COUNCIL STAFF Memo

CITY COUNCIL *of* SALT LAKE CITY

TO: City Council Members

FROM: Amber McClellan & Ben Luedtke
Constituent Liaisons/Public Policy Analysts

DATE: April 9, 2015 at 10:33 AM

Item Schedule:
Written Briefing:
April 14, 2015
Unfinished Business:
April 28, 2015

RE: **Salt Lake County Multi-Jurisdictional Multi-Hazard Mitigation Plan**

Council Sponsor: Exempt - Legally Required

VIEW ADMINISTRATION'S PROPOSAL

ISSUE AT-A-GLANCE

The Federal Disaster Mitigation Act (FEMA) requires state and local governments to identify natural hazards, risks and vulnerabilities, and to formulate strategies, goals and objectives to mitigate risks associated with identified hazards. A city must adopt an updated Pre-Disaster Mitigation plan by resolution every five years to be eligible for Pre-Disaster Mitigation Planning, project or FEMA disaster relief funding.

The Salt Lake County Multi-Jurisdictional Multi-Hazard Mitigation Plan would replace previously adopted plans and allow the City to qualify for FEMA Disaster Mitigation Funds and the National Flood Insurance Program.

ADDITIONAL & BACKGROUND INFORMATION

This plan has been prepared in accordance with FEMA requirements in coordination with Salt Lake County's Bureau of Emergency Management and other local jurisdictions. FEMA provides funding to each county to help facilitate the plan update process.

The table on page two summarizes hazards in Salt Lake City, lists sources that help identify hazard scope, and why the hazard is important for mitigation planning.

Cc: David Everitt, Cory Lyman, Eric Witt, Audrey Pierce, Wes Ing, Martha Ellis, Brian Gourdie, Brandon Fleming, Tim Doubt, Debbie Lyons, Pat Peterson, Terry Craven, David Wharff, Kevin Bell, Laura Briefer

Hazard	How Identified	Why
Earthquake High	• Review of County Emergency Operations Plans • Review of past disaster declarations • Input from City and County Emergency Operations Managers, USGS, UGS, Utah DEM, and community members	• Utah has a 1/5 chance, of experiencing a large earthquake within the next fifty years. • Numerous faults throughout Utah including the Intermountain Seismic Zone. • Yearly, Utah averages approximately 13 earthquakes having a magnitude 3.0 or greater. • Earthquakes can create fire, flooding, hazardous materials incident, transportation, and communication limitations. • The Wasatch Front has recorded large earthquakes in the past and can be expected to experience large earthquakes in the future.
Flood Low	• Review of past disaster declarations • Input from City and County Emergency Operations Managers, Utah DWS, UGS, Utah Army Corps of Engineers, Utah DEM, and community members • Review of Flood Insurance Studies, Floodplain maps, and FIRMs	• Several incidents have caused severe damage and loss of life. • Many of the rivers and streams are located near neighborhoods. • Many neighborhoods are located on floodplains, alluvial fans. • Topography and climate lead to cloudburst storms and heavy precipitation can result in flash flooding throughout most of the Wasatch Front.
Wildland Fire High	• Review of County Emergency Operations Plans • Review of Community Wildfire Plans • Input from County Emergency Managers, Utah DEM, Utah FFSL, Utah FS, NWS, FEMA, and local community members	• Serious threat to life and property. • Much of county is at risk • Increasing threat due to urban growth in WUI areas. • Secondary threat associated with flooding, drought, and earthquake. • Additional funding and resources offered by local and state agencies to reduce risk
Slope Failure Low	• Input from City and County Emergency Operations Managers, USGS, UGS, NCDC, Utah DEM, and community members	• Have caused damage in the past to residential and commercial infrastructure. • Can be life threatening. • Generally occur in known historic locations therefore risks exist through- out much of the Wasatch Front. • To increase community awareness.
Severe Weather Moderate	• Review of County Emergency Operations Plans • Review of past disaster declarations • Input from City and County Emergency Operations Managers, Utah Avalanche, Forecast Center, Utah Department of Transportation, and community members	• Damage to communities, homes, infrastructure, roads, ski areas, and people. • Can cause property damage and loss of life. • Results in economic loss. • Lightning is number one cause of natural hazard death in Utah. • Can be costly to recover from. • Affects the young and old more severely.
Dam Failure Low	• Review of County Emergency Operations Plans • Input from community members, Utah DWS, Dam Safety Section, Utah DEM • Review of inundation maps	• Can cause serious damage to life and property and have subsequent effects such as flooding, fire, debris flow, etc. • Many reservoirs located in the county. • Threat to downhill communities. • Subsequent effects include flooding, fire, and debris flows. • To increase community awareness. • To incorporate mitigation measures into existing plans to help serve local residents
Drought Moderate	• Review of Utah State Water Plan • Input from community members, Utah DHLS, NWS, NCC, and NCDC	• Affects local economy and residents. • Reduces available water in reservoirs impacting culinary, irrigation, and municipal water supplies. • Drought periods may extend several years. • Secondary threat associated with wildfire. • Utah is the nation's second driest state. • Can impact farming and ranching operations. • Neighboring communities have been affected by culinary and irrigation water shortages

SALT LAKE CITY CORPORATION

CITY COUNCIL TRANSMITTAL

David Everitt, Chief of Staff

Date Received: 3/9/2015
Date sent to Council: 3/11/2015

TO: Salt Lake City Council
Luke Garrott, Chair

DATE: February 13, 2015

FROM: Cory Lyman, Emergency Management Director

SUBJECT: Hazard Mitigation Plan 2014

STAFF CONTACT: Cory Lyman, Emergency Management Director,
cory.lyman@slcgov.com or 801-799-3601

COUNCIL SPONSOR: Exempt

DOCUMENT TYPE: Resolution

RECOMMENDATION: The Administration recommends the City Council approve the 2014 County Hazard Mitigation Plan replacing the previous Wasatch Front Region Natural Hazards Pre-Disaster Mitigation Plan.

BUDGET IMPACT: None

BACKGROUND/DISCUSSION: In 2000 the Federal Disaster Mitigation Act was signed into law. It requires state and local governments to identify natural hazards, risks, and vulnerabilities and to formulate strategies, goals and objectives to mitigate the risks associated with the identified hazards. The plans are only good for five years. We have approved resolutions in 2005 and 2009. This plan would supersede both previously adopted plans.By adopting the updated plan the City will continue to qualify for FEMA Disaster Mitigation funds and the National Flood Insurance Program.

PUBLIC PROCESS: The draft plan has been published for comment on the Salt Lake City Emergency Management website since December.

RESOLUTION NO. _____ OF 2015
(Salt Lake County Multi-Jurisdictional Multi-Hazard Disaster Mitigation Plan)

A resolution adopting the Salt Lake County Multi-Jurisdictional Multi-Hazard Mitigation Plan, as required by the Federal Disaster Mitigation and Cost Reduction Act of 2000.

WHEREAS, President William J. Clinton signed H.R. 707, the Disaster Mitigation and Cost Reduction Act of 2000 into law on October 30, 2000 establishing a national disaster hazard mitigation program to reduce the loss of life and property, human suffering, economic disruption, and disaster assistance costs resulting from natural disasters, and to assist state, local and Indian tribal governments in implementing effective hazard mitigation measures designed to ensure the continuation of critical services and facilities after a natural disaster; and

WHEREAS, the Disaster Mitigation Act of 2000 requires, to be eligible for Federal Emergency Management Agency (FEMA) post-disaster funds, jurisdictions develop and be covered by a Pre-Disaster Hazard Mitigation Plan that identifies the natural hazards that could impact their jurisdictions, identify actions and activities to mitigate the effects of those hazards, and establish a coordinated process to implement such plans; and

WHEREAS, the Salt Lake County Multi-Jurisdictional Multi-Hazard Mitigation Plan has been prepared in accordance with FEMA requirements as 4 C.F.R. 201.6 in coordination with Salt Lake County's Bureau of Emergency Management and other local jurisdictions; and

WHEREAS, Salt Lake City is within Salt Lake County and participated in the update of the multi-jurisdictional Plan, the Salt Lake County Multi-Jurisdictional Multi-Hazard Mitigation Plan; and

WHEREAS, Salt Lake City is concerned about mitigating potential losses and has determined that it would be in the best interest of the community to adopt the Salt Lake County Multi-Jurisdictional Multi-Hazard Mitigation Plan.

NOW THEREFORE, be it resolved by the City Council of Salt Lake City that:

1. The City adopts the Salt Lake County Multi-Jurisdictional Multi-Hazard Mitigation Plan as this jurisdiction's Multi-Hazard Mitigation Plan (Attachment A hereto) pursuant to the Disaster Mitigation Act.

Passed by the City Council of Salt Lake City, Utah, this _____ day of _____, 2015.

SALT LAKE CITY COUNCIL

By:_____
CHAIRPERSON

ATTEST AND COUNTERSIGN:

APPROVED AS TO FORM
Salt Lake City Attorney's Office
Date 3-2-15
By

_____
CITY RECORDER

HB_ATTY-#43573-V1-Resolution_Adopting_Salt_Lake_County_Multi-Hazard_Mitigation_Plan.DOC

Hazard Mitigation Plan (2014)

ANNEX J: SALT LAKE CITY

1 Introduction

1.1 Background

Salt Lake City is the capital and the most populous city in the state of Utah. With an estimated population of 191,180 in 2013, the city lies in the core of the Salt Lake City metropolitan area, which has a total population of 1,140,483 as of the 2013 estimate. Salt Lake City is further situated in a larger urban area known as the Salt Lake City-Provo-Orem, UT Combined Statistical Area. This region is a corridor of contiguous urban and suburban development stretched along an approximate 120-mile segment of the Wasatch Front, comprising a total population of 2,389,225 as of 2013.

Given the nature of Utah's population concentration along the Wasatch Front, it is important that Salt Lake City support regional planning and maintain relationships with Salt Lake County and the other municipalities located in the county. Salt Lake City is a member of Utah's Pre-mitigation planning for the Wasatch Region, comprised of five counties, Salt Lake, Summit, Tooele, Davis, and Utah. The region representatives meet to coordinate activities and funding received from the state through the State Homeland Security Program. Salt Lake City has participated in area Gap Analysis and Threat Assessments, the Regional Resilience and Assessment Program (RRAP), and was funded to develop a Local Energy Assurance Plan. Salt Lake City also became a part of the Urban Area Security Initiative (UASI) in 2008 and again in 2014. The Urban Area Working Group (UAWG) includes Salt Lake County with representatives from public safety agencies, volunteer organizations and the state for regional all-hazards planning, mitigation, response and recovery.

1.2 Purpose

The four purposes of this Plan are (1) to identify threats to the community, (2) to create mitigation strategies to address those threats, (3) to develop long-term mitigation planning goals and objectives, and (4) and to fulfill federal, state and local hazard mitigation planning obligations. Mitigation actions, in particular, would serve to minimize conditions that have an undesirable impact on our citizens, the economy, environment and the well-being of Salt Lake County and surrounding municipalities. This Plan is intended to enhance the awareness for elected officials, agencies and the public of these hazards and their associated threat to life and property.

1.3 Scope

This Mitigation Plan is Salt Lake City's Annex to the stand alone mitigation plan for Salt Lake County and replaces the Wasatch Front Regional Council Natural Hazard Pre-Disaster Mitigation Plan (WFRC-PDM).

The plan scope includes the following deliverables:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- A vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input, and development of mitigation actions complementary to those goals. A range of actions must be identified specifically for each jurisdiction;
- Demonstration that there has been a proactively offered opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in an any planning process, attendance at meetings, contributing research, data, other information, commenting on drafts of the plan);
- Documentation of an effective process to maintain and implement the plan.

1.4 Authority and Reference

Local

Salt Lake City Code Title 22 et al. Salt Lake City executives are responsible for carrying out plans and policies. City government must be prepared to participate in the post-disaster hazard mitigation team process and pre-mitigation planning as outlined in this document in order to effectively protect their citizens.

2 Community Profile

2.1 Geography and Environment

Salt Lake City is located in the northeast corner of the Salt Lake Valley surrounded by the Great Salt Lake to the northwest and the steep Wasatch and Oquirrh mountain ranges on the eastern and south western borders, respectively. Its encircling mountains contain several narrow glacial and stream carved canyons. Among them, City Creek, Emigration, Millcreek, and Parley's border the eastern city limits. Salt Lake City has a total area of 110.4 mi^2 and an average elevation of 4,327 feet above sea level. The lowest point within the boundaries of the city is 4,210 feet near the Jordan River and the Great Salt Lake, and the highest is Grandview Peak, at 9,410 feet .

The Great Salt Lake is separated from Salt Lake City by extensive marshlands and mudflats. The metabolic activities of bacteria in the lake result in a phenomenon known as "lake stink", a scent reminiscent of foul poultry eggs, two to three times per year for a few hours. The Jordan River flows through the city and is drainage of Utah Lake that empties into the Great Salt Lake.
The Salt Lake Valley floor is the ancient lakebed of Lake Bonneville, which existed at the end of the last Ice Age. Several Lake Bonneville shorelines can be distinctly seen on the foothills or benches of nearby mountains.

The climate of the Salt Lake City area is typically characterized as semi-arid. Under the Köppen climate classification, Salt Lake City has a dry-summer continental climate (Dsa), a relatively rare form of the continental climate where a region experiences dry summers and wet winters. The city experiences four distinct seasons. Both summer and winter are long, with hot, dry summers and cold, snowy winters. Spring is the wettest season, while summer is very dry.

The nearby Great Salt Lake is a significant contributor to precipitation in the city. The lake effect can help enhance rain from summer thunderstorms and produces lake-effect snow approximately 6 to 8 times per year, some of which can drop excessive snowfalls. It is estimated that about 10% of the annual precipitation in the city can be attributed to the lake effect.

Salt Lake City features large variations in temperatures between seasons. During summer, there are an average of 56 days per year with temperatures of at least 90 °F (32.2 °C), 23 days of at least 95 °F (35 °C), and 5 days of 100 °F (37.8 °C). However, average daytime July humidity is only 22%. Winters are quite cold but rarely frigid. While there are an average of 127 days that drop to or below freezing, and 26 days with high temperatures that fail to rise above freezing, the city only averages 2.3 days at or below 0 °F (−17.8 °C). The record high temperature is 107 °F (42 °C), which occurred first on 26 July 1960 and again on 13 July 2002, while the record low is −30 °F (−34 °C), which occurred on 9 February 1933.

During mid-winter, strong areas of high pressure often situate themselves over the Great Basin, leading to strong temperature inversions. This causes air stagnation and thick smog in the valley from several days to weeks at a time and can result in the worst air-pollution levels in the U.S., reducing air quality to unhealthy levels.

2.1.1 Community Facts

The city was founded in 1847 by Brigham Young, Isaac Morley, George Washington Bradley and several other Mormon followers, who extensively irrigated and cultivated the arid valley. Immigration of international LDS members, mining booms, and the construction of the first transcontinental railroad initially brought economic growth, and the city was nicknamed the Crossroads of the West. It was traversed by the Lincoln Highway, the first transcontinental highway, in 1913, and presently two major cross-country freeways, I-15 and I-80, intersect in the city. Salt Lake City has since developed a strong outdoor recreation tourist industry based primarily on skiing, and hosted the 2002 Winter Olympics. It is the industrial banking center of the United States.

2.1.2 Population and Demographics

Salt Lake City's population is predominantly White 75.1% and Hispanic 22.3% based on the2010 Census. It also consists of 2.7% African American, 1.2% American Indian and Alaska Native, 4.4% Asian, 2.0% Native Hawaiian and Other Pacific Islander, 10.7% from other races and 3.7% of mixed descent.

As of the census of 2010, there are 186,440 people (up from 181,743 in 2000), 75,177 households, and 57,543 families residing in the city. This amounts to 6.75% of Utah's population, 18.11% of Salt Lake County's population, and 16.58% of the new Salt Lake metropolitan population. The area within the city limits covers 14.2% of Salt Lake County. Salt Lake City is more densely populated than the surrounding metro area with a population density of 1,688.77/sq. mi (1,049.36/km²). There are 80,724 housing units at an average density of 731.2 per square mile (454.35/km²). The median age is 30 years. For every 100 females there are 102.6 males. For every 100 females age 18 and over, there are 101.2 males. The median income for a household in the city is $36,944, and the median income for a family is $45,140. Males have a median income of $31,511 versus $26,403 for females. The per capita income for the city is $20,752. 15.3% of the population and 10.4% of families are below the poverty line. Out of the total population, 18.7% of those under the age of 18 and 8.5% of those 65 and older are living below the poverty line. Large family sizes and low housing vacancy rates, which have inflated housing costs along the Wasatch Front, have led to one out of every six residents living below the poverty line.

Salt Lake City is still home to the headquarters of The Church of Jesus Christ of Latter-day Saints (LDS Church) however less than 50% of Salt Lake City's residents are members of The Church of Jesus Christ of Latter-day Saints. This is a much lower proportion than in Utah's more rural municipalities; altogether, LDS members make up about 62% of Utah's population.

2.1.3 Data Sources and Limitations

Background information and data for this Plan was obtained from the sources listed below. From these sources, the planning team extracted relevant information and data. That information and data was subsequently submitted to the County Work Groups for their consideration and approval for inclusion into the Plan. Relevant information gathered from these sources was compiled by the

Working Groups and incorporated into this Plan. Based on the large amount of growth in communities throughout the region, it was determined by the Working Group that the entire Plan would be updated.

Sources for Background Information

- Census Profiles
- Federal Emergency Management Agency (How-to Guides)
- National Weather Service (hazard profile)
- National Climate Data Center (drought, severe weather)
- Utah Division of Emergency Management (Salt Lake City Mitigation Plan, GIS data, flood data, HAZUS data for flood and earthquake)
- Utah Geologic Survey (GIS data, geologic information, various hazard reports)
- Utah Division of Forestry Fire and State Lands (fire data)
- Utah Avalanche Center, Snow and Avalanches, Annual Report 2006-2007 Forest Service
- Utah Department of Transportation (traffic data, avalanche?)
- Utah Automated Geographic Resource Center (GIS data)
- University of Utah Seismic Station (earthquake data)
- Utah State University (climate data)
- Councils or Government
- Association of Governments
- Utah Association of Special Districts
- State Office of Education
- Salt Lake County and municipalities (Emergency Operations Plans, histories, mitigation actions, public input, data: GIS, assessor, transportation, property and infrastructure)
- Earthquake Safety in Utah
- Utah Natural Hazard Handbook 2008
- Utah Statewide Fire Risk Assessment Project
- A Strategic Plan for Earthquake Safety in Utah
- State of Utah Wildfire Plan 2007
- State of Utah Drought Plan 2007
- West Wide Wildfire Assessment 2013

3 Planning Process

3.1 Update Process and Participation Summary

The WFRC plan was reviewed to evaluate its strengths, weakness and utility. The hazards, vulnerabilities and risks were reviewed and revised as to their impact, how hazards may affect the population, and their severity. Updates also describe hazard impacts that have occurred since the last plan revision. The planning team considered previously unidentified hazards to include in the plan update. A capabilities assessment was conducted to identify potential mitigation needs and to further align the mitigation plan with other community planning efforts. The revision process also included a review of proposed mitigation goals, objectives and actions and to determine their validity and how effective they have been/or will be at reducing vulnerability in the county. New priorities have been set to support changes that were identified. The Mitigation Plan was also evaluated to support the State Mitigation Plan goals and objectives, as well as other local planning efforts. Finally, an implementation strategy and timeline will assign the responsibility and schedule for tracking implementation of the identified mitigation actions. The Mitigation Plan will be adopted through the normal legal process and will establish authority and guide all mitigation activities outlined in the plan.

The plan utilized current county, city and applicable private hazard mitigation, emergency operations plans, census data and available GIS and assessor's data as resources for the planning team. Salt Lake City Emergency Management staff, mitigation planning team members, county, and applicable emergency managers/planners, subject matter experts, recruits from other jurisdictions such as other local government units, private sector, non-governmental, academia, airports, military, and the public were also consulted during this planning activity.

3.2 The Planning Team - Acknowledgements

Salt Lake City Emergency Management would like to acknowledge the following individuals and agencies for their dedication and valuable contribution to this document.

Salt Lake City Emergency Management
Cory Lyman,
Eric Witt,
Audrey Pierce

Internal Stakeholders
Wes Ing, SLC Public Utilities
Martha Ellis, Fire Marshal
Brain Gourdie, SLC Public Services
Brandon Fleming, Parks Operations

Tim Doubt, SLC Police
Debbie Lyons, SLC Sustainability
Pat Peterson, SLC Engineering
Terry Craven, SLC Airport
David Wharff, SLC Fire
Kevin Bell, SLC IMS/GIS
Laura Briefer, SLC Public Utilities

External Stakeholders

Amy Shingleton, Rocky Mountain Power
Robert Neilson, Questar
Laird Severinsen, Century Link
Jan Buttrey, UT Hospital Association
Hugh Johnson, RMA –Archives
Carlton Christensen, SLCo Regional Development
Clint Mecham, SLCo EM-UFA
Jackie Nicholl, SLCo Emergency Services
Jeff Graviet, SLCo Emergency Services
John Leonard, Utah Dept of Transportation
Richard Boddy, Utah Transit Authority
Mark Lemery, Utah SAIC
Reed Scharman, West Jordan Fire Dept
Jon Harris, Murray City Fire
Wade Watkins, SLCo-UFA
John Evans, West Valley City Fire
Jerrianne Kolby, Utah Dept Emergency Management
Marty Shuab, University of Utah
Jalae Thompson, Red Cross
Chris Crnich, UT Dept of Agriculture
Cynthia Morgan, SL Valley Health Dept
Bob Jeppessen, SL Valley Health Dept
Terry Begay, SL Valley Health Dept
Mindy Colling, UT Dept of Health
Leon Berrett, SLCo Public Works
Mike Barrett, SLCo EMergency Services

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3.3 Meetings and Documentation

Year	Date	Activity	Purpose
2012	**September**	Utah Division of Emergency Management designates Salt Lake County Emergency Management/Unified Fire Authority as sub-grantees of the state to revise the Pre Disaster Mitigation Plan.	

		Memorandum of Understanding	An MOU was signed by participating jurisdictions committing to participate in the planning process.
	September-October	Phone conferences with UDEM and FEMA Region VIII to discuss the planning process, Risk MAP.	Identified planning team and available resources.
	November 7	RiskMAP Discovery, Mitigation Kickoff	Kick off to introduce RiskMAP and Mitigation projects to reduce risk from natural hazards and increase disaster resiliency in the Jordan River Watershed/Salt Lake County
	November-December	Identifying Planning Team Members	Establish a contact person from each jurisdiction to participate in the planning process.
	December		Meeting with Salt Lake County Emergency Services to discuss cooperation with other county agencies and participation in mitigation planning process.
2013	**January-May**	Gather information.	Data collection.
	January 22	Mitigation Planning Team Meeting	Introduce project scope, identified team responsibilities, key terminology, requirements of the planning process, timeline.
	February 11	Mitigation Planning Team Meeting	Review of hazard maps for earthquake, landslide, and dam failure. Worksheets to gather information of areas of concern. Subject matter experts available to answer questions.
	February 27	Sandy City BCDM (Business Continuity Development Meeting)	Outreach effort, presentation/overview of mitigation plan to Sandy City business partners and emergency managers
	March 7	Salt Lake County Council of Government (COG)	Outreach presentation to elected officials to give overview of mitigation planning project.
	March 11	Mitigation Planning Team Meeting	Discussion with subject matter experts on severe weather and wildfire.
	April 8	Mitigation Planning Team Meeting	Presentation on pandemic flu and wildfire public education programs.
	May 16	Mitigation Planning Team, Risk MAP joint meeting	Presentation of flood and earthquake risk analysis from FEMA Region VIII, presentation from UDEM regarding community Risk MAP meetings to be held over summer, Mitigation team given Capabilities Assessment worksheets and hazard matrix.
	June-Aug	Community Risk MAP meetings and work on worksheets	Risk MAP representatives met with individual communities to discuss flood study needs and areas of concern.
	Sept 11	Mitigation Team Meeting	Recap of Capabilities Assessment, preparing for next stages of plan.
	Oct 21	Salt Lake County Emergency Manager's meeting	Planner reported on mitigation plan progress to emergency managers. Encouraged completion of capabilities assessment worksheets. Provided copy of 2009 mitigation strategies to review and comment

			on progress.
	Oct-Nov	Risk Assessment Draft and mitigation strategies preparation	Planner reviewed and summarized Capabilities Assessment and Hazard worksheets. Continued Revising Risk Assessment. Summarized responses to 2009 Strategies Review.
	Nov. 19	Mitigation Planning Team Meeting – Mitigation Strategies Part II	Brainstorming meeting to begin identifying possible mitigation strategies. Hazards discussed were flood, wildfire, earthquake, and avalanche. Rough draft of Risk Assessment made available.
	Nov. 20	Planner meeting with SHMO regarding plan progress	Discussed timeline and planning progress
	December	Reviewed mitigation strategies.	Planner compiled notes from mitigation strategies brainstorm meeting and
2014	**Jan 14**	Mitigation Planning Team Meeting – Mitigation Strategies Part II	Brainstorming meeting to begin identifying possible mitigation strategies. Hazards discussed were earthquake, pandemic, dams and canals, and drought.
	Feb-Mar	Mitigation strategies draft, update wildfire risk assessment.	Planner compiled notes from mitigation strategies brainstorm sessions, continued revision of Risk Assessment as new data became available for Wildfire.
	Apr-June	Mitigation Strategies review	Create timeline to meet Grant requirements. Complete all elements of
	June	Review Best Practices SOG for Mitigation	Find a better system for Mitigation planning. Permission to use Pennsylvania's Mitigation SOG
	July 1	Review Progress with EM staff	Prepare Plan for submission to State and FEM review boards
	July 14	Mitigation Planning Team Prioritization Workshop	Planning Team reviews final mitigation strategies to assign responsibility, estimate costs, and define priority
		Revision of remaining Plan sections.	For review.
		Public comment period.	Draft placed on UFA/SLCOEM website for public involvement
		Prepare plan Crosswalk	
		Submitted Plan to Utah DHLS for initial State review and FEMA conditional review.	State and federal review.
		Continued Plan revision.	Final Plan proofreading, mitigation strategy updates. Addition of Special Service District data.
		Submit Plan to Utah DHLS for final State review.	State review.
		Plan forwarded to FEMA for final approval.	Federal review may take up to 45 days, Appendix
		Local Jurisdiction Plan Adoption	

Planning Process Timeline

3.4 Public Stakeholder Participation

To ensure the public and their officials were supportive of the Plan, the SLCEM Mitigation Planner presented at the Salt Lake County Council of Governments meeting in March 2013. Salt Lake City's Chief Executive was present at this meeting.. The draft of this annex is posted on Salt Lake City's Emergency Management webpage for review and public input.

Getting Started

Salt Lake City has participated in the County multi- jurisdictional planning committee based on the Memorandum of Understanding to create a standalone mitigation plan that will meet the 44CFR 201.6 planning requirements and will result in a FEMA approved mitigation plan since 2012.

Jordan River Watershed RiskMAP Collaboration

FEMA Region VIII and the Utah Division of Emergency Management initiated a project to identify flood mapping and risk analysis needs in the Jordan River watershed near the same time as the Salt Lake County Mitigation planning project. The flood risk project and mitigation planning project shared the same planning area, and many common objectives. This presented a unique opportunity to share resources, integrate programs, and implement a more comprehensive approach to risk reduction for Salt Lake City Officials since water resources have interdependencies across the valley.

Objectives of the RiskMap project included:

- Assist communities to identify, assess, communicate, and mitigate risk
- Document flood risk issues and floodplain mapping needs within the Jordan River watershed which could potentially initiate a new mapping project in a future year
- Develop non-regulatory flood risk data, analysis, and mapping based on local needs and priorities
- Identify areas of mitigation interest for Salt Lake County, Salt Lake City, local communities and special districts
- Build capabilities of local jurisdictions to create and use risk analysis data, identify mitigation actions, and access resources for implementing projects
- Incorporate a multi-hazard approach into the Risk MAP project by working with local staff and jurisdictions on analyzing and integrating impacts of wildfire, earthquake, and other major hazards in the planning area
- Provide technical assistance as needed to help support a comprehensive and inclusive mitigation planning process and the development of an effective, high quality plan. FEMA planning and GIS Staff provided technical assistance through risk assessment data, analysis and mapping, training to local staff, meeting facilitation, and guidance on meeting federal regulations for plan approval.

Collaboration between the Risk MAP team, County, and Salt Lake City mitigation planning team improved coordination and partnerships between local, state and regional staff used stakeholder time more efficiently by combining meetings and improved the quality of risk analysis by sharing

data and technical expertise. This also improved the plan review and approval process through early and consistent involvement and guidance on regulations from FEMA.

Data Review and Acquisition

The 2009 WFRC PDM Plan was reviewed by the Planning Team to evaluate which portions of the plan required updating and revision. Contact was made with the GIS technician and/or planning commission staff in cities and county departments to assess available data. Mapping data layers obtained included some or all of the following: local roads, plot maps, county tax assessor's data, hazard data, flood maps, topographic data, aerial photographs and land development data. The Planning Team evaluated revised data and maps, and through a consensus process developed the revised mitigation strategies based on current data.

Vulnerability Assessment

This step was conducted through a review of local hazard maps, topographical maps, floodplain maps, and Utah Geological Survey (UGS) maps, Automated Geographic Reference Center (AGRC) data, FEMA hazard maps and climate maps from the National Climatic Data Center (NCDC). Assessor data was used to estimate the number of structures and their value that could potentially be affected by hazards. Census 2010 data were used to estimate the number of residents and households that could be affected by hazards. A detailed vulnerability assessment was completed with the use of GIS software. The FEMA modeling program Hazards United States – Multi-Hazards (HAZUS-MH) was used to determine earthquake and flood vulnerability. In summary, loss estimation methodology was developed by the core planning team, with assistance from the technical team, to determine vulnerability from each identified hazard. Vulnerability and Risk Analysis (VRA) provides stakeholders with a guide to understanding the impacts that are associated with major deficiencies, disruptions, and response processes. In practical terms, VRA analysis provides insight into the following questions:

1. What are the City's specific vulnerabilities?
2. What are the potential consequences of disruptions in particular critical assets?
3. What are the most relevant event-driven vulnerabilities?

Capabilities Assessment

Salt Lake City completed the Capabilities Assessment Worksheet and Hazard Identification Matrix with city planners, economic development, building and zoning officials, engineers, floodplain administrators, GIS Analyst or others as appropriate. It encouraged them to review existing plans, studies, reports or other technical information. The worksheets were also intended to help recognize established goals as well as identify known hazards or problem areas that could potentially be addressed by implementing mitigation actions. The Hazard Identification Matrix allowed them to identify which hazards present the greatest threat to Salt Lake City.

Mitigation Strategy Development

Developing the mitigation strategies was a process in which all of the previous steps were taken into account. Each participating jurisdiction evaluated, identified and profiled the hazards, and vulnerability assessment completed by SLCOEM. The strategies from the 2009 WFRC plan were

reviewed to identify which projects had been completed, which were ongoing, and whether others should be carried over into the current plan. The planning team met several times to brainstorm additional strategies and improve upon the existing strategies. Each mitigation strategy developed was evaluated to determine that actions met the objectives stated in Section D (page 10) of the Introduction.

Prioritization of Identified Mitigation Strategies

DMA 2000 requires state, tribal, and local governments to show how mitigation actions were evaluated and prioritized. The Planning Team determined which strategies were highest priority, which jurisdiction was responsible, and evaluated to ensure best action to take given limited budgets allocated to hazard mitigation efforts at the local level. The prioritization process was completed by the Planning Team over a series of planning meetings (workshops). Each action was assigned a responsible party, an anticipated cost, and a timeline. Prioritization was accomplished using the STAPLEE method as explained in the FEMA How to Guide, Document 386-3. This process resulted in each Mitigation Strategy given a High, Medium or Low priority by the local planning teams.

4 Risk Assessment

4.1 Update Process Summary

Risk Assessment Review
Salt Lake City has meet with stakeholders from multiple disciplines public and private sector to identify the risk. Including but not limited to involvement with the following projects that focused on risk to the area: Regional Resilience Assessment Program (RRAP), Local Energy Assurance Planning (LEAP), and the Salt Lake County HMP2013-Flood and Earthquake Risk Assessment.

4.2 Hazard Identification

4.2.1 Table of Presidential Disaster Declarations

Salt Lake City Presidential disaster declarations related to flooding in 1983 and 1984. Following these events of an enormous amount of mitigation was completed in Salt Lake City along the urban areas of the Wasatch Front. The State of Utah constructed a county flood control project in which pumps were installed on the Great Salt Lake to pump excess water into the west desert. Salt Lake City benefited from the pump project and the following upgrades: an advanced water-monitoring network of stream gauges, SNOTEL sites, and automated stream flow gates give warning of elevated flows.

4.2.2 Summary of Hazards

Each of the hazards that can affect Salt Lake City, and the potential impacts, will be described in this section, known as a Hazard Identification and Risk Assessment or HIRA.

Hazard Description: These are general descriptions of the causes and characteristics of each hazard to give a general understanding of each hazard and why, when and how the hazards occur.

Hazard Profile: This section describes the potential impact of each identified hazard, including its:

- Severity or magnitude (as it relates to the percentage of the jurisdiction that can be affected)
- Probability: likelihood that the hazard will occur
- Conditions that make the area prone to the hazard, including seasonal patterns
- Hazard history
- Geographic location or extent - maps

The hazards were profiled based on historical evidence, local input, emergency operations plans, scientific reports, scenario based models, county master or general plans, hazard analysis plans, and historical evidence.

A hazard profile table was created for each hazard, which highlights the above mentioned characteristics. Hazard magnitude is based on the anticipated level of damage on a city-wide basis described on a scale of Catastrophic to Negligible. The probability of a hazard event was determined through the amount of risk to the county. Probability was identified by four categories: Highly Likely, Likely, Possible, and Unlikely.

Vulnerability Analysis: The vulnerability analysis is based on asset identification and potential loss estimates for located within identified hazard areas. For each hazard, a risk assessment was conducted. The vulnerability analysis summarizes the results of the risk assessment and describes the potential impacts of each hazard. This includes a description of exposure to the hazard for each jurisdiction and the potential losses based on scenario models or historical occurrences.

Asset Identification: The vulnerability analysis combines the data from each of the hazard profiles and merges it with community asset information to analyze and quantify potential damages from future hazard events. The asset inventory identifies critical facilities and infrastructure that can be damaged or affected by hazard events. Critical facilities are of particular concern because of the essential services and products they provide to the general public. These critical facilities may fulfill important public safety, emergency response, and/or disaster recovery functions. The facilities identified in this plan include hospitals, police and fire stations, schools, communication facilities, utility companies, water and wastewater treatment plants. In order to assess where and to what extent the identified hazards will affect the assets of each jurisdiction, the locations of these assets were identified and overlaid with the mapped hazards using GIS software. Additional community assets considered were assets of historical or economic significance, vulnerable populations, or natural resources.

Potential Loss Estimates: Potential dollar loss estimates were identified using the same method as the asset identification and were completed for existing infrastructure only. When data permitted, structure, content, and function of the identified vulnerable infrastructure was incorporated into the vulnerability assessments. Describing the vulnerability in terms of dollar losses provides the community and state with a common framework in which to measure the effects of hazards on assets.

The estimated potential losses for the identified hazards using the methodology explained in the FEMA document titled "Understanding Your Risks: Identifying Hazards and Estimating Losses", along with Utah Division of Emergency Management historical data and GIS data.

The information sources used to complete the vulnerability assessment portion of this plan include; Utah DEM, county and city GIS departments, Salt Lake County Assessor's Office, Salt Lake County Planning and Development, FEMA Region VIII RiskMAP and HAZUS-MH data, and the Utah Automated Geographic Reference Center (AGRC). This data was compiled into GIS layers that were used as overlays to identify critical facilities, municipalities, roads, and residents. The assets that have been identified are based on the best available data during the development of this plan.

The HIRA was initiated through a series of meetings with the Core Planning Team and subject matter experts from the following organizations:

- City and county agencies
- Jordan Valley Water Conservancy District
- Salt Lake City Public Utilities
- Utah Geological Survey
- National Weather Service
- Utah Division of Water Rights
- Utah Forestry, Fire, and State Lands
- Unified Fire Authority
- Salt Lake Valley Health Department

The Planning Team identified the hazards in Table 4 as having the potential to affecting all or a portion of Salt Lake County, based on history of occurrences and/or future probability. Each of these was carried over from the 2009 WFRC Pre-Disaster Mitigation Plan, with the addition of Avalanche and Flu Epidemic.

The HIRA process was aided through the use of FEMA How-to Guidance Documents, FEMA Local Mitigation Planning Handbook, Local Mitigation Plan Review Guide, the Utah State Hazard Mitigation Plan, Utah Natural Hazards Handbook 2008, FEMA 386-1,2,3,7, Disaster Mitigation Act of 2000, 44 CFR Parts 201 and 206, Interim Final Rule, and FEMA Region VIII Crosswalk. The risk assessment process also utilized assistance from local GIS departments using the best available data.

Hazard	How Identified	Why Identified
Earthquake High	• Review of County Emergency Operations Plans • Review of past disaster declarations • Input from City and County Emergency Operations Managers, USGS, UGS, Utah DEM, and community members	• Utah has a 1/5 chance, of experiencing a large earthquake within the next fifty years. • Numerous faults throughout Utah including the Intermountain Seismic Zone. • Yearly, Utah averages approximately 13 earthquakes having a magnitude 3.0 or greater. • Earthquakes can create fire, flooding, hazardous materials incident, transportation, and communication limitations. • The Wasatch Front has recorded large earthquakes in the past and can be expected to experience large earthquakes in the future.
Flood **Low**	• Review of past disaster declarations • Input from City and County Emergency Operations Managers, Utah DWS, UGS, Utah Army Corps of Engineers, Utah DEM, and community members • Review of Flood Insurance Studies, Floodplain maps, and FIRMs	• Several incidents have caused severe damage and loss of life. • Many of the rivers and streams are located near neighborhoods. • Many neighborhoods are located on floodplains, alluvial fans. • Topography and climate lead to cloudburst storms and heavy precipitation can result in flash flooding throughout most of the Wasatch Front.
Wildland Fire High	• Review of County Emergency Operations Plans • Review of Community Wildfire Plans • Input from County Emergency Managers, Utah DEM, Utah FFSL, Utah FS, NWS, FEMA, and local community members	• Serious threat to life and property. • Much of county is at risk • Increasing threat due to urban growth in WUI areas. • Secondary threat associated with flooding, drought, and earthquake. • Additional funding and resources offered by local and state agencies to reduce risk • To increase community awareness.
Slope Failure **Low**	• Input from City and County Emergency Operations Managers, USGS, UGS, NCDC, Utah DEM, and community members	• Have caused damage in the past to residential and commercial infrastructure. • Can be life threatening. • Generally occur in known historic locations therefore risks exist through-out much of the Wasatch Front. • To increase community awareness.
Severe Weather **Mod**	• Review of County Emergency Operations Plans • Review of past disaster declarations • Input from City and County Emergency Operations Managers, Utah Avalanche, Forecast Center, Utah Department of Transportation, and community members	• Damage to communities, homes, infrastructure, roads, ski areas, and people. • Can cause property damage and loss of life. • Results in economic loss. • Lightning is number one cause of natural hazard death in Utah. • Can be costly to recover from. • Affects the young and old more severely.
Dam Failure **Low**	• Review of County Emergency Operations Plans • Input from community members, Utah DWS, Dam Safety Section, Utah DEM • Review of inundation maps	• Can cause serious damage to life and property and have subsequent effects such as flooding, fire, debris flow, etc.. • Many reservoirs located in the county. • Threat to downhill communities. • Subsequent effects include flooding, fire, and debris flows. • To increase community awareness. • To incorporate mitigation measures into existing plans to help serve local residents
Drought Mod	• Review of Utah State Water Plan • Input from community members, Utah DHLS, NWS, NCC, and NCDC	• Affects local economy and residents. • Reduces available water in reservoirs impacting culinary, irrigation, and municipal water supplies. • Drought periods may extend several years. • Secondary threat associated with wildfire. • Utah is the nation's second driest state. • Can impact farming and ranching operations. • Neighboring communities have been affected by culinary and irrigation water shortages

Table Local Hazards Identification

4.3 Hazard Profiles

4.3.1 Hazard 1-Earthquake

4.3.1.1 Location and Extent

The Salt Lake City segment of the Wasatch fault lies within the Intermountain Seismic Belt (ISB), which extends 800 miles from Montana to Nevada and Arizona, and trends from north to south through the center of Utah (The Wasatch Fault, UGS PIS 40). The ISB contains the Wasatch fault; one of the longest and most active normal faults in the world, with a potential for earthquake with a magnitude up to 7.5. The largest earthquakes in Utah occur in the ISB, where at least 35 earthquakes of magnitude 5.0 or greater have occurred since 1850. (UNHH 2008)

The Wasatch Fault traces along the base of the Wasatch mountain range. It is made up of 10 segments that act independently, meaning that a part of the fault ruptures separately as a unit during an earthquake. The Salt Lake City Segment traverses Salt Lake County from north to south, roughly along the eastern foothills of the Wasatch Mountains. Within the Salt Lake City segment of the Wasatch Fault are three smaller segments from north to south known as Warm Springs Fault, Virginia Street Fault and the East Bench Fault. Earthquakes originating in any of the five Wasatch faults pose a direct threat to Salt Lake City.

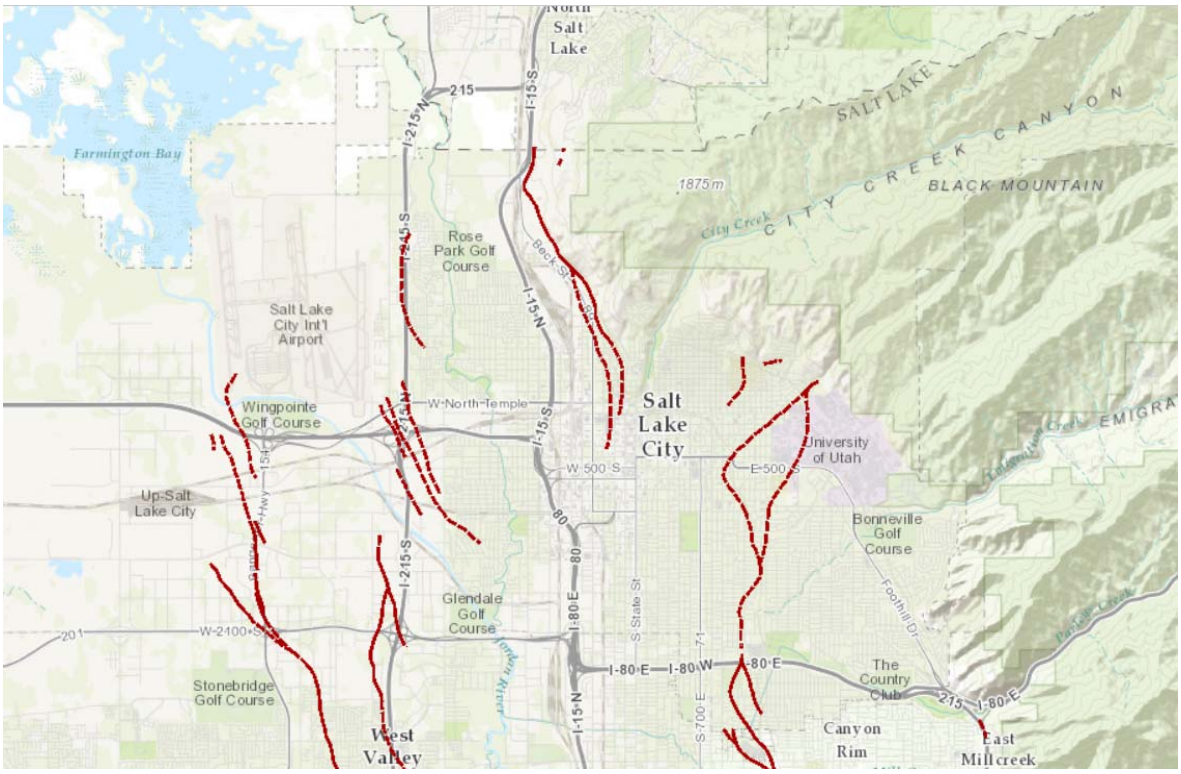


Image of Fault Segments in Salt Lake City

Name	Fault Type	Length (km)	Time of Most Recent Deformation	Recurrence Interval
East Great Salt Lake fault zone, Antelope Island section	Normal	35	586+201/-241 cal yr B.P.	4,200 years
Wasatch fault zone, Salt Lake segment	Normal	43	1,300±650 cal yr B.P.	1,300 years
West Valley fault zone, Granger segment	Normal	16	1,500±200 cal yr B.P.	2,600-6,500 years
West Valley fault zone, Taylorsville segment	Normal	15	2,200±200 cal yr B.P.	6,000-12,000 years

Table. Quaternary Faults, Salt Lake County (UGS 2002, UGS 2006) cal. Yr. B.P.=calendar years before present

4.3.1.2 Range of Magnitude

Utah experiences approximately 700 earthquakes each year, and approximately six of those have a magnitude 3.0 or greater. On average, a moderate, potentially damaging earthquake (magnitude 5.5 to 6.5) occurs every 10 years. Large earthquakes (magnitude 6.5-7.5) occur on average every 50 years (UNHH 2008). The history of seismic activity in Utah and along the Wasatch Front suggests that it is not a matter of "if" but "when" an earthquake will occur. The probability of a large earthquake occurring along the central segments of the Wasatch Front is 13 percent in 50 years, or 25 percent in 100 years. (The Wasatch Fault, UGS PIS 40)

Earthquake Hazard Profile

Potential Magnitude	***X***	**Catastrophic**	**Probability**		**Highly Likely**
		Critical (25-50%)		**X**	**Likely**
		Limited (10-25%)			**Possible**
		Negligible (< 10%)			**Unlikely**
Location	***Fault Activity within the Wasatch area magnitude 5.0 or greater poses a direct threat to Salt Lake City.***				
Seasonal Pattern	None.				
Conditions	Liquefaction potential within areas with shallow ground water. Soil that is comprised of old lakebed sediments. Historic movement along faults. Intermountain Seismic Zone, Wasatch Fault.				
Duration	Actual ground shaking will be under one minute, aftershocks can occur for weeks or even months.				
Secondary Hazards	Fire, landslide, rock falls, avalanche, flooding, hazardous material release, transportation and infrastructure disruptions, essential service disruptions (communications, utilities).				
Analysis Used	Review of hazard analysis plans and other information provided by the University of Utah Seismograph Station, UGS, USGS, FEMA, UDEM, AGRC.				

4.3.1.3 Past Occurrence

Although no surface-faulting earthquakes have occurred on the Wasatch fault since settlement in Salt Lake, evidence of numerous prehistoric events exists in the geologic record (The Wasatch Fault, UGS PIS 40) The segments between Brigham City and Nephi have a composite recurrence interval (average time between earthquake events) for large surface-faulting earthquakes

(magnitude 7.0-7.5) of 300-400 years. The average repeat time on an individual segment is 1,200-2,600 years. The most recent surface-faulting earthquakes occurred about 500 years ago on the Provo and Weber segments, and about 350 years ago on the Nephi segment. (UNHH 2008)

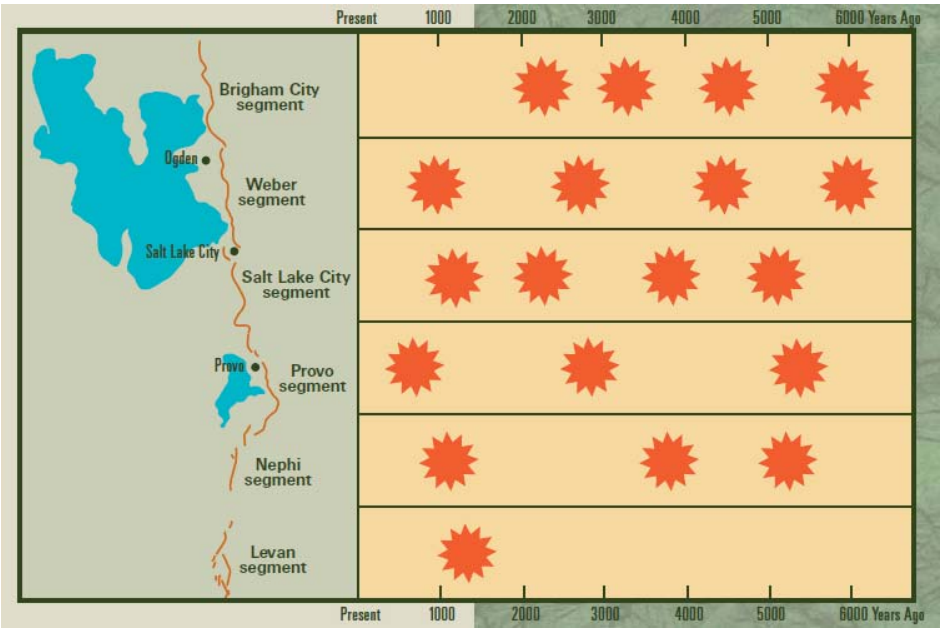


Table Wasatch Fault Segments and Timeline of Major Ruptures
("The Wasatch Fault", Utah Geological Survey Public Information Series 40)

Significant earthquakes have occurred in Salt Lake County within the last 50 years. In 1962, a 5.2 Richter magnitude quake jolted the Magna area. In 1992, a magnitude 4.2 quake shook the southern portion of the County.

Liquefaction is one of the secondary hazards associated with an earthquake and affects nearly all of Salt City. The City is located atop the ancient Lake Bonneville lakebed, which is made up of unconsolidated sandy soils. Much of the valley is also subject to shallow ground water and a relatively high earthquake threat.

4.3.1.3 Future Occurrence

Other faults within Salt Lake County include the West Valley Fault Zone and the East Great Salt Lake Fault Zone. Each of these fault zones has much longer return interval (2,500 years or more) and is not expected to produce a major quake in the near future.

4.3.1.4 Potential Loss Estimates

Building Damage

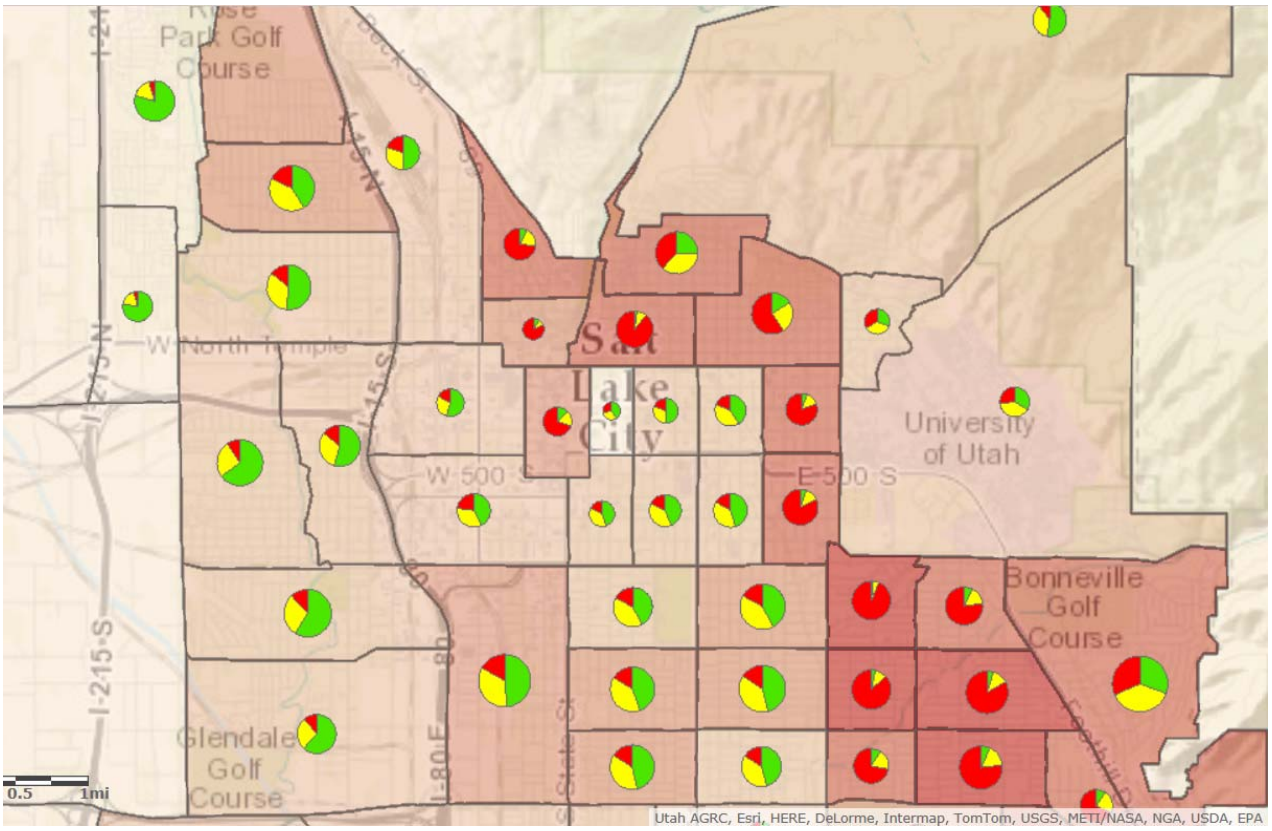
HAZUS-MH classifies building damage into five states: none, slight, moderate, extensive and complete. Table 11 lists the number of buildings by occupancy estimated to sustain moderate to complete levels of damage during an arbitrarily-determined Richter magnitude 5.9 (M5.9)

earthquake scenarios or a probabilistic Richter magnitude 7.1 (M7.1) earthquake scenario. Also listed are the estimated monetary losses to structures, contents/inventory, and income.

Models show Salt Lake City will have $12,249,473,845 of total building economic loss and 7,966,834 tons of debris. As a result of our $32,341 unreinforced masonry buildings 35,786 households will be displaced, 21,629 individuals seeking public shelter, 13,698 casualties and 1,397 life threatening injuries and fatalities.

Category	Number of Structures with > 50% Damage		Category	Estimated Losses	
	Salt Lake M5.9	2500-yr M7.1		Salt Lake M5.9	2500-yr M7.1
Residential	30,342	157,705	Structural Losses	$519,320,000	$3,419,030,470
Commercial	1,896	5,199	Non-Structural Losses	$1,818,647,000	$12,331,504,070
Industrial	495	1,367	Content Losses	$719,709,000	$4,114,455,740
Government	167	475	Inventory Losses	$29,216,000	$175,756,410
Education	51	159	Income and Relocation Losses	$623,140,000	$3,263,449,580
Totals	32,951	164,905	Totals	**$3,710,032,000**	**$23,304,196,270**

Table. Building Damage Counts and Estimated Losses using HAZUS MH



Building Damage Estimates: Red 70-100%, Yellow 30-70%, Green 5-30%

Transportation and Utilities Damage

Damages to transportation and utility infrastructure are in illustrated below. Infrastructure sustaining moderate or worse damage and estimated monetary losses are both shown.

Category	Total	At Least Moderate Damage >50%		Estimated Losses	
		Salt Lake M5.9	2500-yr M7.1	Salt Lake M5.9	2500-yr M7.1
Waste Water Facilities	5	2	4	$44,008,000	$146,243,000
Waste Water Pipelines	3.975 km	637 leaks/breaks	14,005 leaks/breaks	$2,294,000	$50,416,000
Potable Water Pipelines	6,625 km	805 leaks/breaks	17,706 leaks/breaks	$2,900,000	$63,744,000
Natural Gas Pipelines	2,650 km	681 leaks/breaks	14,970 leaks/breaks	$2,452,000	$53,893,000
Electrical Power Facilities	7	3	7	$92,024,000	$343,874,000
Communication Facilities	42	9	34	$242,000	$1,478,000
Highway Bridges	698	126	496	$81,646,000	$468,944,000
Railway Bridges	17	0	8	$9,000	$358,000

Railway Facilities	6	0	6	$3,494,000	$7,525,000
Bus Facilities	2	0	2	$490,000	$1,157,000
Airport Facilities	3	0	3	$2,675,000	$7,450,000
Total Losses				$232,234,000	$1,145,082,000

Table. Damage to Transportation and Utilities

Debris Removal

Table below shows how much debris would be generated by the earthquake and how many loads it would take to remove the debris, based on 25 tons per load. One truck can likely haul one load per hour. A second debris removal issue is landfill space. Fifty thousand tons at a weight-to-volume ratio of one ton per cubic yard would cover more than ten acres to a depth of three feet.

Category	Salt Lake M5.9	2500-yr M7.1
Brick, Wood & Others	581,000 tons / 23,240 loads	3,356,000 tons / 134,240 loads
Concrete & Steel	1,195,000 tons / 47,800 loads	7,678,000 tons / 307,120 loads

Table . Debris Generated/Number of Loads

Fires Following an Earthquake

Multiple ignitions and broken water mains following an earthquake can make firefighting nearly impossible. HAZUS-MH uses estimated building damages, loss of transportation infrastructure and estimated winds to calculate the estimated area that would be burned following an earthquake.

Category	Number of Structures	
	Salt Lake M5.9	2500-yr M7.1
Ignitions	49	80
Persons Exposed	806	2,116
Value Exposed	$50,232,000	$120,188,000

Table 14. Fire Following Event, Population Exposed, and Building Stock Exposed

Casualties

Table below estimates casualties likely to occur during each earthquake scenario. The nighttime scenario (2 a.m. local time) assumes a primarily residential concentration of persons, the daytime scenario (2 p.m. local time) a commercial concentration, and the commute scenario (5 pm. local time) a concentration of persons on commuting routes. Categories of casualties include those not requiring hospitalization (minor), those requiring treatment at a medical facility (major), and fatalities.

Night Event	Salt Lake	2500-yr M7.1	Day Event	Salt Lake	2500-yr M7.1	Commute	Salt Lake	2500-yr M7.1

	M5.9			M5.9		Event	M5.9	
Minor	1,024	10,475	**Minor**	1,883	17,110	**Minor**	1,432	13,442
Major	219	3,224	**Major**	502	6,192	**Major**	369	4,688
Fatalities	44	758	**Fatalities**	122	1,742	**Fatalities**	87	1,258

Table . Casualties

4.3.1.5 Mitigation Strategy

Goal 1 – Reduce earthquakes losses to infrastructure

Objective 1.1 (Priority HIGH): Encourage retrofit and rehabilitation of highly susceptible infrastructure

Action 1: Identify structures at risk to earthquake damage through HAZUS data and building inspections.

Time Frame: Ongoing

Funding: Municipal

Estimated Cost: Minimal

Action 2: Research feasibility of an incentive program for retrofitting privately-owned buildings, particularly unreinforced masonry.

Time Frame: Ongoing

Funding: Municipal

Estimated Cost: Minimal

Action 3: Complete seismic rehabilitation/retrofitting projects of public buildings at risk. For example the City and County building has undergone seismic retrofitting and then new Public Safety Building was constructed to withstand 7.5 earthquake

Time Frame: Complete

Objective 1.2 (Priority MEDIUM): Improve public education regarding earthquake risks to unreinforced masonry buildings

Action 1: Provide educational materials to unreinforced masonry home and business owners. Particularly marketing Fix the Bricks Program to educate home and business owners about masonry reinforcement.

Time Frame: Ongoing

Funding: Municipal

Estimated Cost: Minimal

4.3.2 Hazard 2-Flooding

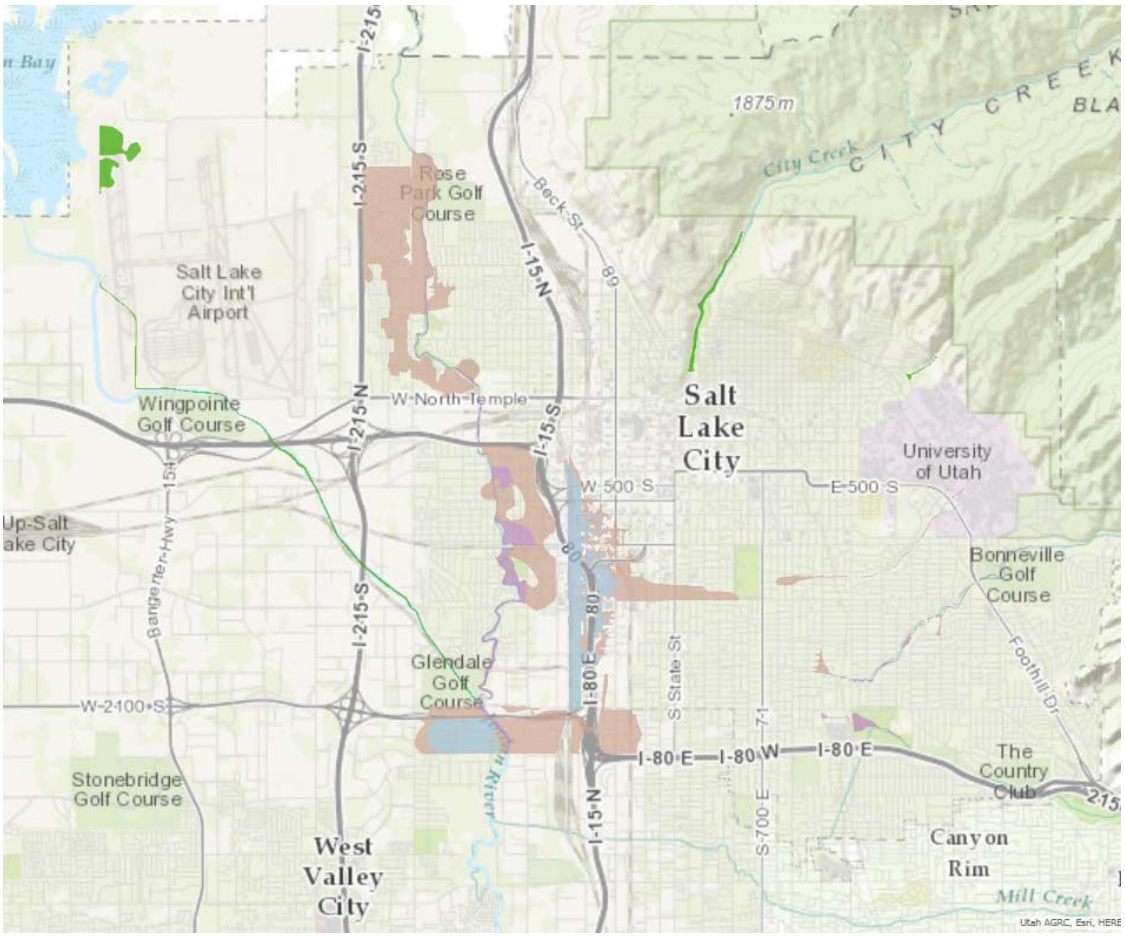
Although located in a semi-arid region, Salt Lake City is subject to flash flooding due to heavy rainfall and rapid snowmelt. The Federal Emergency Management Agency (FEMA) has rated floodplains along the Jordan River and its tributaries for expected flood heights and areas susceptible to 100-year flood-frequency inundation. Significant flood mitigation measures were implemented following the major floods of 1983-84 that greatly reduced the flood threat to Salt Lake City. Of the many causes for flooding Salt Lake City's most likely event is from Post-fire debris

flow flooding. Enhanced runoff conditions from a fire-damaged watershed can result in debris flow flooding. As fires burn, they destroy vegetation and leave soils in a hydrophobic state, resulting in greater peak flows.

4.3.2.1 Location and Extent

The Jordan River's four major northern tributaries (City, Red Butte, Emigration and Parley's Creeks) are diverted into storm sewers beneath the city. These storm sewers have sufficient capacity to handle the excessive runoff, but must be continually maintained to prevent debris from accumulating. Public works agencies have built debris basins, installed stream-bank protection, and regularly dredge stream channels to reduce flood hazards. Parley's Creek has flood storage capacity at Mountain Dell and Little Dell Reservoirs and is routed through a retention basin in Sugarhouse Park. Big and Little Cottonwood Creeks and have a number of smaller flood storage lakes and ponds providing some flood protection, such as Wheeler Historic Farm. In Salt Lake City, Emigration Creek and Red Butte Creek come together at 700 East and 1300 South and can be discharged in or bypass Liberty Park pond. Parley's Creek discharges to the 1300 South drain at State Street.

Areas to monitor include 13th South between 700 East and State Street, 7th West and North Temple Streets. Retention ponds are also used to store runoff from commercial and residential development areas.



4.3.2.2 Range of Magnitude

Flooding Hazard Profile

Potential Magnitude			Probability		
		Catastrophic			Highly Likely
		Critical (25-50%)			Likely
	X	Limited (10-25%)		X	Possible
		Negligible (< 10%)			Unlikely
Location	Fire damaged areas where soil is in hydrophobic				
Seasonal Conditions	Spring, heavy rainfall, and spring snowmelt runoff.				
Conditions	Thunderstorms w/heavy rainfall, extended wet periods.				
Duration	Flooding can last anywhere from hours to days and even months.				
Secondary Hazards	Raw sewage/health risk, electrical fires, gas spills.				
Analysis Used	Review of FIS, FIRM, Army Corp of Engineers Flood Study.				

4.3.2.3 Past Occurrence

History: The following flood events are of notable significance:

2011 - Large snowpack meant larger resulting spring runoff flows

2010 - Spring snowmelt combined with heavy rains caused several streams to overtop their banks

1987 – Great Salt Lake reached its all-time maximum water level (4211.6 feet)

1983 - Large snowpack was coupled with a rain-on-snow event, (City Creek diverted down State Street)

1983/1984 - Large snowpack overwhelmed Utah Lake and affected Jordan River downstream

1952 - Rapid melt of a large snowpack

Salt Lake City implemented mitigation efforts post 1983-84 floods and subsequently there are no repetitive loss claims due to flooding identified under NFIP.

The City's Community Development Director oversees enforcement of floodplain management requirements adopted by the City, including regulating new construction in Special Flood Hazard Areas (SFHAs); Floodplain identification and mapping, including any local requests for map updates; description of community assistance and monitoring activities.

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4.3.2.4 Vulnerability Assessment

A community assessment exercise was performed at the Risk MAP Discovery Meeting and at several community follow-up meetings. Community representatives worked together to gain a comprehensive understanding of previous flooding events and areas of concern (including future development areas), existing community studies that can be leveraged as part of the Risk MAP project, and the status of flooding mitigation actions from the Wasatch Front Regional Council Natural Hazard Pre-Disaster Mitigation Pan. The assessment exercise also helped to identify vulnerable community assets including critical facilities, socially vulnerable populations, and areas of mitigation interest. The participants identified and prioritized several future flood study needs. A number of potential mitigation actions were identified and will be described in the Mitigation Strategies section.

4.3.2.5 Mitigation Strategies

Goal 1 – Protection of life and property before, during and after a flooding event

Objective 1.1 (Priority MEDIUM): Provide 100% availability of the National Flood Insurance Program (NFIP).

Action # 2: Encourage communities to actively participate in NFIP.
Time Frame: Ongoing
Funding: Municipal
Estimated Cost: Minimal

Objective 1.2 (Priority MEDIUM): Encourage appropriate flood control measures, particularly in new developments.

Action 1: Determine potential flood impacts and identify areas in need of additional flood control structures.
Time Frame: Ongoing
Funding: Municipal
Estimated Cost: Minimal

Action 2: Address identified problems through construction of debris basins, flood retention ponds, energy dissipaters or other flood control structures.
Time Frame: Ongoing
Funding: Municipal
Estimated Cost: Minimal

Objective 1.3 (Priority HIGH): Provide maintenance, repairs and improvements to drainage structures, storm water systems and flood control structures.

Goal 2 – Reduce threat of unstable or inadequate flood control structures

Objective 2.1 (Priority HIGH): Reduce potential for failure of flood control structures.

Action 1: Identify and assess structures for deficiencies.
Time Frame: Ongoing
Funding: Municipal

Action 2: Modify structures as needed to address deficiencies.
Time Frame: Ongoing
Funding: Municipal
Estimated Cost: Minimal

Jurisdiction	1% Annual Chance Building and Contents Structure Exposure	1% Annual Chance Building and Contents Loss*	1% Annual Chance Loss Ratio**	0.2% Annual Chance Building and Contents Structure Exposure	0.2% Annual Chance Building and Contents Loss	0.2% Annual Chance Loss Ratio
Salt Lake City	424	$ 14,806,691	0.034%	1,835	$ 24,286,386	0.06%
County Total	**1,533**	**$ 118,217,947**		**6,763**	**$ 320,309,430**	**0.23%**

Structure Exposure and HAZUS Generated Losses

***Data not available for 1% annual chance loss calculation for x structures. More detail on structures**

without associated losses available in jurisdictional tables. Structure count is accurate.

**Ratio of damages/losses by hazard and total building inventory.

The following data for flooding is carried over from the WFRC Pre-Disaster Mitigation Plan and was obtained from HAZUS-MH**. Vulnerability was assessed for both 100-year (NFIP Zone A) and 500-year (NFIP Zone B or Zone X (shaded) flood events. Analysis was completed using Digital Flood Insurance Rate Maps (DFIRM). Only streams that contained detailed flood cross-section data could be used. Flooding from the Great Salt Lake was not included. Consequently, the results should be considered conservative. (***For a more detailed explanation of the loss estimation methodology of HAZUS-MH MR2, please see Part VI of the WFRC Mitigation Plan or the HAZUS-MH Technical Manual (Flood Model) at www.fema.gov/hazus).*

4.3.3 Hazard 3-Wildfire

Wildfires are particularly concerning in the wildland-urban interface. The wildland-urban interface (WUI) is the line, area or zone where structures or other human development meet or intermingle with undeveloped wildland or vegetative fuel. Homes, storage sheds, recreational facilities, transmission lines and other buildings may meet or intermingle with trees, brush, and grasses in the WUI. The three conditions that affect fire behavior are topography, vegetation and weather.

Topography: Topography includes factors such as slope, aspect and elevation. Fires spread faster upslope because fuels are closer to flames. Aspect influences fuel moisture content. Fuels tend to be drier on south and west-facing slopes. Higher elevation is related to cooler temperatures and higher relative humidity, as well as changes in vegetative fuel types.

Vegetation: The type of vegetation has a major effect on how quickly a fire will spread. For example, light grasses burn rapidly, whereas heavy, dense fuels like Douglas fir burn slowly but with greater intensity. Different fuels burn at different rates of spread, intensity, and will resist control to different degrees.

Size, continuity and compactness also affect the fuel's rate of spread. Large fuels do not burn as readily as small fuels, and take more heat to ignite. Small fuels ignite easier and fire will spread more rapidly through them. Continuity describes how a fuel is arranged horizontally. Fuels that are broken up in patches burn unevenly and slower than uniform fuels. Compactness is how fuel is arranged vertically. Compact fuels burn slower than tall, deep fuels that have more oxygen available

Weather: Weather (temperature, humidity, precipitation, and wind) affects the ease with which a fuel ignites, the intensity at which it burns, and how easy control may be. High temperatures heat fuels and reduce water content, which increases flammability. A decrease in relative humidity causes a proportionate decrease in fuel moisture, promoting easier ignition and more intense burning. Wind carries the heat from a fire into unburned fuels, drying them out and

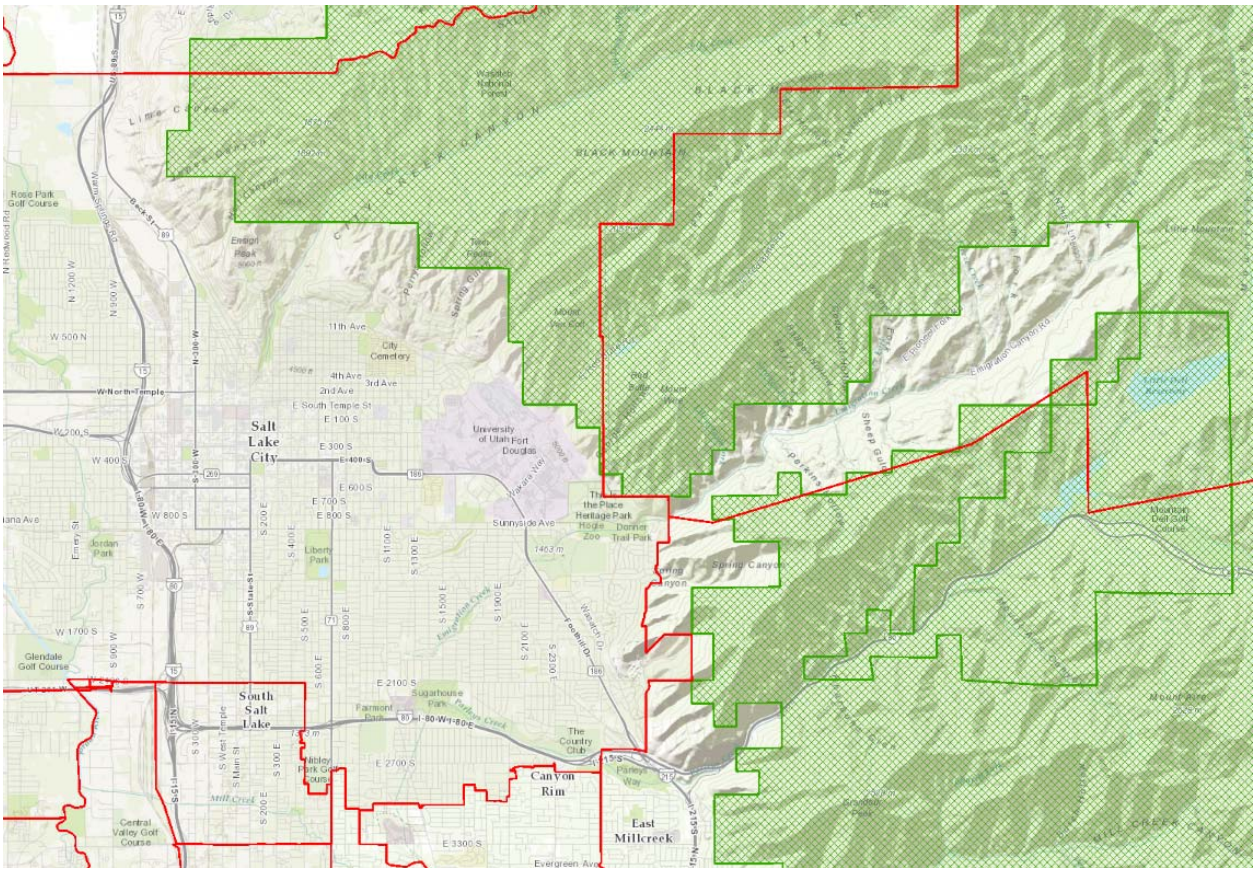
causing them to ignite easier. The wind may also blow burning embers into unburned areas ahead of the main fire that may start spot fires.

Wildfire removes vegetation that protects soil from excessive rainfall and resulting runoff. It also damages soil by making the soil hydrophobic, or water repellent. These conditions contribute to depletion of wildlife resources, soil erosion, water runoff, and in some cases severe slope failures and debris flows .

Providing adequate fire protection in the WUI can be difficult. Local suppression methods and resources may not be suited to wildfire suppression, and personnel can become easily overwhelmed when multiple structures are threatened simultaneously. Energy output from a wildfire may make protection of homes almost impossible and involves tremendous danger to firefighters and homeowners.

4.3.3.1 Location and Extent

The portions of Salt Lake City that could experience significant amount of destruction due to a wildland fire include the foothills and the bench areas on or near the Wasatch Range. These WUI areas are threatened most because of the amount of forested lands and the increasing population growth spreading into the foothills. Another concern is vegetation type in these areas such as sagebrush, mountain scrub oak, cheat grass, pinion and juniper trees, and rural and riparian vegetation. Sagebrush and mountain shrub burn hot and fast, spreads easily and is found throughout the county. During prime burning conditions (hot, dry and windy) the pinion juniper class will burn. The image below illustrates where Salt Lake City's WUI occurs and includes fire response boundaries (red lines) in conjunction with the forestry service areas (green patches).



4.3.3.2 Range of Magnitude

Past wildfires in Salt Lake City have had a significant impact on watersheds, resulting in slope failure, debris flows and other forms of erosion. State and local agencies have worked together to enhance ordinances and other measures to protect these watersheds.

Wildfire Hazard Profile

Potential Magnitude			Probability		
		Catastrophic			**Highly Likely**
	X	**Critical (25-50%)**		X	**Likely**
		Limited (10-25%)			**Possible**
		Negligible (< 10%)			**Unlikely**

Location	Wildland-Urban Interface (WUI) zones near the foothills and in forested areas
Seasonal Pattern	June-October.
Conditions	Areas affected by drought; heavily overgrown and dry brush and debris; lightning and human triggers.
Duration	Days to months; depends on climate and fuel load as well as resources (financial, manpower) to extinguish the fire.
Secondary Hazards	Landslides, debris flows/flash floods, erosion, traffic accidents, air pollution.
Analysis Used	Review of plans and data provided by US Forest Service, FFSL, FEMA, AGRC, County Hazard Analysis Plans, WWA, and UDEM.

4.3.3.3 Past Occurrence

Several notable wildfires have occurred in Salt Lake County since the last Mitigation Plan was completed. These include the Corner Canyon Fire in Draper City in August 2008, The Machine Gun fire in Herriman City in September, 2010, and the Rose Crest fire and Pinion Fire also in Herriman City in 2012. These fires prompted major fire response, required evacuations of large numbers of citizens, and created the threat of debris flows in following years. Even though these fires did not occur within Salt Lake City boundaries they impacted our resources and capabilities due to mutual aide response.

4.3.3.4 Future Occurrence

As population growth continues, pressure to develop in WUI areas is likely to increase the threats associated with fire. Mitigation measures will need to be recognized and enforced to reduce these threats.

4.3.3.5 Vulnerability Assessment

The next two tables estimate the total area, population and buildings vulnerable to wildland fire for Salt Lake City. These values are based on a new GIS analysis to account for population growth and new structures. Salt Lake County Assessor data and 2010 Census data were overlaid on the located within Moderate, High or Extreme wildfire risk. Wildfire Hazard Risk data is shown in Map 10 to determine population and structures.

Incorporated Areas	Total Population Affected	Total Households	Total Structures		
				Residential (Total Assessed Value)	**Commercial (Total Assessed Value)**
Salt Lake City	2680	1095	611	410 $83,640,000	60 $209,789,232

Table. Population vulnerability and structures in areas of Moderate or Greater Hazard, based on BLM Wildfire Hazard data. 2007

Communities At Risk	Fire Occurrence	Fuels Hazards	Values Protected	Fire Protection Capability	Overall Score
Salt Lake City	2	3	2	1	8

4.3.3.6 Mitigation Strategy

Goal 1 – Community education on wildfire hazard

Objective 1.1 (Priority HIGH): Reduce risk from wild fire through education programs

Action 1: Increase public awareness through “Fire Wise” program.

Time Frame: Ongoing

Funding: Municipal

Estimated Cost: Minimal

Action 2:Educate homeowners on the need to create defensible space near structures in WUI.
Time Frame: Ongoing
Funding: Municipal
Estimated Cost: Minimal

Goal 2 – Improve safety from wildfire hazards through planning, protective actions and improved fire response capabilities

Objective 2.1 (Priority HIGH): Assist homeowners with creating defensible space near structures in WUI areas.

Action 1:Designate and promote county-wide annual initiative for clearing fuels.
Time Frame: Ongoing
Funding: Municipal
Estimated Cost: Minimal

Action 2: Provide waste removal, such as chipping of green waste by Public Works, following designated fuel clearing day/week.
Time Frame: Ongoing
Funding: Municipal
Estimated Cost: Minimal

Objective 2.2 (Priority HIGH): Improve evacuation capabilities for WUI areas.

Action 1: Work with experts and communities to develop or update evacuation plans.
Time Frame: Ongoing
Funding: Municipal
Estimated Cost: Minimal

Action 2: Evaluate transportation network and address needed improvements to facilitate evacuation and emergency response.
Time Frame: Ongoing
Funding: Municipal
Estimated Cost: Minimal

Objective 2.3 (Priority HIGH): Complete wildfire protection projects

Action 1: Reduce fuels around publicly owned structures.
Time Frame: Ongoing
Funding: Municipal
Estimated Cost: Minimal

Action 2: Implement fire breaks and other protective measures.
Time Frame: Ongoing
Funding: Municipal
Estimated Cost: Minimal

4.3.4 Hazard 4-Landslide and Slope Failure

Slope failure is any type of ground disturbance on a surface with any slope, not flat ground. Landslides, also referred to as slope failures, are classified according to the type of movement and material involved. Movement types include falls, topples, slides, lateral spreads and flows. Materials include rocks, debris (coarse-grained soil), and earth (fine-grained soil). The most common landslides include rack falls, rock topples, debris slides, debris flows, earth slides, and earth flows.

Slope instability has not been a major problem in the Salt Lake area. Yet, as development moves higher into the foothills and nearby canyons, slope stability is becoming a major issue affecting future development. Types of slope instability in the Salt Lake area include rock fall, debris flow and debris flood, rotational and transitional slumps, and earth flows. During the unusually wet springs of 1983 and 1984, numerous slope failures in the Wasatch Range resulted in debris flows and floods that caused extensive damage to urban areas north of Salt Lake City. Similar failures occurred in canyons adjacent to Salt Lake City, but none reached developed areas.

4.3.4.1 Location and Extent

Landslides and debris flows are most common in the foothills along the base of the Wasatch Mountain Range from wet climatic conditions. Some major landslide areas include the Grand View Peak rockslide in upper City Creek Canyon. As urbanization spreads into geologically unstable areas the risk to life and property increases.

4.3.4.2 Range of Magnitude

Landslide and slope failure Hazard Profile

Potential Magnitude		**Catastrophic**	**Probability**		**Highly Likely**
		Critical (25-50%)		**X**	**Likely**
	X	**Limited (10-25%)**			**Possible**
		Negligible (< 10%)			**Unlikely**
Location	Foothills and nearby canyons				
Seasonal Pattern	Spring and summer months.				
Conditions	Usually caused by the stress release of over-weighted soils or loosening of rock and debris by wind, water or ground shaking.				
Duration	*Landslides/Rock falls:* Hours to Months. *Debris flows*: Instantaneous.				
Secondary Hazards	Flooding (natural dams), traffic accidents.				
Analysis Used	Information and maps provided by UGS, UDEM, AGRC.				

4.3.4.3 Past Occurrence

A cluster of historical landslides is visible from the hairpin turn in Bonneville Boulevard in lower City Creek Canyon in Salt Lake City. Movement of the largest and most damaging of these landslides has been monitored since June 1998 by the UGS and the Salt Lake City surveyor. Since

June 1998, the toe of the landslide has moved about 24 feet, and the main scarp has offset the ground surface about the same amount. Like most recurrently active landslides in northern Utah, movement typically occurs between March and June as ground-water levels rise following the snowmelt. Four houses at the top of the slide are threatened, and efforts to protect one house have cost in excess of $300,000. In 2006 the landslide reactivated again, moving about 2 feet, despite drier-than-normal conditions in Salt Lake City. (Utah Hazard Mitigation Plan)

Subsidence is possible in City Creek, Emigration, Parley's, and Big Cottonwood Canyons due to the prevalence of dissolvable limestone. Subsidence can also occur in the Avenues area of Salt Lake City due to collapsible soils that are compactable upon wetting.

Incorporated Areas	Acres Affected	Population Affected	Structures in Areas of Moderate or Greater Hazard	
			Residential (Replacement Value)	Commercial (Annual Sales)
Salt Lake City	15,701	15,762	6,327 $1,294,504,200	176 $47,480,280

Table . Vulnerability Assessment for Landslides

4.3.4.4 Mitigation Strategy

Goal 1 – Reduce or eliminate the threat of slope failure damage

Objective 1.1 (Priority MEDIUM): Reduce the threat of slope failures following wild fires.

Action 1: Develop protocol for working with State and Federal agencies in reducing the impact of post-fire debris flow hazard.

Time Frame: Ongoing
Funding: Municipal
Estimated Cost: Minimal

Objective 1.2 (Priority MEDIUM): Monitor historic landslide areas.

Action 1: Coordinate with Utah Geological Survey and other agencies to understand current slope failure threats/potential.

Time Frame: Ongoing
Funding: Municipal
Estimated Cost: Minimal

Objective 2.1 (Priority HIGH): Address landslide hazards in new sub-divisions.

Action 1: Utilize recommendations provided by State Geologic Hazards Working Group to address land-use and planning for new developments.

Time Frame: Ongoing
Funding: Municipal
Estimated Cost: Minimal

4.3.5 Hazard 5-Severe Weather

Severe weather over northern Utah can have a dramatic impact on regional commerce, transportation and daily activity and is a major forecast challenge for local meteorologists. The region is characterized by intense vertical relief with the Great Salt Lake and surrounding lowlands located near 4,300 ft above mean sea level (MSL) while the adjoining Wasatch Mountains to the east reach as high as 11,000 ft MSL. This relief has major impact on winter storms and results in large contrasts in average annual precipitation.

4.3.5.1 Types of Weather Events

Vulnerability Assessment

Severe Storms: Severe storms can include thunderstorms, lightning, hailstorms, heavy snow or rain. These storms are generally related to high precipitation events during the summer and winter months and can happen anywhere in the region. Damage can be extensive especially for agriculture, farming, and transportation systems; they can also disrupt business due to power outages.

Severe Thunderstorms: Severe thunderstorms are storms that either produce tornadoes, winds 58 mph or greater, wind damage, and/or hail three-quarters of an inch or larger in diameter. Thunderstorms can also lead to flash flooding from heavy rainfall.

Hailstorms: Hailstorms occur when freezing water (in thunderstorm clouds) accumulates in layers around an icy core generally during the warmer months of May through September. Hail causes damage by battering crops, structures and automobiles. When hailstorms are large, damage can be extensive, especially when combined with high winds.

Heavy Precipitation: Heavy amounts of precipitation from rain or snow can result in flash flood events. The Wasatch Front has been susceptible to these types of storms because of close proximity to the mountain ranges.
Major winter storms can produce five to ten times the amount of snow in the mountains than in the valley locations. Heavy snow can cause a secondary hazard in avalanches.
Much of the valley's development has occurred on old alluvial fans from the canyon mouths. During heavy rain events, water and debris collect on these same alluvial fans, damaging residential, commercial property and infrastructure.

Tornado: A tornado is a "violently rotating column of air extending from a thunderstorm to the ground". Some tornadoes can have wind speeds greater than 250 mph with a damage zone 50 miles long and greater than a mile wide. Although they are less common in the Intermountain Region tornados have occurred in Salt Lake City. Historically, atmospheric conditions have not been favorable for tornado development in Salt Lake due to a dry climate and mountainous terrain. Utah is

one of the lowest ranked in the nation for incidences of tornadoes with only one F2 or stronger tornado every seven years.

4.3.5.2 Past Occurrence

Winter Storms: Winter storms can pose a significant threat due to vehicle traffic accidents on icy roads, prolonged exposure to cold, damage to electrical, telephone or communication systems from ice or heavy snow accumulation, and indirectly related health threats such as individuals suffering heart attacks while shoveling snow. Prolonged exposure to cold can cause frostbite or hypothermia and can become life threatening. Winter weather can also have significant economic costs associated with snow removal, revenue and wage losses from road and airport delays or closures, flooding damage from rapid snowmelt, and agricultural and timber losses from frost and ice.

Fog: Temperature inversions often occur during the winter months as a result of high pressure trapping cold air in the valley. These inversions keep cold, moist air trapped on the valley floor forming super-cooled fog. This fog can cause visibility restrictions and icy surfaces. Wind is needed to clear the inversion and fog. The Great Salt Lake has been shown to affect the prevalence of fog, especially when lake levels are high.

Extreme Temperatures: Temperatures in Utah can reach the extreme ends of the thermometer. Winter months often experience temperatures below zero degrees Fahrenheit. Summer temperatures regularly reach into the nineties with many days above 100 degrees Fahrenheit. Drastic temperature changes also occur, even in matter of hours. Temperature swings in such a short period of time can cause severe emotional stress in people.

Sub-zero temperatures occur during most winters; however, prolonged periods of extremely cold weather are infrequent. An exception was January 2013, the coldest month on record for Salt Lake City since 1949, with a mean temperature of 19.4 degrees (10.1 degrees below normal), average daily maximum temperature of only 26.6 degrees, and extended periods of inversions. January is generally the coldest month of the year. Historically, extreme cold in the region has disrupted agriculture, farming and crops. Especially vulnerable to extreme cold are the young, elderly, homeless and animals. Wind chill can further the effects of extreme cold.
Extreme heat is “summertime weather that is substantially hotter and/or more human than average for a location at that time of year”. Extreme heat not only causes discomfort, but personal health can be affected through heat cramps, heat exhaustion or heat stroke, particularly affecting vulnerable populations such as the very young, elderly, poor, and homeless. Extreme heat places a substantial burden on power grids through widespread use of evaporative coolers and air conditioning. This strain can lead to brownouts or blackouts leaving many without power.

Freezing Rain: Freezing rain is rare in Salt Lake City, but occurs on occasion. A freezing rain storm occurred along the Wasatch Front in the record cold January of 2013, causing the closure of all runways at the Salt Lake City International Airport and resulting in numerous traffic accidents.

Tornado: Most tornadoes in Utah typically have winds less than 110 mph (F2 or smaller), and no wider than 60 feet and are on the ground no longer than a few minutes. Tornado distribution for the region suggests many tornadoes are funnel clouds aloft coming into contact with the increasing elevation of Salt Lake City's foothills and mountains. Despite this fact, interactions of the relatively cool air of the Great Salt Lake and relatively warm air of urban areas could create situations more favorable for tornado development. This phenomenon possibly contributed to the formation of the August 1999 Salt Lake City tornado. The $170 million in damages caused by this tornado make it the costliest disaster in Salt Lake history.

4.3.5.3 Mitigation Strategy

Goal 1: Reduce threat of loss of life or property due to extreme weather events

Objective 1.1 (Priority LOW): Maintain status as a StormReady Community

Action 1: Maintain Hazardous Weather Operations Plan according to StormReady requirements.
Time Frame: Ongoing
Funding: Municipal
Estimated Cost: Minimal

Objective 1.2 (Priority MEDIUM): Increase awareness of information services provided by NWS.

Action 1: Meet with NWS representative on an annual basis to receive information on new services and alerts available.
Time Frame: Complete
Funding: N/A
Estimated Cost: N/A

Action 2: Assist NWS in making other agencies and departments aware of available resources.
Ongoing: Salt Lake City (all city departments represented at meetings w/NWS),
Time Frame: Ongoing
Funding: Municipal
Estimated Cost: Minimal

Objective 1.3 (Priority HIGH): Examine the vulnerability of attendees at large event venues to extreme weather events.

Action: Work with the NWS to develop large event venue weather safety and evacuation procedures.
Time Frame: Ongoing
Funding: Municipal

4.3.6 Hazard 6-Dam Failure

Dams are usually man-made, and therefore not inherently naturals hazards; however, dam failures can occur by natural hazard loading events. The impacts of a dam failure can also be similar to natural flood events; however, they are often more sudden and violent than normal stream floods. Causes include breach from flooding or overtopping, ground shaking from earthquakes, settlement from liquefaction, slope failure and slumping, internal erosion from piping, failure of foundations and abutments, outlet leaks or failures, and internal weakening caused by vegetation and rodents. Possible effects include flooding, silting, loss of water resources, loss of property, and loss of life.

4.3.6.1 Location and Extent

There are 3 dams located in Salt Lake City. These dams are built by different agencies, and may serve various functions such as flood control, water storage, recreation, and power generation. The dam safety hazard is classified as no threat to high risk by the State Engineer. Hazard ratings are determined by downstream uses; size, height and volume; and incremental risk/damage assessments. This classification is based upon the damage caused if the dam were to fail, not the dam's probability of failure. Therefore, the classification of a high hazard dam does not mean that the dam has a high probability of failure. Utah Division of Water Rights inspects high-hazard dams annually, moderate-hazard dams biennially, and low-hazard dams every five years (Living With Dams, UNHH 2008).

Name	Rating
Little Dell	High
Mountain Dell	High
Red Butte Dam	High

Table 26. High and Moderate Hazard Dams, Salt Lake City *(Source: Utah Division of Water Rights)*

4.3.6.2 Range of Magnitude

Dam Failure Hazard Profile

Potential Magnitude		**Catastrophic**	**Probability**		**Highly Likely**
	X	**Critical (25-50%)**			**Likely**
		Limited (10-25%)		**X**	**Possible**
		Negligible (< 10%)			**Unlikely**
Location	Little Dell, Mountain Dell, and Red Butte Dam				
Seasonal Conditions	*Rainy Day Failure:* Spring, late summer *Sunny Day Failure:* Anytime				
Conditions	*Rainy Day Failure* happens mainly during heavy precipitation events, can have some warning time. *Sunny Day Failure* can happen anytime without warning.				
Duration	Hours or days - depends on spillway type and area, maximum cubic feet per second (cfs) discharge, overflow or breach type and dam type.				

Secondary Hazards	Raw sewage/health risk, electrical fires, gas spills.
Analysis Used	Review of BOR inundation maps and plans, FIS, Utah Division of Water Rights.

4.3.6.3 Past Occurrence

No record was found of dam failure incidents within Salt Lake City.

4.3.6.4 Vulnerability Assessment

According to the 2011 Utah Hazard Mitigation Plan, a hazard evaluation designed by the Federal Energy Regulatory Commission FERC, compiled a ranking of high priority dams based on a number of variables which include: public access, population at risk, breach flow, inundation depth, and dam type. 3 of the 50 highest priority dams are located within Salt Lake City.

1. Mountain Dell
2. Little Dell
10. Red Butte Dam

4.3.6.5 Mitigation strategy

Goal 1 – Include dam failure inundation in future planning efforts.

Objective 1.1 (Priority MEDIUM): Review current State dam safety information on all identified high hazard dams in the County.

Action 1: Include dam inundation maps in current City Emergency Operations Plans.
Time Frame: Not Necessary
Funding: N/A
Estimated Cost: N/A

Action 2: Utilize inundation maps to identify potential evacuation areas and routes.
Time Frame: Not Necessary
Funding: N/A
Estimated Cost: N/A

4.3.7 Hazard 9-Drought

Because the Salt Lake is a desert climate, there have always been periods of intermittent drought. Measures must be taken to conserve water and to address water shortages for both culinary and agricultural use.

According to the National Drought Mitigation Center, drought is a “deficiency of precipitation over an extended period of time, resulting in a water shortage for some activity, group, or environmental sector.” Although variation in the amount of precipitation recorded each year is normal, a drought is beyond these norms in terms of low precipitation for an extended period or over a large area. While most natural hazards are sudden and result in immediate impacts, droughts “sneak up on us quietly disguised as lovely sunny weather” (McKee, Doesken, and Kleist 2005) and can last a long time resulting in significant socioeconomic impacts. Drought can be

categorized according to unique characteristics and may be thought of as phases of the same drought (UNHH 2008).

- Meteorological drought: a measure of departure of precipitation from normal for a particular location.
- Agricultural drought: where the amount of moisture in the soil no longer meets the needs of a particular crop.
- Hydrological drought: when surface and subsurface water supplies are below normal.
- Socioeconomic drought: when dry conditions persist long enough and are severe enough to impact sectors beyond the agricultural community, such as community drinking supply and other social and economic enterprises.

4.3.7.1 Range of Magnitude

Drought Hazard Profile

Potential Magnitude		***Catastrophic (>50%)***	***Probability***		***Highly Likely***
		Critical (25-50%)		***X***	***Likely***
	X	***Limited (10-25%)***			***Possible***
		Negligible (< 10%)			***Unlikely***
Location	Citywide.				
Seasonal Pattern	Impacts typically noticeable in summer, conditions can be year round.				
Conditions	*Meteorological Drought:*	Lack of precipitation			
	Agricultural Drought:	Lack of water for crop production			
	Hydrologic Drought:	Lack of water in the entire water supply			
	Socioeconomic Drought:	Lack of water sufficient to support population			
Duration	Months, Years				
Secondary Hazards	Wildfire, dust storms, air quality.				
Analysis Used	National Weather Service, Utah Climate Center, Utah Division of Water Resources, Newspapers, Local input.				

Although the agricultural community is usually the most heavily impacted by drought, direct and indirect impacts extend into economic, social, or environmental sectors as well (UNHH 2008).

4.0 or more	Extremely wet
3.0 to 3.99	Very wet
2.0 to 2.99	Moderately wet
1.0 to 1.99	Slightly wet
0.5 to 0.99	Incipient wet spell
0.49 to -0.49	Near normal
-0.5 to -0.99	Incipient dry spell
-1.0 to -1.99	Mild drought

-2.0 to -2.99	Moderate drought
-3.0 to -3.99	Severe drought
-4.0 or less	Extreme drought

Table. Palmer Drought Severity Index (NDMC 2006)

The Palmer Drought Severity Index (PDSI) developed by Wayne Palmer in the 1965, measures drought severity using temperature, precipitation and soil moisture (Utah Division of Water Resources 2007a). The PDSI has become the "semi-official" drought index as it is standardized across various climates. The index uses zero as normal and assigns a number between +6 and -6, with dry periods having negative numbers and wet periods expressed using positive numbers (NDMC 2006).

Times of extended drought can turn into socioeconomic drought, or drought that begins to affect the general population. When this occurs, reservoirs, wells and aquifers are low and conservation measures are required. Some forms of water conservation are water-use restrictions, implementation of secondary water or water recycling and xeriscaping. Other conservation options include emergency water agreements with neighboring water districts or transporting water from elsewhere.

4.3.7.2 Location and Extent

Utah is the second driest state in the nation. Drought dramatically affects this area because of the lack of water for agriculture and industry, which limits economic activity, irrigation and culinary uses. The severity of the drought results in depletion of agriculture lands and deterioration of soils. In the Wasatch Front region, the risk of drought is high.

Salt Lake City falls within two climatic regions: the North Central region (3), and the Northern Mountains region (5). Each of these regions has differing characteristics, but often experience similar drought periods. The two regions experience mild drought (PDSI ≥ -1) every 2.6-3.3 years, moderate drought (PDSI ≥ -2) every 3.7-5.2 years, and severe drought (PDSI ≥ -3) every 6.9-8.5 years. The Northern Mountain region typically experiences droughts less frequently (Utah Division of Water Resources 2007a). Conversely, the Northern Mountain region averages more severe drought conditions at its peak than the Western region. It may be Northern Mountains region simply has more water to lose as the Wasatch and Uinta Mountains receive much more precipitation on average.

4.3.7.3 Past Occurrence

The most severe drought period in recorded history for the North Central and Northern Mountains regions occurred in 1934 at the height of the Great Depression (Figure 8-1 above) and during the same drought period (1930 to 1936) that caused the “Dust Bowl” on the Great Plains. The longest drought period varies from 11 years for the North Central region (1953-1963), and 6 years for the Northern Mountains (twice; 1900-1905 and 1987-1992) (Utah Division of Water Resources 2007a).

4.3.7.4 Vulnerability Assessment

Due to the unpredictability of drought, it is difficult to identify the areas most threatened and to provide loss estimate values. Utah is currently experiencing drought conditions, yet reports are not yet available on the impact of the current drought. However, historical drought records

demonstrate that agriculture is typically the economic sector most impacted by drought (UHMP). The 2003 Economic Report to the Governor discusses some of the statewide economic impacts of a drought beginning in 1999. Since it is not known what the local impacts of the current drought will be, this report will serve as the best available loss estimate. It is expected droughts in the future will have similar losses.

4.3.7.5 Mitigation strategy

Goal 1 – Reduce and prevent hardships associated with water shortages

Objective 1.1 (Priority HIGH): Limit unnecessary consumption of water

Action 1:Continue to encourage water conservation utilizing and promoting outreach material

Time Frame: Ongoing
Funding: Municipal
Estimated Cost: Minimal

Action 2: Emergency Managers will coordinate with public utilities to support ongoing conservation efforts.
Time Frame: Ongoing
Funding: Municipal
Estimated Cost: Minimal

Action 3: Investigate feasibility of implementing an incentive program to encourage the use of low-flow appliances and fixtures in homes and businesses.
Time Frame: Complete
Funding: N/A
Estimated Cost: N/A

Action 4: Implement water-saving devices and practices in public facilities.
Time Frame: Ongoing
Funding: Municipal
Estimated Cost: Minimal

Action 5:Repair, maintain and improve water distribution infrastructure to prevent loss from leakage, breaks, etc.
Time Frame: Ongoing
Funding: Municipal
Estimated Cost: Minimal

Action 6: Coordinate public safety water use, such as hydrant testing.
Time Frame: Ongoing
Funding: Municipal
Estimated Cost: Minimal

Action 7: Provide information on landscaping alternatives for persons subject to green area requirements.
Time Frame: Complete

Funding: N/A
Estimated Cost: N/A

Objective 1.2 (Priority MEDIUM): Encourage development of secondary water systems
Action 1: Coordinate with water districts to plan for, develop and/or expand secondary water systems.
Time Frame: Ongoing
Funding: Municipal
Estimated Cost: Minimal

5 Mitigation Strategy

5.1 Mitigation Goals and Objectives

The following plan goals and objectives of the Mitigation plan were retained from the WFRC plan. These include reducing the risk from natural hazards in Salt Lake County through coordinating with all local governments to develop a county-wide planning process that meets each planning component identified in the FEMA Region VIII Crosswalk document, Utah Division of Emergency Management (DEM) planning expectations, and local input.

Short Term Local Goals

The following general goals were used in the development of the Mitigation Plan. They are shown from highest to lowest priority.

1. Protect life safety.
2. Eliminate and/or reduce property damage.
3. Promote public awareness through education about community hazards and mitigation measures.
4. Protect emergency response services and capabilities, critical infrastructure, critical facilities, communication and warning systems, mobile resources, and other lifelines.
5. Ensure government continuity
6. Protect the cultural fabric of the community, including cultural resources, developed property, homes, businesses, industry, education and other institutions.
7. Combine hazard loss reduction efforts with other environmental, social and economic needs of the community.
8. Preserve and/or restore natural features, natural resources, and the environment.

Long Term Local Goals

1. Eliminate or reduce long-term risk to human life and property.
2. Aid private and public sectors in understanding the risks they may be exposed to and identify mitigation strategies to reduce those risks.
3. Avoid risk of exposure to natural and technological hazards.
4. Minimize the impacts of risks that cannot be avoided.
5. Mitigate the impacts of damage as a result of identified hazards.
6. Accomplish mitigation strategies in such a way that negative environmental impacts are minimized.
7. Provide a basis for prioritizing and funding mitigation projects.
8. Establish a county-wide platform to enable the community to take advantage of shared goals and resources.

Objectives

The following objectives are meant to serve as a measure upon which individual hazard mitigation strategies can be evaluated. These objectives become especially important when two or more projects are competing for limited resources.

1. Address a repetitive problem, or one that has the potential to have a major impact on an area or population.
2. Identify persons, agencies or organizations responsible for implementation.
3. Identify a time frame for implementation.
4. Explain how the project will be financed including the conditions for financing and implementation (as information is available).
5. Identify alternative measures, should financing not be available.
6. Be consistent with, support, and help implement the goals and objectives of hazard mitigation plans already in place.
7. Significantly reduce potential damages to public and/or private property and/or reduce the cost of state and federal recovery for future disasters.
8. Are practical, cost-effective and environmentally and politically sound after consideration of the options.
9. Can meet applicable permit requirements.
10. Benefits should outweigh the costs.
11. Have manageable maintenance and modification costs.
12. Accomplish multiple objectives when possible.
13. Should be implemented using existing resources, agencies and programs when possible.

Capital investment decisions must be considered in conjunction with natural hazard vulnerability. Capital investments can include homes, roads, public utilities, pipelines, power plants, chemical plants, warehouses and public works facilities. These decisions can influence the degree of hazard vulnerability of a community. Once a capital facility is in place, few opportunities will present themselves over the useful life of the facility to correct any errors in location or construction with respect to hazard vulnerability. It is for these reasons that zoning ordinances, which could restrict development in high vulnerability areas, and building codes, which could ensure that new buildings are built to withstand the damaging forces of hazards, are the most useful mitigation approaches a city can implement.

5.2 Mitigation Action Plan

Implementation through Existing Programs (Including NFIP)

Once the Plan is promulgated the City will integrate the strategies into existing programs and planning processes. These could include the Master Plan, Capital Improvements Plan, Emergency Operations Plan, etc. Many of the mitigation actions developed have elements of mitigation implementation including the National Flood Insurance Program (NFIP), the Utah Wildland-Urban Interface Code, the Building Code Effectiveness Grading System (BCEGS), and Community Rating System (CRS), all of which have been implemented.

Salt Lake City will integrate mitigation strategies into its building codes, the planning commission, and the actions of the City Council and other relevant agencies by education by the Emergency Manager during daily, weekly, and monthly city and public meetings.
The City's Community Development Director oversees enforcement of floodplain management requirements adopted by the City, including regulating new construction in Special Flood Hazard Areas (SFHAs).

Process

It will be the responsibility of Mayor, as he sees fit, to ensure these actions are carried out no later than the target dates unless reasonable circumstances prevent their implementation (i.e. lack of funding availability).

6 Plan Maintenance

6.1 Monitoring, Evaluating & Updating the Plan

Periodic monitoring and updates of this Plan are required to ensure that the goals and objectives for the Region are kept current and that local mitigation strategies are being carried out. This Plan has been designed to be user-friendly in terms of maintenance and implementation. This portion of the Plan outlines the procedures for completing revisions and updates. The Plan will also be revised to reflect lessons learned or to address specific hazard incidents arising out of a disaster.

Annual Review Procedures

The City will be responsible to annually review the mitigation strategies described in this Plan, as required by the Utah Division of Emergency Management (UDEM), or as situations dictate such as following a disaster declaration. The process will include the county organizing a Mitigation Planning committee comprised of individuals from organizations responsible to implement the described mitigation strategies. Progress toward the completion of the strategies will be assessed and revised as warranted. If determined that a modification of the Plan is warranted, an amendment to the Plan may be initiated as described below.

Five Year Plan Review

The entire Plan including any background studies and analysis shall be revised and updated every five years to determine if there have been any significant changes in the city that would affect the Plan. Increased development, increased exposure to certain hazards, the development of new mitigation capabilities or techniques and changes to Federal or State legislation are examples of changes that may affect the condition of the Plan.

Plan Amendments

The Utah DEM State Hazard Mitigation Officer, Local Mitigation Committee, or the Salt Lake City Mayor will initiate amendments and updates to the Plan.

Upon initiation of an amendment to the Plan, UDEM will forward information on the proposed amendment to all interested parties. including, but not limited to, all affected city departments, residents and businesses. Depending on the magnitude of the amendment, the full planning committee may be reconstituted.

At a minimum, the information will be made available through public notice in a newspaper of general circulation or on the Salt Lake City Emergency Management website www.slcgov.com/em. The review and comment period for the proposed Plan amendment will last for not less than forty-five (45) days.

In determining whether to recommend approval or denial of a Plan amendment request, the following factors will be considered:

- There are errors or omissions made in the identification of issues or needs during the preparation of the Plan; and/or
- New issues or needs have been identified which were not adequately addressed in the Plan; and/or
- There has been a change in information, data or assumptions from those on which the Plan was based.
- The nature or magnitude of risks has changed.
- There are implementation problems, such as technical, political, legal or coordination issues with other agencies.

Then one of the following actions will take place:

1. Adopt the proposed amendment as presented.
2. Adopt the proposed amendment with modifications.
3. Defer the amendment request for further consideration and/or hearing.
4. Reject the amendment request.

2009 Wasatch Front Mitigation Plan strategies status

Category	Goal / Objective	Action	Status	Comments
All Hazards	1 – Improve and maintain communications capabilities for emergency operations 1.1 – Improve communication capabilities	1 – Conduct an inventory and assessment of communications equipment and systems and identify needs	completed	Capabilities were assessed and new communications systems have been implemented.
All Hazards	1 – Improve and maintain communications capabilities for emergency operations 1.1 – Improve communication capabilities	2 – Conduct Training and awareness activities on communication equipment, tools, and systems	ongoing	This has to be done on a regular basis for staffing purposes.
All Hazards	1 – Improve and maintain communications capabilities for emergency operations 1.1 – Improve communication capabilities	3 – Establish agreements to share communications equipment between agencies involved in emergency operations	completed	Some of the current systems are shared across the valley and have agreements for who is responsible for maintenance, etc.
All Hazards	1 – Improve and maintain communications capabilities for emergency operations 1.1 – Improve communication capabilities	4 – Establish notification capabilities and procedures for emergency personnel	completed	
All Hazards	1 – Improve and maintain communications capabilities for emergency operations 1.2 – Maintain communications capabilities for critical facilities	1 – Evaluate vulnerability of critical communications systems	completed	
All Hazards	1 – Improve and maintain communications capabilities for emergency operations 1.2 – Maintain communications capabilities for critical facilities	2 – Establish redundancy for dispatch centers and other critical communications	completed	New Integrated communications system across the valley.

Category	Goal / Objective	Action	Status	Comments
All Hazards	1 – Improve and maintain communications capabilities for emergency operations 1.3 – Conduct communications Strategic Planning	1 – Establish a coordinating group to address long-term communication needs and implementation strategies	Complete and ongoing	A group was formed that played a role in the systems we have now.
All Hazards	1 – Improve and maintain communications capabilities for emergency operations 1.3 – Conduct communications Strategic Planning	2 – Acquire, upgrade, and/or integrate communications equipment and systems as determined by coordinating group	Completed	See answers above
All Hazards	2 – Improve awareness and analysis of hazards 2.1 – Improved Quality and Access to digital geographic (GIS) hazards data	1 – Establish a coordinating group to address geographic data issues	Ongoing	A GIS position and capabilities were added to our EOC. A GIS working group has been established
All Hazards	2 – Improve awareness and analysis of hazards 2.1 – Improved Quality and Access to digital geographic (GIS) hazards data	2 – Examine current data availability and sharing capabilities, evaluate needs, and identify shortcomings	Ongoing	GIS working group is trying to address these issue by forming a Common Operating Picture (COP).
All Hazards	2 – Improve awareness and analysis of hazards 2.1 – Improved Quality and Access to digital geographic (GIS) hazards data	3 – Update and expand data on hazards, critical facilities, and critical infrastructure according to assessed needs	Ongoing	In conjunction with our other projects new data is added to the GIS layers
All Hazards	2 – Improve awareness and analysis of hazards 2.1 – Improved Quality and Access to digital geographic (GIS) hazards data	4 – Provide centralized access to geographic data to emergency planners and responders	Ongoing	See comment above on forming a COP
All Hazards	2 – Improve awareness and analysis of hazards 2.2 – Improve and expand hazard monitoring capabilities	1 – Integrate existing hazard monitoring networks in emergency operations centers. Utilize sensors such as weather stations, stream gages, seismograph stations, road conditions, etc.	NA	

Category	Goal / Objective	Action	Status	Comments
All Hazards	2 – Improve awareness and analysis of hazards 2.2 – Improve and expand hazard monitoring capabilities	2 – Identify and implement additional hazard monitoring capabilities.	NA	
All Hazards	3 – Ensure critical facilities can sustain operations for emergency response and recovery 3.1 – Prevent damage to critical facilities and infrastructure	1 – Utilize GIS to identify facilities and infrastructure at risk	Ongoing	GIS data used to estimate which buildings will fail and how much debris they will create. Data on URMs was used to create maps, planning tools and educational materials.
All Hazards	3 – Ensure critical facilities can sustain operations for emergency response and recovery 3.1 – Prevent damage to critical facilities and infrastructure	2 – Assess critical facilities for hazard exposure, structural weaknesses, power, communications and equipment resources and redundancy, and adequate emergency procedures	Ongoing	Gathered data while participating in various programs (LEAP, RRAP, etc.) to use in planning/response. Plan to implement use of IP gateway.
All Hazards	3 – Ensure critical facilities can sustain operations for emergency response and recovery 3.1 – Prevent damage to critical facilities and infrastructure	3 – Implement improvements to address identified in assessment	Ongoing	Having mobile command center capabilities. Keep 96hr supplies and equipment in various key locations for rapid access to after an event.
All Hazards	4 – Improve response capabilities through mutual-aid agreements 4.1 – Utilize mutual-aid agreements in accordance with National Incident Management System (NIMS) requirements	1 – Compile inventory of mutual-aid agreements and memoranda of understanding (MOU) and identify deficiencies	Ongoing	Putting them in places that be readily accessed like the WebEOC library

Category	Goal / Objective	Action	Status	Comments
All Hazards	4 – Improve response capabilities through mutual-aid agreements 4.1 – Utilize mutual-aid agreements in accordance with National Incident Management System (NIMS) requirements	2 – Pursue and implement needed mutual-aid agreements	Ongoing	
All Hazards	5 – Increase citizen safety through improved hazard awareness 5.1 – establish a comprehensive public education program	1 – Provide education regarding all natural hazards through live trainings, as well as web-based, print and broadcast media	Ongoing	Added a community preparedness coordinator to staff and we utilize several forms of outreach (fairs, workshops, web pages, social media, etc.)
All Hazards	5 – Increase citizen safety through improved hazard awareness 5.1 – Establish a comprehensive public education program	2 – Incorporate information about cascading effects of hazards in education programs	Ongoing	Increasing Hazard awareness through our Fix the Bricks program and URM maps. Promote community participation in programs like SAFE neighborhoods
All Hazards	5 – Increase citizen safety through improved hazard awareness 5.1 – Establish a comprehensive public education program	3 – Develop education programs to target specific groups including homeowners, developers, schools and people with special needs	Ongoing	Via Fix the Bricks and SAFE Neighborhoods
All Hazards	5 – Increase citizen safety through improved hazard awareness 5.1 – Establish a comprehensive public education program	4 – Utilize maps and similar products on County EM website and other media to educate public on areas at risk to hazards	NA	However we do post hazard maps and public outreach materials on our local jurisdictions webpage.
All Hazards	5 – Increase citizen safety through improved hazard awareness 5.1 – Establish a comprehensive public education program	5 – Coordinate with existing public education programs such as the American Red Cross, Utah Living with Fire, be Ready Utah, the National Weather Service, etc.	Ongoing	We partner with the local Red cross and SLC district on SAFE Neighborhoods Program. We also promote other public educations programs; such as Be Ready Utah.

Category	Goal / Objective	Action	Status	Comments
All Hazards	6 – Improve public safety through preventative regulations 6.1 – Minimize hazard impacts through the adoption of appropriate prevention measures	1 – Establish and enforce appropriate planning, zoning, and building code ordinances	Ongoing	Adopted current international building code
All Hazards	6 – Improve public safety through preventative regulations 6.1 – Minimize hazard impacts through the adoption of appropriate prevention measures	2 – Ensure current hazard ordinances are available for viewing online	Complete	
Dam Failure	1 – Include dam failure inundation in future County and City planning efforts 1.1 – Review current State dam safety information on all identified high hazard dams in the County	1 – Include dam inundation maps in current County, City and Special Service District Emergency Operations Plans	Complete	
Dam Failure	1 – Include dam failure inundation in future County and City planning efforts 1.1 – Review current State dam safety information on all identified high hazard dams in the County	2 – Utilize inundation maps to identify potential evacuation areas and routes	Complete	
Drought	1 – Reduce and prevent hardships associated with water shortages 1.1 – Limit unnecessary consumption of water throughout the County	1 – Continue to encourage water conservation utilizing and promoting outreach material from all water districts in the County	Complete	
Drought	1 – Reduce and prevent hardships associated with water shortages 1.1 – Limit unnecessary consumption of water throughout the County	2 – Emergency Managers will coordinate with local water districts/public utilities to support ongoing conservation efforts	Complete	We coordinate regularly with our Public Utilities Department

Category	Goal / Objective	Action	Status	Comments
Drought	1 – Reduce and prevent hardships associated with water shortages 1.1 – Limit unnecessary consumption of water throughout the County	3 – Investigate feasibility of implementing an incentive program to encourage the use of low-flow appliances and fixtures in homes and businesses	complete	
Drought	1 – Reduce and prevent hardships associated with water shortages 1.1 – Limit unnecessary consumption of water throughout the County	4 – Implement water-saving devices and practices in public facilities	Ongoing	SLC policy that public facilities meet LEEDs silver standard at a minimum
Drought	1 – Reduce and prevent hardships associated with water shortages 1.1 – Limit unnecessary consumption of water throughout the County	5 – Repair, maintain and improve water distribution infrastructure to prevent loss from leakage, breaks, etc.	Ongoing	
Drought	1 – Reduce and prevent hardships associated with water shortages 1.1 – Limit unnecessary consumption of water throughout the County	6 – Coordinate public safety water use, such as hydrant testing	Ongoing	
Drought	1 – Reduce and prevent hardships associated with water shortages 1.1 – Limit unnecessary consumption of water throughout the County	7 – Provide information on landscaping alternatives for persons subject to green area requirements	Ongoing	
Drought	1 – Reduce and prevent hardships associated with water shortages 1.2 – Address agricultural water shortages in the County	1 – Set up livestock water rotation in areas of agricultural use	NA	
Drought	1 – Reduce and prevent hardships associated with water shortages 1.3 – Encourage development of secondary water systems	1 – Coordinate with water districts to plan for, develop and/or expand secondary water	NA	
Earthquake	1 – Reduce earthquakes losses to infrastructure 1.1 – Encourage retrofit and rehabilitation of highly susceptible infrastructure	1 – Identify structures at risk to earthquake damage	Complete	Used data to create URM maps, planning tools and education materials.

Category	Goal / Objective	Action	Status	Comments
Earthquake	1 – Reduce earthquakes losses to infrastructure 1.1 – Encourage retrofit and rehabilitation of highly susceptible infrastructure	2 – Research feasibility of an incentive program for retrofitting privately-owned buildings, particularly unreinforced masonry	Complete	Established Fix the Bricks Program
Earthquake	1 – Reduce earthquakes losses to infrastructure 1.1 – Encourage retrofit and rehabilitation of highly susceptible infrastructure	3 – Complete seismic rehabilitation/retrofitting projects of public buildings at risk	Ongoing	
Earthquake	1 – Reduce earthquakes losses to infrastructure 1.2 – Improve public education regarding earthquake risks to unreinforced masonry buildings	1 – Provide educational materials to unreinforced masonry home and business owners	Ongoing	Fix the Bricks was added to our community outreach materials and publications
Earthquake	1 – Reduce earthquakes losses to infrastructure 1.3 – Improve Seismic Hazard understanding and seismic resistance of CUWCD Red Butte Dam in Salt Lake County.	1 – Procure Engineering Consultant to perform the nonstructural design and geotechnical assessment and review.	NA	
Flooding	1 – Protection of life and property before, during and after a flooding event 1.1 – Provide 100% availability of the National Flood Insurance Program	1 – Assist Cities with NFIP application	NA	
Flooding	1 – Protection of life and property before, during and after a flooding event 1.1 – Provide 100% availability of the National Flood Insurance Program	2 – Encourage Communities to actively participate in NFIP	Ongoing	

Category	Goal / Objective	Action	Status	Comments
Flooding	1 – Protection of life and property before, during and after a flooding event 1.2 – Encourage appropriate flood control measures, particularly in new developments	1 – Determine potential flood impacts and identify areas in need of additional flood control structures	Ongoing	Evaluated Regularly
Flooding	1 – Protection of life and property before, during and after a flooding event 1.2 – Encourage appropriate flood control measures, particularly in new developments	2 – Address identified problems through construction of debris basins, flood retention ponds, energy dissipaters or other flood control structures	Ongoing	Evaluated Regularly
Flooding	1 – Protection of life and property before, during and after a flooding event 1.3 – Provide maintenance, repairs and improvements to drainage structures, storm water systems and flood control structures	1 – Establish maintenance and repair programs to remove debris, improve resistance and otherwise maintain effectiveness of storm water and flood control systems	Ongoing	Evaluated Regularly
Flooding	2 – Reduce threat of unstable or inadequate flood control structures 2.1 – Reduce potential for failure of flood control structures	1 – Identify and assess structures for deficiencies	Ongoing	Evaluated Regularly
Flooding	2 – Reduce threat of unstable or inadequate flood control structures 2.1 – Reduce potential for failure of flood control structures	2 – Modify structures as needed to address deficiencies	Ongoing	Evaluated Regularly
Severe Weather	1 – Reduce threat of loss of life or property due to extreme weather events 1.1 – Maintain status as a StormReady Community	1 – Maintain Hazardous Weather Operations Plan according to StormReady requirements	Ongoing	
Severe Weather	1 – Reduce threat of loss of life or property due to extreme weather events 1.1 – Maintain status as a StormReady Community	2 – Maintain Contact with NWS prior to re-application in 2010	Complete	

Category	Goal / Objective	Action	Status	Comments
Severe Weather	1 – Reduce threat of loss of life or property due to extreme weather events 1.2 – Increase awareness of information services provided by NWS	1 – Meet with NWS representative on an annual basis to receive information on new services and alerts available	Ongoing	
Severe Weather	1 – Reduce threat of loss of life or property due to extreme weather events 1.2 – Increase awareness of information services provided by NWS	2 – Assist NWS in making other agencies and departments aware of available resources	Ongoing	
Severe Weather	1 – Reduce threat of loss of life or property due to extreme weather events 1.3 – Encourage safe practices in avalanche prone areas	1 – Assist Forest Service Utah Avalanche Forecast Center and other organizations in promoting avalanche hazard awareness for backcountry users	NA	
Severe Weather	1 – Reduce threat of loss of life or property due to extreme weather events 1.4 – Examine the vulnerability of patrons at large event venues to extreme weather events	1 – Work with NWS to develop large event venue weather safety and evacuation procedures	Ongoing	
Slope Failure	1 – Reduce or eliminate the threat of slope failure damage 1.1 – Reduce the threat of slope failures following wildfires	1 – Develop protocol for working with State and Federal agencies in reducing the impact of post-fire debris flow hazard	Ongoing	
Slope Failure	1 – Reduce or eliminate the threat of slope failure damage 1.2 – Monitor historic landslide areas	1 – Coordinate with the Utah Geological Survey and other agencies to understand current slope failure threats/potential	Ongoing	
Slope Failure	1 – Reduce or eliminate the threat of slope failure damage 1.3 – Address landslide hazards in new sub-divisions	1 – Utilize recommendations provided by the State Geological Hazards Working Group to address land-use and planning for new developments	Ongoing	

Category	Goal / Objective	Action	Status	Comments
Wildland Fire	1 – Community education on wildfire hazard 1.1 – Reduce risk from wildfire through education programs	1 – Increase public awareness through "Firewise" program	Ongoing	We promote Firewise when applicable
Wildland Fire	1 – Community education on wildfire hazard 1.1 – Reduce risk from wildfire through education programs	2 – Educate homeowners on the need to create defensible space near structures in WUI	Ongoing	Part of Firewise
Wildland Fire	2 – Improve safety from wildfire hazards through planning, protective actions and improved fire response capabilities 2.1 – Assist homeowners with creating defensible space near structures in WUI areas	1 – Designate and promote county-wide annual initiative for clearing fuels	NA	
Wildland Fire	2 – Improve safety from wildfire hazards through planning, protective actions and improved fire response capabilities 2.1 – Assist homeowners with creating defensible space near structures in WUI areas	2 – Provide waste removal, such as chipping of green waste by public works, following designated fuel clearing day/week	Ongoing	
Wildland Fire	2 – Improve safety from wildfire hazards through planning, protective actions and improved fire response capabilities 2.2 – Improve evacuation capabilities for WUI areas	1 – Work with experts and communities to develop or update evacuation plans	Ongoing	
Wildland Fire	2 – Improve safety from wildfire hazards through planning, protective actions and improved fire response capabilities 2.2 – Improve evacuation capabilities for WUI areas	2 – Evaluate transportation network and address needed improvements to facilitate evacuation and emergency response	Ongoing	

Category	Goal / Objective	Action	Status	Comments
Wildland Fire	2 – Improve safety from wildfire hazards through planning, protective actions and improved fire response capabilities 2.3 – Improve addressing system in WUI areas to facilitate emergency response	1 – Identify all facilities, businesses, and residences, particularly in the canyons, and assign addresses according to current county addressing standards	NA	
Wildland Fire	2 – Improve safety from wildfire hazards through planning, protective actions and improved fire response capabilities 2.3 – Improve addressing system in WUI areas to facilitate emergency response	2 – Incorporate improved addresses in fire-dispatch and other databases	Ongoing	
Wildland Fire	2 – Improve safety from wildfire hazards through planning, protective actions and improved fire response capabilities 2.4 – Complete wildfire protection projects	1 – Reduce fuels around publically owned structures	Ongoing	
Wildland Fire	2 – Improve safety from wildfire hazards through planning, protective actions and improved fire response capabilities 2.4 – Complete wildfire protection projects	2 – Implement fire breaks and other protective measures	NA	
Wildland Fire	2 – Improve safety from wildfire hazards through planning, protective actions and improved fire response capabilities 2.4 – Complete wildfire protection projects	3 – Assess existing water flow capabilities, both public and private, and address deficiencies	Ongoing	
Wildland Fire	2 – Improve safety from wildfire hazards through planning, protective actions and improved fire response capabilities 2.4 – Complete wildfire protection projects	4 – Assist communities in developing Community Wildfire Protection Plans or similar plans	Ongoing	

Category	Goal / Objective	Action	Status	Comments
Wildland Fire	2 – Improve safety from wildfire hazards through planning, protective actions and improved fire response capabilities 2.5 – Encourage proper development practices in the WUI	1 – Adopt the Utah Wildland-Urban Interface Code	Complete	
Wildland Fire	2 – Improve safety from wildfire hazards through planning, protective actions and improved fire response capabilities 2.5 – Encourage proper development practices in the WUI	2 – Define wildland-urban interface and develop digital maps of the WUI	Complete	

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