An alternate EOC has been established at Swift Gym. The EOC, which is activated by order of the Mayor, is a central location where the Mayor and senior decision makers gather to provide a coordinated response. Additionally, the Public Safety Director has assigned the responsibility for emergency management to the Fire Chief.

The Central Falls Emergency Support Functions (ESF) provide resources, program implementation, and services that are most likely to be needed to save lives, protect property and the environment in the event of a disaster. These ESFs are activated whenever the EOC is running. Current Central Falls ESFs are: transportation, communications, public works & engineering, firefighting, emergency management, mass care, housing & human services, resource report, urban search & rescue, hazardous materials, agriculture & natural resources, energy, public safety & security, long-term community recovery, and external affairs. The ESFs are managed by the Department of Public Works, Fire Department, Central Falls Mayor's Office and Emergency Management Agency. The Emergency Management Agency is the primary agency involved in disaster mitigation; it is responsible for allocating and coordinating resources and all support activities for the majority of the ESFs.

(WHO, 2012).

City Offices	Address	Phone Number	Email Address	Services Provided
Receiver	580 Broad Street, Central Falls, RI 02863	401.727.7474	<a href="mailto:receiver@centralfallsri.us">receiver@centralfallsri.us</a>	Leading the city through a municipal bankruptcy reorganization
Administration and Finance*	580 Broad Street, 1st Floor	401.727.7470	<a href="mailto:ldykeman@centralfallsri.us">ldykeman@centralfallsri.us</a>	All administrative, human resources, purchasing and accounting functions for the city and schools
Assessor	580 Broad Street, 1st Floor	401.727.7430	<a href="mailto:mhelfand@centralfallsri.us">mhelfand@centralfallsri.us</a>	Valuation of property and property ownership information
City Clerk's Office	205 Central Street	401.727.7400	<a href="mailto:marie@centralfallsri.us">marie@centralfallsri.us</a>	Official documents of the city, license or permit applications, city council minutes
Code Enforcement	580 Broad Street 3rd Floor, Central Falls, RI 02863	401.727.7460	<a href="mailto:tolbrych@centralfallsri.us">tolbrych@centralfallsri.us</a>	Minimum housing and environmental inspections, zoning information, certificates of occupancy
Planning and Economic Development	580 Broad Street 3rd Floor, Central Falls, RI 02863	401.727.7480	<a href="mailto:planning@centralfallsri.us">planning@centralfallsri.us</a>	Promoting public safety/ economic well-being by working with the community to develop and promote a vision for land use
Public Safety*	150 Illinois Street	401.727.7446	<a href="mailto:cffd@centralfallsri.us">cffd@centralfallsri.us</a>	Fire department and police department have merged, dispatch center
Public Works	1280 High Street	401.727.7466	<a href="mailto:jnield@centralfallsri.us">jnield@centralfallsri.us</a>	Recycling, garbage pickup, flood control, road maintenance

(WHO, 2012). **Table 3.5.2: Central Falls, Directory of City Departments Related to Disaster Risk Reduction and Response**

\*Department has been consolidated since bankruptcy

### 3.5.3. Review of Existing Hazard Mitigation Assessments and Programs

The following is a summary of Central Falls' hazard mitigation capability through local regulations, policies and programs as well as related federal programs that currently support mitigation in the city. For a complete list of statewide programs directly and indirectly involved



in hazard mitigation in Rhode Island reference Tables 5-2 through 5-7 in the 2011 Rhode Island State Hazard Mitigation Plan (RI HMP 2011: 144-170).

The assessments, plans and programs that have been performed and implemented over the past 10 years in and around Central Falls are described below in Table 3.5.b An overview of the groups and agencies involved in Central Falls land use decisions as well as information regarding the Community Emergency Response Team is provided following the table. This information is consolidated for ease of reference when making land use plans and executing changes in the future.

**Table 3.5.3: Assessments regarding hazard mitigation in the Central Falls community and programs currently employed for hazard mitigation.**

Assessment/ Program	Year	Description	Organizations Involved
Reducing Risks from Natural Hazards in Central Falls, Rhode Island	2011	Evaluation of 2005 Central Falls HMP and suggestions for its revision	Brown University Center for Environmental Studies
Rhode Island State Hazard Mitigation Plan	2011	Info re: current State laws, Executive Orders, regulations, policies and programs and related federal programs that currently support State Hazard mitigation (Tables 5.1 through 5.6);	Rhode Island Emergency Management Agency, Rhode Island State Hazard Mitigation Committee
Finding of No Significant Impact & Final Environmental Assessment for the Blackstone River Fish Passage Restoration Project	2008	Environmental review of proposed fish ladders and eel passages at Valley Falls Dam; determined project would not negatively affect the quality of the human environment	National Resources Conservation Service, United States Department of Agriculture

Central Falls Comprehensive Community Plan	2007	Assessment and statement of goals and policies Central Falls has or plans to implement regarding land use, housing, economic development, resources, services and facilities, open spaces and recreation, and circulation	Central Falls Office of Planning and Economic Development
Strategy for Reducing Risks from Natural Hazards in Central Falls, RI	2005	Background information and Central Falls previous hazard mitigation goals	Central Falls Natural Hazards Mitigation Committee, Central Falls City Council
Urban Environmental Design Manual	2005	Analysis of current development, including opportunities and constraints of current design, for several cities including Central Falls; proposes urban design recommendations and storm water best management practices (BMP) for the city, includes specific suggestions regarding location and scale of BMP elements	Sustainable Watersheds Office, Rhode Island Department of Environmental Management, Environmental Protection Agency – New England, Blackstone River Valley
Environmental Protection Agency Targeted Brownfield Assessment – Spintex Mill of Central Falls, RI	1998-2002	Two Targeted Brownfield Assessments (TBAs) were performed; results from the TBAs showed that there was no contamination found on the site and no clean up was needed; Central Falls redeveloped the site into the River Island Community Park and Blackstone River Island Nature Trail, completed in 2002	EPA, RIDEM, Rhode Island Greenways Council, RI Department of Transportation, Community Development Block Grant, Central Falls Departments of Parks and Recreation and Public Works
National Flood Insurance Program	Current	FEMA provides maps of hazardous areas and provides federally backed flood insurance; Central Falls enacts and enforces floodplain regulations intended to minimize the threats to life and property	Federal Emergency Management Agency, Flood Insurance and Mitigation Administration

Central Falls Code Enforcement Office	Current	Administers building, plumbing, electrical, mechanical and dumpster placement permits, as well as drain laying certificates, zoning information and applications, certificates of occupancy, and minimum housing information; performs environmental inspections	Central Falls City Council
Storm Water Management Program Plan (SWMPP)	Current	In 2003 all municipalities with Small Municipal Separate Storm Sewer Systems were required to submit an RIPDES Storm Water Phase II permit application and prepare a SWMPP describing how they will manage stormwater to reduce the discharge of stormwater pollutants to the maximum extent practicable	Rhode Island Pollution Discharge Elimination System, Rhode Island Department of Environmental Management
Illicit Discharge Detection and Elimination Ordinance	Current	Prohibits illicit discharges to the Small Municipal Separate Storm Sewer Systems and provides an enforcement mechanism	City of Central Falls, Rhode Island Department of Environmental Management
Emergency Operations Plan	Current (2012)	Framework in which City of Central Falls elected and appointed officials, department heads and emergency services personnel can plan during a disaster or emergency	Central Falls City Council, Central Falls Fire Department

### 3.5.4 Agencies Required to be Addressed for Land Use Revisions

Reducing risks involves land use planning, which opens legal issues of authority over land. For example, rezoning land in the Blackstone River floodplain and utilizing “eminent domain” to buy out homes for removal involves a series of steps that must be taken. Rhode Island land use is characterized by very strong local rule; volunteer boards and commissions are

responsible for local planning. Prior experience or knowledge relative to the particular board or commission is not necessarily a requirement for appointment. Review of applications for development also appears before various State Agencies prior to approval. The following regulatory agencies lists was modified slightly from the 2011 Rhode Island Hazard Mitigation Plan (RI HMP 2011: 26).

All proposals for land use decisions and development appear in an application before the following local boards and commissions, at a minimum, prior to approval:

- Planning Board
- Conservation Commission
- Zoning Board
- Harbor Management Commission (only if application is for a water-dependent use)
- Building Board of Appeals (if a variance from the State building code or NFIP is being pursued)
- Town Council

In some instances, state agencies must review land use decisions prior to approval, the agencies involved vary based on the proposal in question:

- Department of Environmental Management (all applications that may impact freshwater water wetlands, environmental habitats, applications requiring or modifying septic systems)
- Rhode Island Building Commission (in instances when a variance to the State Building Code is being sought)

### **3.5.5 The Community Emergency Response Team (CERT)**

The Community Emergency Response Team is a positive and realistic approach to emergency and disaster situations. A CERT course trains citizens to be better prepared to respond to and cope with the aftermath of a disaster, and is delivered in the community by a team of trained first responders. In the city of Central Falls, the CERT course has become a part of the agenda of the city government. Since 2005, two CERTs classes have trained 15 individuals in emergency preparedness and plans are currently underway to recruit and recertify new and existing members of the team. The Central Falls Emergency Management Agency has called on members of the team to assist in the recent H1N1 clinic and recent flooding of the

Blackstone River. Ideally, CERTs trainings will occur on a more regular basis for government officials, community groups, and citizens from every neighborhood.

To reach a broad spectrum of citizens, a training in Spanish should also be provided. At the very least, literature produced from CERTs training, on everything from providing basic medical aid to organizing volunteers, should be translated into Spanish and even Portuguese. In the time of a disaster, the number of victims, communication failures, and road blockages may prevent emergency services from immediately accessing the city of Central Falls. With basic annual training, citizens of Central Falls can rely on each other for help in order to meet immediate life saving and life sustaining needs (“Community Emergency Response Team” 2012).

### **3.5.6 Recent Hazard Mitigation Funding**

In an attempt to quantify the fiscal capability of the city for hazard mitigation through recent hazard mitigation grants, Table 3.5.c summarizes the grants Central Falls has received in the past 10 years that are directly or indirectly related to mitigation strategies. This list is not comprehensive, however, as Central Falls has not kept a complete record of the grants they receive. In the future, it would be useful for Central Falls to archive all of the hazard mitigation grants it receives, including notes on where the money is from and where it is spent.

Recipient	Year	Grant Title	Amount	Description of Project	Source
City of Central Falls	2010	Pre-Disaster Mitigation Program Funding for Mitigation Projects and Plans	\$4,776	Hazard mitigation plan updating	Federal Emergency Management Agency
City of Central Falls	2010*	Cogswell Tower Renovations	\$250,000	The City of Central Falls seeks funding to historic clock tower located in the Jenks Park and Cogswell Tower National Historic site	Rhode Islands Financial Services and General Government
City of Central Falls	2010	Economic Development Initiative	\$196,980	Encourages communities to develop local strategies to assist struggling community members	United States Department of Housing and Urban Development
City of Central Falls	2010	Small Cities Program	\$2,824,500	States award grants to smaller units of general local government that carry out community development activities	Community Development Block Grants
City of Central Falls	2009	Local Equities Program	\$250,000	Road re-paving	Rhode Island Department of Transportation

**Table 3.5.6: Recent grants Central Falls or related organizations have received that are relevant to hazard mitigation**

Rhode Island DEM	2008	Brownfields Assessment Grant – Hazardous Substances	\$200,000	RI received a TBA grant; state is targeting seven communities including Central Falls	Environmental Protection Agency
Rhode Island DEM	2008	Brownfields Assessment Grant – Petroleum	\$200,000	RI received a TBA grant; state is targeting seven communities including Central Falls	Environmental Protection Agency
City of Central Falls	1998-2002	CDBG Grant	\$550,000	Redevelop the Spintex Mill Brownfield site into the River Island Community Park and Blackstone River Island Nature Trail, completed in 2002	Community Development Block Grants
City of Central Falls	1998-2002	Open Space Bond	\$225,000	Redevelop the Spintex Mill Brownfield site	Rhode Island Department of Environmental Management
City of Central Falls	1998-2002	Rhode Island Recreation Area Grant	\$25,000	Redevelop the Spintex Mill Brownfield site	Rhode Island Greenways Council
City of Central Falls	1998-2002	Trails Grant	\$46,348	Redevelop the Spintex Mill Brownfield site	Rhode Island Department of Transportation

\* Requested

### **3.6 – Ecosystem Services and Disaster Risk Reduction in Central Falls**

Ecosystem services are the benefits that ecosystems provide for humans. Ecosystems provide resources such as food and water and cultural services including recreational and aesthetic benefits. Ecosystem health influences the provision of ecosystem services, which directly affects human well-being (Millennium Ecosystem Assessment 2005).

In Central Falls, there are four main sources of ecosystem services: street trees, the marshland, Blackstone River, and green spaces such as Jenks Park.

#### **3.6.1 Street Trees**

Trees offer several main benefits for urban areas: they capture airborne pollutants, counteract the urban heat island effect, reduce storm water runoff, increase local real estate values, act as carbon sinks, and improve community health (Maco and McPherson: 2002). Trees help to mitigate the urban heat island effect, the phenomenon in which cities are much warmer than surrounding rural areas because pavement and other urban structures absorb more heat than trees and other vegetation (Boston Climate Action Plan: 2011). As a result of the cooling effect, street trees reduce building energy use for air conditioning and lessen the potential for deadly heat waves (Rosenzweig et al., 2006). Street trees save home heating costs by blocking winds in winter, and they have been shown to increase property values by improving the visual landscape of a neighborhood.

Street trees provide important benefits for community health and flood prevention. Each year, 100 street trees can remove 24 tons of carbon dioxide and 261 pounds of other airborne pollutants, including ozone and particulates, from the air. This results in lower levels of asthma and respiratory illnesses. In one year, 100 trees also capture 190,900 gallons of rainwater, reducing the risk of flooding from storm water runoff (Pacific Southwest Research Station: 2011).

Given the potential for street trees to help Central Falls reduce its vulnerability to flooding and fatal heat waves the, city should plan to increase the urban tree cover. Since the majority of the benefits accrue from mature trees, the city should begin planting as soon as possible. Although there is an initial cost of planting and maintenance, the trees quickly begin to provide net benefits for the city by decreasing energy use for air conditioning and lessening the potential for deadly heat waves (Rosenzweig et al.: 2006). Based on recent studies in



Providence and New York, in Central Falls, a street tree can provide \$5,870 in net benefits over its lifetime (Pacific Southwest Research Station: 2011).

### **3.6.2 Marshes**

Freshwater marshes provide a number of extremely important ecosystem services to the local environment. The roots of marsh plants hold soil and sediment together, preventing erosion, and help to filter groundwater, while marsh shoots remove sediment from overland flow and help to attenuate increases in water level. Marshes also provide critical habitat for local bird and plant species (Zedler and Kercher: 2005). As a result of the important role that marshes play in the local environment, extra attention should be paid to the preservation and maintenance of these areas.

Marshes are highly vulnerable to human development. As a result, Central Falls should preserve the marshes of the Blackstone River area. This is important for the local ecosystem and the safety and well-being of people living on the banks of the river. If the water level of the river rises, marshes will begin to fill with sediment, decreasing the bank stability (Southeast Florida Regional Climate Change Commission 2009). Central Falls may be able to reduce its risk of flooding from large storms by creating culverts within marshy areas that would allow for better drainage and reduce the amount of water retention on banks (Peninsula Hazard Mitigation Plan 2011 Update). It could also restore some marshes in strategic low areas now prone to flooding. Wooden “marsh toe stabilization structures” (which prevent erosion at the marsh’s edge) can further aid in river bank stabilization (Louisiana Speaks: Long Term Hazard Mitigation). Furthermore, in order to increase bank stabilization in high-risk banks, the community can initiate marsh planting projects to ensure the connectivity of the current wetland areas. This will lead to improved productivity of marshes, increasing soil stabilization and flood protection in the area (Peninsula Hazard Mitigation Plan: 2011). Finally, local environmental agencies, such as the Blackstone River Coalition, should work to increase the level of awareness and appreciation for the freshwater marshes in and around Central Falls and the important ecosystem services that these areas provide.

### **3.6.3 The Blackstone River**

The Blackstone River is a designated National Heritage River and an American Heritage River (Blackstone River Coalition); as such it is highly visible and many federal as well as local efforts are underway to protect and enhance the services that the river provides.

Practical ecosystem services provided by the Blackstone River include hydroelectric power and a drainage system for storm water (Blackstone River Hydropower Initiative 2011, Blackstone River Coalition). The hydroelectric facility at the Valley Falls dam in Central Falls feeds electricity directly into the local power company grid (USDA NRCS 2008). Additionally, the Blackstone River provides many opportunities for outdoor activities such as boating, freshwater sport fishing, bird watching, hiking, and biking on the Blackstone River Bikeway (National Parks Service). This provides both commercial and recreational benefits to the city of Central Falls, most notably at Central Falls Landing, which has canoe and kayak access to the river and offers riverboat tours of Blackstone River.

If current restoration programs succeed, there will be additional recreational and commercial services provided by the river. Additional fish will provide commercial fishery benefits, while also adding to the available food for birds (R.I. Fish and Wildlife, 2002). Recreational fishing, bird watching, and swimming opportunities will increase. Restoration is currently behind schedule, although construction of two fish ladders began this year (Shorey 2012). A 2002 study estimated that once fish ladders are installed on the lowest four dams of the river, over 20,000 American Shad and over one million river herring will be able to colonize the Blackstone River (R.I. Fish and Wildlife, 2002).

Restoration projects along the Blackstone provide some unique opportunities for the city of Central Falls to improve the ecological services offered by the river and its surroundings. For example, the expansion of the Blackstone Bikeway could be used to expand on the riparian buffer zone surrounding the river, allowing for better storm water and flood absorption, reducing erosion, and beautifying the bikeway itself.

### **3.6.4 Green Space**

Green space is made up of parks, front yards, vegetable gardens, and other grassy or forested areas. In addition to their aesthetic value, these areas provide important ecological services. Green space absorbs water during rain and storm events, lessening strains on local

storm water systems and reducing flooding (Blackstone River Coalition). Urban environments consist mostly of impervious surfaces such as roofs, driveways, and streets. This causes high runoff during rain events and the city is very dependent on their drainage system. According to the U.N. World Meteorological Association, in urban settings (typically 75-100% impervious surface) more than 50% of all incoming rain will stay on the surface and become runoff, which then must flow into drains or risk flooding. Meanwhile, on natural ground cover, only between 10-20% of all incoming rain becomes runoff water (U.N. World Meteorological Association 2008).

Green spaces are especially important around the Blackstone River and in areas of the city with poor drainage. The city of Central Falls has areas of green space such as Jenks Park and the riparian buffer zone between the city and Valley Falls Pond, and the river downstream of the dam. Most other green space is composed of lawns, cemeteries or athletic fields. Higginson Avenue, an inland area that experiences frequent flooding, has a large amount of parking lots and other impervious surfaces nearby, contributing to flood issues. The green space in that area is composed of either sports fields or is degraded with not much vegetation on it. The addition of trees or a conversion to rain gardens in the degraded areas may contribute to better drainage in this region.

## **Section 4 – Risk Mitigation Actions**

### **4.1 Prioritization of Risks**

The following section identifies the most important hazards for Central Falls based on research gathered in this report. After the hazard identification, there are possible mitigation efforts. The information in this section is to be passed on to the appropriate department for identification of specific projects. Because of the lack of site-specific knowledge and geographical information, we cannot identify actions to more than a general category heading. Instead, this section offers generalized approaches and strategies to dealing with these threats. This list should then serve as resource for local agencies who can identify projects that will fulfill the goals identified here.

*Time period Lengths:* Short term- under 1 year; Medium term- 1-3 years; and Long term - 3-5 years.

## 1. Risk Area: Flooding

With heavy rains, the Blackstone River may overflow and flood the surrounding area, resulting in property damage and threats to human health and well being. The threat of flooding will increase in the coming years if climate change contributes to increased precipitation and infrastructure decays.

### *Suggested Actions:*

- **Fix drainage issues on susceptible streets:** A number of streets in Central Falls are at high risk for flooding (See Table 3.4.e), including some important commercial districts and buildings. The city needs to develop infrastructure for these areas. Possible actions include installation of proper drainage sewers, re-paving of streets, re-grading of slopes and surfaces, or creation of runoff culverts.
  - *Responsible Party:* Director of Public Works
  - *In Coordination With:* Department of Public Works
  - *When:* Medium term
  - *Benefit:* Reduce damage and increase transportation abilities in the event of a flood.
  - *Estimated Cost:* To be determined
- **Update city sewer system:** The city should update and modernize its sewer system to deal with increasing precipitation. Storm sewers should be fully separated from municipal sewer, and could include storage tanks to regulate outflow.
  - *Responsible Party:* Director of Public Works
  - *In Coordination With:* Department of Public Works
  - *When:* Medium term
  - *Benefit:* Improve drainage throughout the city and regulate water flow during high precipitation events.
  - *Estimated Cost:* significant
- **Remove unused impervious areas and encourage ecosystem services:** Large paved areas increase the speed of runoff into the river, increasing the severity floods. Removing unused parking lots and replacing them with fallow or forested green space would increase the groundwater reservoir, decreasing flooding. Protecting wetland areas around the river and planting trees throughout the city would also slow storm water runoff by increases surface permeability.
  - *Responsible Party:* Director of Public Works
  - *In Coordination With:* Department of Public Works
  - *When:* Long term
  - *Benefit:* Trees and wetland zones throughout the city slow the runoff of storm water, decreasing the likelihood and severity of floods.
  - *Estimated Cost:* to be determined
- **Apply for funds to fix Higginson Avenue drainage:** The Higginson Avenue area is shaped like a large bowl and drains very poorly. A major re-grading project could

fix the problem, but would take a large grant from a governmental organization such as FEMA and administrated by an agency such as the Army Corps of Engineers.

- *Responsible Party:* Director of Public Works
- *In Coordination With:* Department of Public Works
- *When:* Long Term
- *Benefit:* Secure a large area against persistent drainage issues.
- *Estimated Cost:* Significant, to be supplied in a grant

## 2. Risk Area: Heat Waves

Heat waves are likely to be increasingly common in the coming century as temperatures rise with climate change. One especially high-risk population the elderly, are well represented in Central Falls and the population may grow as baby boomers retire.

### *Suggested Actions:*

- **Establish designated cooling centers:** In the event of a major heat wave, residents should have a designated public space in which to cool off. These spaces can provide necessary services to persons whose own homes or workspaces become dangerously warm. Arrangements could be made with commercial property owners to temporarily utilize lobbies or other marginal spaces. These centers could also dispense supplies, such as bottled water, to help residents cope with extreme heat events. These negotiations should be made in advance of any heat wave, to ensure that adequate resources are available in an emergency.
  - *Responsible Party:* Fire Chief
  - *In Coordination With:* Fire Department
  - *When:* Short term, ideally before summer
  - *Benefit:* Provide a location where vulnerable
  - *Estimated Cost:* Minimal
- **Prepare outreach mechanisms on heat precautions:** In the event of a heat emergency, the city should have an outreach plan in place. This system would alert residents of the impending heat risk and direct them to available services such as cooling centers. The city has a reverse 911 system which could be utilized to warn residents to take precautions, but improved funding will be needed because the city is charged each time it is mobilized. Radio and internet broadcasts, or loudspeaker announcements, such as is done for winter parking bans, may assist to reach residents without home phones.
  - *Responsible Party:* Police Chief
  - *In Coordination With:* Police Department
  - *When:* Short term, ideally before summer
  - *Benefit:* Provide residents with warnings of impending heat waves, as well as provide information as to how they may access cooling centers and other municipal aid.
  - *Estimated Cost:* \$5,000-\$20,000
- **Institute a Ban on utility shut-off of power to households during heat**

**emergencies:** As with times of extreme cold temperatures, National Grid should be prevented from shutting off power to those with unpaid utility bills.

- *Responsible Party:*
  - *In Coordination With:*
  - *When:* Medium term, will require governmental action
  - *Benefit:* Provide residents having difficulty making utility payments with protection during dangerous heat waves.
  - *Estimated Cost:* none
- 
- **Explore ways to support poor citizens in purchasing fans and air conditioners:** As Rhode Island's climate becomes more like those in more southerly climates, air conditioning should no longer be considered a luxury service, but rather a household necessity. Window fans can be effective as well, with lower energy use, for cooling the most closed-in spaces where people have tended to die during heat waves.
    - *Responsible Party:*
    - *In Coordination With:*
    - *When:* Medium term,
    - *Benefit:* Provide low-income residents with protection during dangerous heat waves.
    - *Estimated Cost:* to be determined
- 
- **Establishment of a "buddy-system":** The buddy system was pioneered in Philadelphia and has proven to be an effective way to check up on high-risk populations. This system is initiated following radio, television and newspaper announcements of oppressive heat conditions. Following these announcements, friends, family, neighbors and volunteers are expected to check up on their elderly "buddies" daily to ensure that they have adequate means to cope with the weather (i.e. proper ventilation, adequate fluids) (Ebi *et al* 2004: 1072).
    - *Responsible Party:*
    - *In Coordination With:*
    - *When:* Medium term, will require extensive outreach efforts
    - *Benefit:* Could provide protection for high-risk populations during multiple hazards, including dangerous heat waves.
    - *Estimated Cost:* to be determined

### 3. Risk Area: Electrical Outages

The electric grid can be interrupted by a variety of hazards, including storms, lightning, and flooding. In the floods of 2010, power went out throughout Central Falls. Lack of power prevents residents from accessing critical services and hampers outreach and communication in a disaster situation.

*Suggested Actions:*

- **Obtain more municipal generators:** The city needs to be prepared to supply emergency electricity to keep services running. Currently, the city has four

generators, one in the Department of Public Works one in the fire station, one in the police station, and the other in the middle school. The city needs a generator in City Hall and an additional portable generator would be invaluable.

- *Responsible Party:* Director of Public Works
  - *In Coordination With:* Department of Public Works
  - *When:* Short-term
  - *Benefit:* Provide support to keep municipal and residential services running during power outages.
  - *Estimated Cost:* to be determined
- 
- **Put power infrastructure underground or route wires away from high-risk areas:** To prevent the loss of electrical infrastructure, the city can put the wires underground or position them away from large trees and other hazards. This would be a long-term project, but would add significantly to the resiliency of Central Fall's electrical network.
    - *Responsible Party:* Director of Public Works
    - *In Coordination With:* Department of Public Works
    - *When:* Long-term
    - *Benefit:* Reduce damage
    - *Estimated Cost:* To be determined

## **General Emergency Preparedness**

### *Action Items:*

- **Implement D-SNAP for emergency food distribution:** To ensure that residents have food in the event of a natural disaster or prolonged power outage, the city can implement a disaster food stamp program (D-SNAP) through the federal government. Also, a community food response plan where officials, representatives of local organizations, residents and others distribute food in case of emergency will make sure the needs of those at highest-risk are met.
  - *Responsible Party:*
  - *In Coordination With:* Community Organizations
  - *When:* Short-term
  - *Benefit:* Ensure health and safety of residents
  - *Estimated Cost:* \$5,000
  
- **Create a centralized database of all grants received:** Central Falls should have publicly accessible repository of documents of all the grants it has received. This will aid in tracking the progress of Central Fall's projects and let future administrators know what action have been taken.
  - *Responsible Party:* City Clerk
  - *In Coordination With:* Departments applying for grants
  - *When:* Short-term
  - *Benefit:* Maintain record of projects that have or have yet to receive funding.
  - *Estimated Cost:* Negligible

## **4.2 Strategy Adoption**

After approval by the authors of this report, the plan will be submitted to City Council for review and approval. If it is approved, the plan will provide a basis under which the city may apply for FEMA funding to address these risks.

*[This section will need to be filled in after Central Falls takes up the report to describe the steps of its passage through committees and public vetting, and adoption by the Receiver's office. The previous version ended: "The Plan will next be forwarded to the RIEMA for approval by the State Hazard Mitigation Committee, the executive director of the RIEMA, and then FEMA Region I. " This suggests the next steps needed.]*

## **4.3 Implementation, Evaluation & Revision of Strategy**

Once the plan has been adopted, the City will form a committee on Natural Hazards to begin addressing the concerns cited in this report. The committee will identify specific actions that need to be addressed and list them according to priority. These actions can then be submitted to the appropriate FEMA office to apply for grants and other forms of funding. Once funding has been obtained, the projects can be forwarded to the appropriate department for implementation. The committee should meet at least once a year, to discuss new actions and review the status of ongoing projects.

*[This section needs to be completed, with statements about how the plan will be followed up on by the city, and how progress will be tracked. There should probably be a "Mitigation Action Progress Form" placed in an appendix, and the Hazard Mitigation Committee keep this up to date and have a public meeting each year (or more, or less) to review progress on action items and discuss missing elements of the plan. A formal revision is supposed to happen every five years, and revisions need to be sent to RIEMA to assure the plan conforms with state hazard mitigation plan goals.]*

## **Section 5 – Community Outreach**

### **5.1 Why is Community Engagement Important?**

Rather than asking ourselves how community participation can become an effective process within disaster management, we should assume that *community participation will*



*ensure that disaster management will become an effective process within the community.*

Community engagement can educate and raise awareness, energize social trust between authorities and communities, and coordinate the respective response and recovery roles of government, business, civic groups, and individuals.

**Table 5.1: Benefits of Community Engagement**

Benefits of Good Community Participation in Disaster Risk Reduction Planning
Greater Ability to Govern and Maintain Trust during a Crisis
More Citizen Responders to Ease Burdens on Health and Safety Agencies
Fiscal Savings through Reduced Disaster-related Losses and Expenditures
Emergency Plans that Are Feasible Because They Reflect Community Values, Economic Realities, and Collective Judgment

## **5.2 Techniques for Community Outreach**

### **5.2.1 Community Meetings:**

Meetings will provide a strong foundation for disaster risk mitigation efforts. Meetings are a simple and effective way to get people together, but it is essential that they are conducted in a way that ensures that everyone involved has a voice. The goal of a community meeting is collaboration, which has several parts:

- Sharing information about upcoming plans
- Soliciting input from community members
- Identifying priorities and generating new ideas

Too often, however, community meetings work as a way for planners to go through the motions of sharing information with community members, but are not broadly accessible and do not allow for real collaboration between planners and people that will be affected by a proposal.

There are several methods to ensure that a meeting is as democratic as possible:

- Provide translation for people who do not speak English. As a majority of the community is Latino/a, Spanish is necessary; Portuguese translation is also desirable.
- Provide childcare so that people with children can attend.

- Make sure the meeting is in a place that is widely accessible, including to those with limited mobility. Consider providing bus schedules of lines that stop near the meeting location.
- Meetings need to be at a time of day or week when working families can attend.
- Publicize the meeting well in advance, through the channels detailed below.
- Keep the agenda short, with clear goals and objectives.
- Provide visual aids such as projector or white/blackboard.
- Allot time specifically for questions and people to voice their concerns.
- Hazard mapping: provide maps that community members can write on to get a visual assessment of what residents perceive as most important.

A significant portion of Central Falls' population lives in assisted-living facilities and may have limited mobility. In order to include these residents in the feedback and collaboration process, it is important to hold smaller meetings at individual facilities in addition to forums aimed at the general public.

### **5.2.2 Media**

A subcommittee should be created to oversee publicity efforts. This group will be responsible for distributing flyers and posting notices in the public places listed in the following table. Public Service Announcements should be scheduled once a week in the month preceding the meeting.

All meetings should be broadcast on a public access television channel. Posters and flyers for the meeting should encourage the public to tune in and email, mail, or telephone to voice concerns, suggestions, and questions to planners. Sample posters can be found in Appendix B.

Central Falls is a diverse community, so a varied approach is required to appeal to all residents. To reach families with children, newsletters can be distributed through schools for students to take home. Community organizations are an important way to reach residents of Central Falls as they have various ways of getting in touch with their members. Churches may be willing to put information in a newsletter to their congregation, and assisted-living facilities can put events on their calendar. Media outlets such as radio stations or newspapers can publish press releases. Ads can be placed on the RIPTA lines that run through central falls advising residents of the plan in order to reach riders of public transportation who might not otherwise be involved with schools or community organizations.

### 5.2.3 Newsletters and Pamphlets

One of the best ways to communicate with community members is by distributing newsletters. Newsletters provide detailed information about the current status of the planning effort, lay out proposals for future initiatives, build support, create a citizen's forum, and provide articles about mitigation efforts in other communities.

Keeping technical information and jargon to a minimum, the goal is to build rapport with people in the community. Writing as one would for a church or civic club newsletter is seen to be effective. Use plenty of photos, illustrations, cartoons, white space and other graphic enhancements. Above all, keep it short and to the point; people have many other reading options. The goal is to get them to spend just a few minutes reading.

**Table 5.2.3: List of organizations in Central Falls that can help with engaging community members.**

Organization	Type	Phone	Address	ZIP	Contact
Blackstone Valley Assisted Living	Assisted Living	401-725-7045	649 Broad St	02863	
Mansion Nursing Home	Assisted Living	401-722-0830	104 Clay St	02863	
Forand Manor	Assisted Living	401-722-7120	30 Washington St	02863	
Chateau Anne	Assisted Living	401-728-1578	82 Fales St	02863	
Wilfred Manor	Assisted Living	401-724-0330	466 Hunt St	02863	

Rand Place Apartments	Assisted Living	401-724-2815	250 Rand St	02863	
Fuerza Laboral	Community Organization	401-725-2700	Offices: 127 Clay Street Mailing: PO Box 202	02683	Josie Shagwert
Progreso Latino	Community Organization	401.728.5920	626 Broad Street	02888	Marta Martinez
Providence en Español	Newspaper	(401) 454-3004	280 Broadway, Providence	02903	Victor Cuenca
Nuevos Horizontes	Newspaper	(401) 723-2268	89 Broad St, Cumberland	02864	Jaime Salazar
Calcutt Middle School	School	401-727-7726	112 Washington St		Nancy Tobin
Ella Risk Elementary School	School	401-727-7730	949 Dexter Street		Maureen Azar
Veterans Memorial Elementary School	School	401-727-7740	150 Fuller Ave		Ann Lynch
Central Falls High School	School	401-727-7710	24 Summer St		Evelyn Cosme Jones, Joshua Laplante
Captain Hunt Early Learning Center	School	401-727-7720	12 Kendall St		Cindy Giroux
Margaret Robertson Elementary	School	401-727-7733	135 Hunt St		David Alba
The Learning Community	School	401-722-9998	21 Lincoln Ave		Kath Connolly
Poder 1110	Radio	401-726-8413	1270 Mineral Spring Avenue	02904	Tony Mendez
Latina 100.3	Radio	401-419-1050			Juan Garcia

Iglesia Evan- gelica Hispana	Church	401-726-4414	235 Dexter		Julio Filomeno
Holy Spirit Par- ish	Church		1030 Dexter		
Spirit & Truth United Pente- costal Church	Church	401-722-8001	45 Shawmut Ave		J. Stirnemann
Christian Life Center, Assem- bly of God	Church	401-726-0780	754 Broad		James Moore
Iglesia Getse- mani	Church	401-725-5010	702 Broad St		
Jesucristo es el senor	Church		668 Broad		
The Church of Jesus Christ of latter day saints	Church	401-724-8793	44 Broad		
Saint Joseph's Parish	Church		391 High St		Rev. Zapras- samy
Immaculate Heart of Mary	Church		291 High St		Antonio Fi- gueira Pinto
Iglesia Bautista Biblica	Church	401-728-9420	161 Cross St		
Iglesia Episco- pal San Jorge	Church	401-722-9449	12 Clinton St		Jose Roberts
Iglesias Refugio del Altismo	Church	401-454-0159	6 Summer St		Iris M. Rivera
Iglesia Adventi- sta del septimo dia	Church	401-724-9453	563 Pine St		Jorge Ruiz
Iglesia pente- costal. Caa de Oracion	Church		14 Chapel St		E. Santiago

### **5.3 Summary**

#### **Obtaining Support for Hazard Mitigation Planning**

If citizens of Central Falls are uncomfortable with any portion of the plan submitted, planners should make editing the text a priority until it suits the communities' needs. This being said, the community must be aware of the environmental hazards present in order to understand why certain portions are included. Planners should outline the true cost of disasters for the community—that they will not just affect a few houses, but that disasters pose potential costs in terms of business closures or interruptions, employment losses, injuries and loss of life, claims of community liability, reduced community "image," interruption of essential services, impacted quality of life, higher insurance rates, and so on. Once community members understand the factors involved, they will be more equipped to play a central role in revising problematic sections and ultimately, implementing the plan

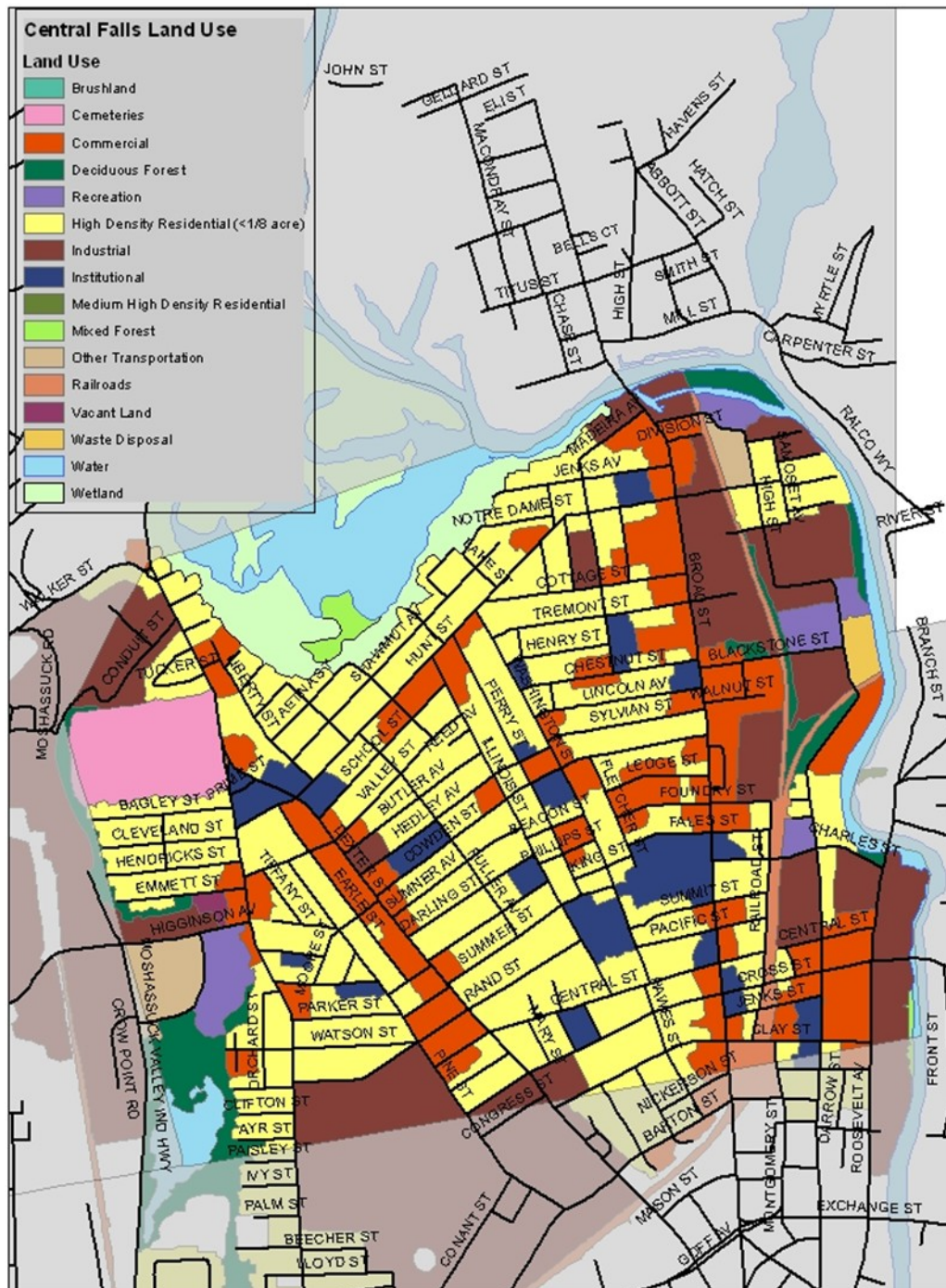
### **Appendix A: GIS Map Legends and Notes**

#### **Central Falls Land Use map**

The nature of land use in Central Falls is highlighted by the GIS map. The arrangement of land uses reveal interesting information about access and the vulnerability of certain types of activities that are indicative of certain types of land use. The map shows, for example, that industrial land use, in brown, borders in the city from all sides except for the north side. The north side of Central Falls is buffered from the Valley Falls Pond by wetlands. The industrial land extends beyond the city limits in a thick ring and crosses the border into surrounding Pawtucket. The GIS map also shows that the few green spaces in the city are placed along the periphery and that there is little to no established greenery in the center of the city. Commercial spaces lie on the major streets in town: Broad, Hunt, and Dexter streets. Residential property occupies the largest percentage of the city and, on the west and south sides, is directly adjacent to industrial buildings. RIGIS information says that this residential land is dense, with each individual plot less than an eighth of an acre. The recreational land is also limited to the periphery; the map only displays five major plots, all at either the far west or east of the city. Institutional land (schools, government buildings, hospitals, etc.) is relatively well dispersed throughout the city. Like residential land, it is centrally located in the city. Vacant land in Central Falls is minimal, occurring only in one small section on the west side. An overview of

land use in Central Falls would be remiss to omit the sizable cemetery on the west side. It is roughly three times the size of the biggest institutional land and is as large as all of the forest/green space combined.

**Figure A.1: Central Falls Current Land Use Map**

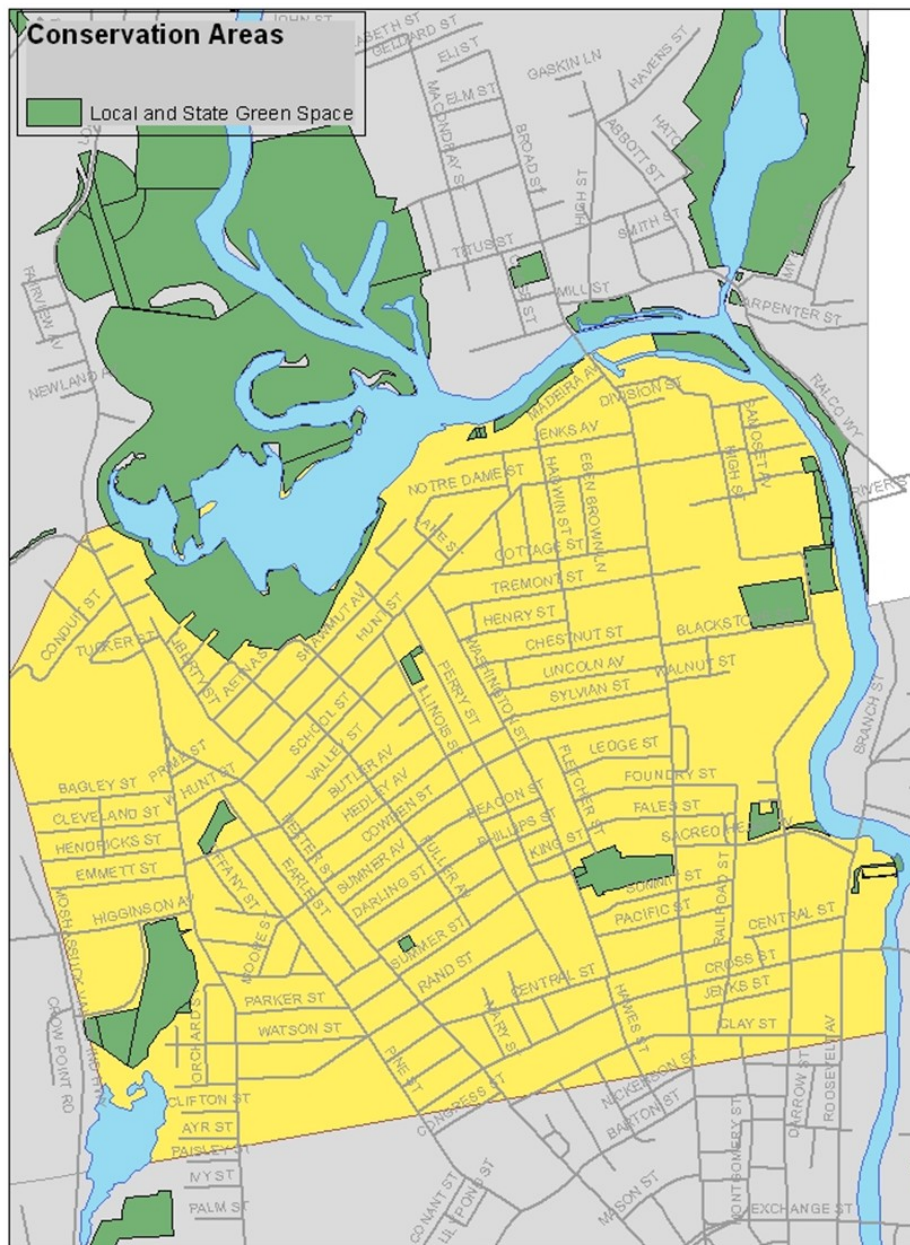




### Central Falls green space map

The green spaces pictured feature many human-maintained areas which include sports fields such as the Higginson Sports Complex in the southwest corner and Macomber Stadium along the eastern edge. Jenks Park, located at the center of the map, is the only park with a walking path within city limits. The most significant green space mapped is located to the north of the city, surrounding the Blackstone River. This green space does not remediate the scarcity of recreational green space, but provides other ecological and recreational services.

**Figure A.2: Central Falls Green Space Map**

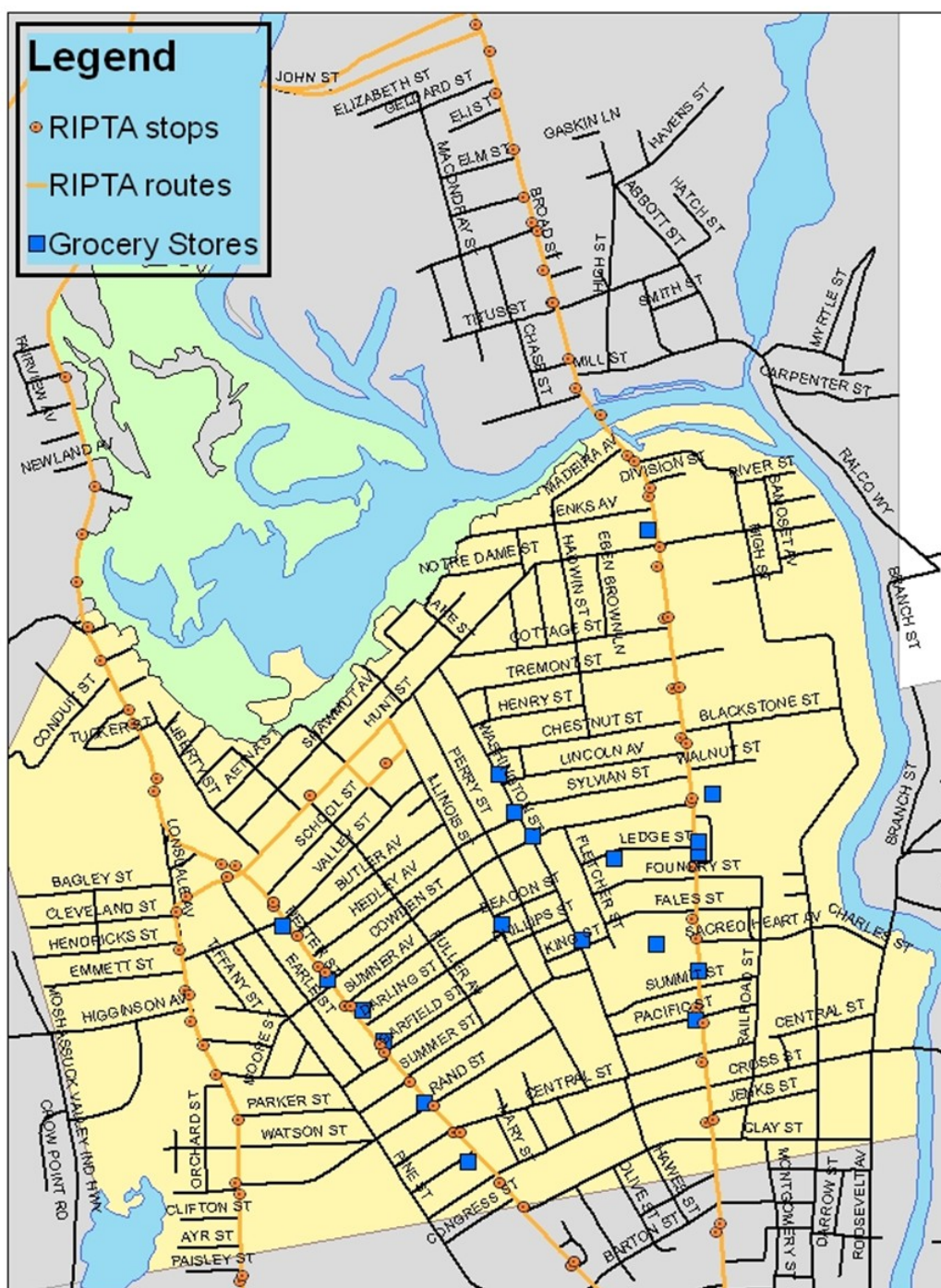




## Central Falls food access map

In Central Falls and proximate Pawtucket, there are 3 food pantries, 17 grocery stores, markets, and convenience stores, and one pastry company. The nearest farmer's market is the Pawtucket Wintertime Farmers Market south of Central Falls.

**Figure A.3: Central Falls Food Access Map**



One concern that deserves further investigation is the capacity of the available grocery stores to provide sufficient choice in nutrition. Many of these stores appear to be very small businesses which may act more as convenience stores. However, since Central Falls is such a small area, all of the food stores are within walking distance of residences. This can become a problem in extreme weather events, such as heat waves or storms, when walking is not safe.

### **Hazardous Sites in Central Falls map**

This map depicts the placement of hazardous material sites and leaking underground storage tanks, or LUST sites. The hazardous material sites are defined as such by the United States Environmental Protection Agency (US EPA). They are sites targeted for cleanup and remediation of bad practices. (EPA, 7 December 2011) Only one hazardous material site rests within the technical city limits of Central Falls, but the other three are in close proximity--upstream and upwind. The EPA is similarly concerned with the state and cleanup of LUST sites as well. With federally mandated jurisdiction, the EPA is tasked with mediating the problems associated with the leaking tanks. (EPA, 28 February 2012) While the word 'hazardous' only appears in one of the site titles, LUSTs are potentially harmful as well and should not be concerned with any less weight than the hazardous material sites.

The hazardous material site in Central Falls is the Dytex Chemical Company. It is located in the most northern and eastern quadrant of the city, close to the water's edge. According to the EPA, "The site is bounded by Hunt Street to the north, High Street to the east, a residence to the south, and the Providence and Worcester Railroad to the west. Across High Street, within an estimated fifty feet of the Dytex property, are four to six residential properties with single or multiple unit dwellings. On the opposite side of the site, trains regularly run along the Providence and Worcester Railroad, which is also within an estimated fifty feet of the site. Abutting the Dytex property on a third side is a residence separated from the Dytex property by a chain-link fence." (EPA, 15 July 2002) In partnership with the EPA Superfund program, the Rhode Island Department of Environmental Management assessed the condition of the site and found "approximately 1,100 drums of flammables, poisons, corrosives, and cyanide were found present in this densely populated community." (EPA, 15 July 2002)

Two of the hazardous material sites outside of Central Falls city limits are directly on top of coastal wetlands. Another site is further north, similarly along the water. The last is just

[illegible]

71

are in residential, commercial, and land plots. Particularly troubling are those located along the northern shore above the city. As they are located upstream, the leaked material could flow into the river and travel along the entire eastern shore of the city contaminating the shore. Along this shore are two of the already limited forest areas in the city as well as part of one of the few recreational plots.



## Appendix B: Sample Outreach Flyers

Figure B.1: Sample Flyer English

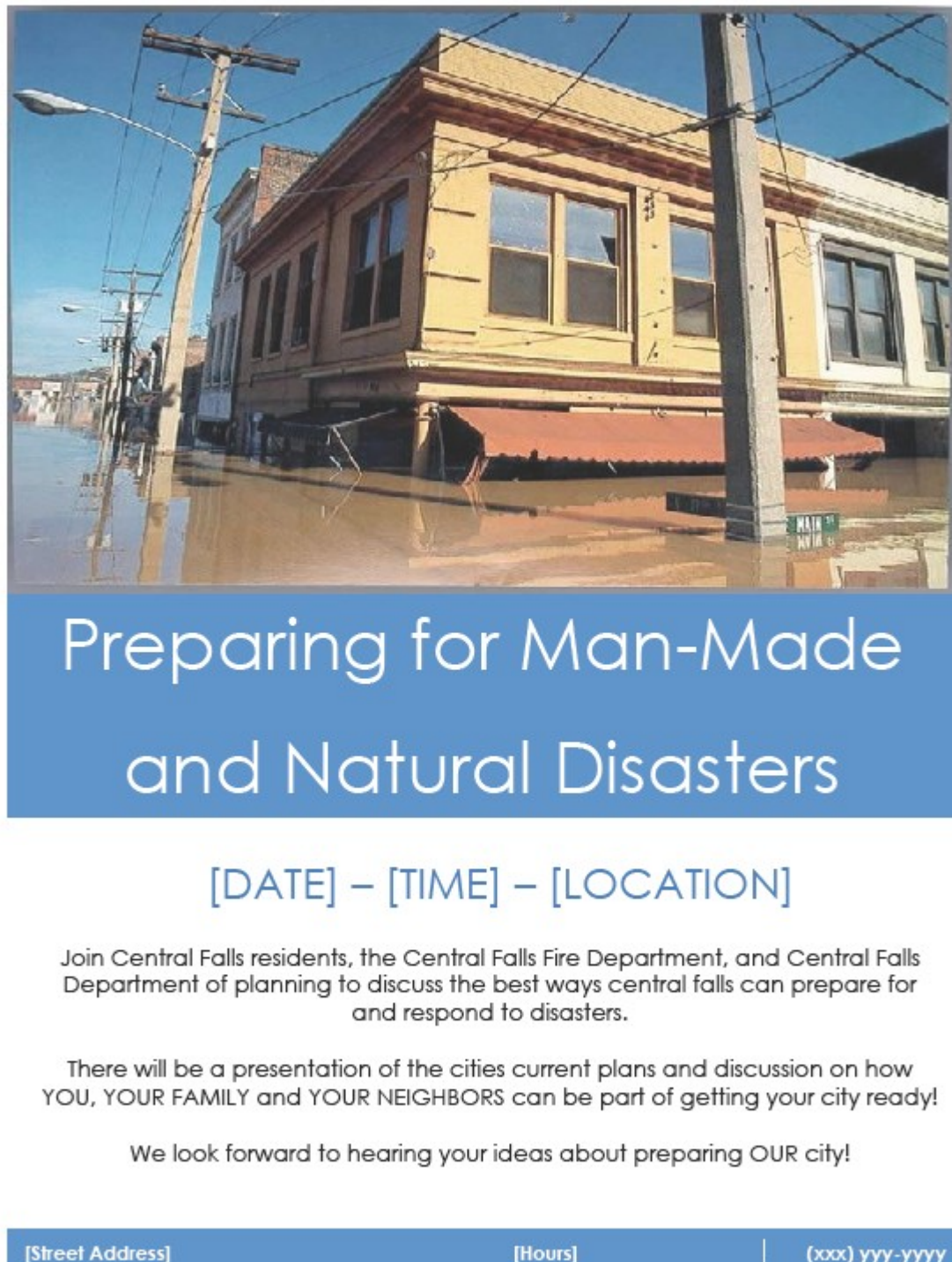


Figure B.2: Sample Flyer Spanish



## Preparando para desastres climatológicos y artificiales

[DATO] – [HORA] – [LUGAR]

Únase con residentes de Central Falls, el Departamento de Bomberos de Central Falls, y el Departamento de Planificación de Central Falls para discutir y decidir en cuales son las maneras mejores en que la ciudad de Central Falls puede responder a desastres.

¡Va a haber una presentación/actualización de los planes actuales de la Ciudad y una platica con sobre como USTED, SU FAMILIA, Y SUS VECINOS pueden participar en prepararse a nuestra ciudad!

¡Esperamos escuchar sus consejos e ideas!

Dirección

Horas

(xxx) xxx-xxxx

## Endnotes

1. “Find New England Sites: Waste Site Cleanup & Reuse in New England” – US EPA  
< <http://www.epa.gov/region1/cleanup/resource/findnesites.html>>.
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### 3.1 High-Risk Populations

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2010 Census

### 3.21 Food Aid and Food Security

Bueno, Mario. (Progreso Latino Executive Director). Personal interview. 3 Mar. 2012.

Carter, Vernia. (Progreso Latino Wellness/Substance Abuse Prevention Program Manager). Personal interview. 3 Mar 2012.

Lester, Sarah. (Farm Fresh Rhode Island). Personal Interview. 9 March 2012.

### 3.2 Public Health

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CityData.com (<http://www.city-data.com/zip/02863.html>)

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