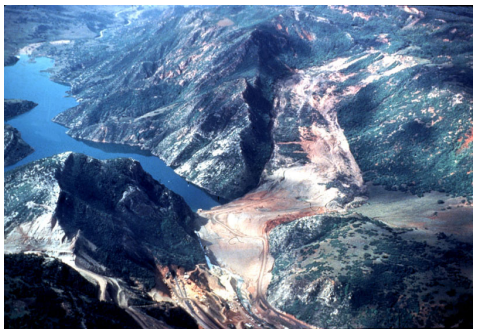
Mountainland Pre-Disaster Hazard Mitigation Plan 2016



Prepared by

MOUNTAINLAND
ASSOCIATION OF GOVERNMENTS
Serving Summit, Utah and Wasatch Cities & Counties

Avalanche near Park City (Mark White); Fox Bay Fire (Wasatch County); Flood/Debris Flow event (Utah County); Thistle Creek Landslide (Utah County)

Executive Summary

Purpose

To fulfill federal, state, and local hazard mitigation planning responsibilities; to promote pre- and post-disaster mitigation measures, short/long range strategies that minimize suffering, loss of life, and damage to property resulting from hazardous or potentially hazardous conditions to which citizens and institutions within the state are exposed; and to eliminate or minimize conditions which would have an undesirable impact on our citizens, the economy, environment, and the well-being of the state of Utah. This plan is an aid in enhancing city and state officials, agencies, and public awareness to the threat that hazards have on property and life and what can be done to help prevent or reduce the vulnerability and risk of each Utah jurisdiction.

Scope

Utah PDM Planning phase is statewide. The State of Utah will work with all local jurisdictions by means of the seven regional Association of Governments. The Mountainland Association of Governments area, which covers the counties of Summit, Utah and Wasatch, will have a plan completed by April 01, 2017 to give to the Utah Division of Emergency Management. Future monitoring, evaluating, updating and implementing will take place as new incidents occur and or every three to five years and will be included in the local mitigation plans as well. Natural hazards addressed are: Flooding; Wildland Fire; Landslide; Earthquake; Drought; Severe Weather; and Infestation.

The counties, cities and towns of the Mountainland three-county area are:

Summit County

Coalville, Francis, Henefer, Kamas, Oakley, and Park City.

Utah County

Alpine, American Fork, Cedar Fort, Cedar Hills, Eagle Mountain, Elk Ridge, Fairfield, Genola, Goshen, Highland, Lehi, Lindon, Mapleton, Orem, Payson, Pleasant Grove, Provo, Salem, Santaquin, Saratoga Springs, Spanish Fork, Springville, Vineyard, and Woodland Hills.

Wasatch County

Charleston, Daniel, Heber, Hideout, Independence, Interlaken, Midway, and Wallsburg.

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Part I
Introduction

Introduction

The State of Utah is vulnerable to natural, technological, and man-made hazards that have the possibility of causing serious threat to the health, welfare, and security of our citizens. The cost of response to and recovery from potential disasters can be lessened when attention is turned to mitigating their impacts and effects before they occur or re-occur.

What is Hazard Mitigation

Hazard mitigation is defined as any cost-effective action(s) that have the effect of reducing, limiting, or preventing vulnerability of people, property, and the environment to potentially damaging, harmful, or costly hazards. Hazard mitigation measures, which can be used to eliminate or minimize the risk to life and property, fall into three categories. First; those that keep the hazard away from people, property, and structures. Second; those that keep people, property, and structures away from the hazard. Third; those that do not address the hazard at all but rather reduce the impact of the hazard on the victims such as insurance or grants. This mitigation plan has strategies that fall into all three categories.

Hazard mitigation measures must be practical, cost effective, and environmentally and politically acceptable. Actions taken to limit the vulnerability of society to hazards must not in themselves be more costly than the value of anticipated damages.

The primary focus of hazard mitigation actions must be at the point at which capital investment decisions are made and based on vulnerability. Capital investments, whether for homes, roads public utilities, pipelines, power plants, chemical plants or warehouses, or public works, determine to a large extent the nature and degree of hazard vulnerability of a community. Once a capital facility is in place, very 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 restrict development in high vulnerability areas, and building codes, which insure that new buildings are built to withstand the damaging forces of hazards, are the most useful mitigation approaches a city can implement.

Previously, mitigation measures have been the most neglected programs within emergency management. Since the priority to implement mitigation activities is generally low in comparison to the perceived threat, some important mitigation measures take time to implement. Mitigation success can be achieved, however, if accurate information is portrayed through complete hazard identification and impact studies, followed by effective mitigation management. Hazard mitigation is the key to eliminating long-term risk to people and property living in Utah from hazards and their effects. Preparedness for all hazards includes response and recovery plans, training, development, management of resources, and the need to mitigate each jurisdictional hazard.

The State Division of Emergency Management has identified the following hazards to be analyzed by each county. These hazards include avalanche, dam failure, debris flow, drought, earthquake, flood, flash flooding, infestation, landslide, problem soils, summer storm, tornado, urban and rural fires, and winter storm.

This regional/multi-jurisdictional plan evaluates the impacts, risks and vulnerabilities of natural hazards in a jurisdictional area affected by a disaster. The plan supports, provides assistance, identifies and describes mitigation projects for each annex. The suggestive actions and plan implementation for local and tribal governments could reduce the impact of future disasters. Only through the coordinated partnership with emergency managers, political entities, public works officials, community planners and other dedicated individuals working to implement this program was it accomplished.

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Commented [APC1]: Changed date from March 1, 2010 to September 15, 2016

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Coalville, Francis, Henefer, Kamas, Oakley, and Park City.

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Commented [APC3]: Updated Cities to include: Fairfield, Hideout, and Independence

Commented [SM4R3]: And Interlaken

Wasatch County

Charleston, Daniel, Heber, Hideout, Independence, Interlaken, Midway, and Wallsburg.

Authority

Federal: Public Law 93-288 as amended, established the basis for federal hazard mitigation activity in 1974. A section of this Act requires the identification, evaluation, and mitigation of hazards as a prerequisite for state receipt of future disaster assistance outlays. Since 1974, many additional programs, regulations, and laws have expanded on the original legislation to establish hazard mitigation as a priority at all levels of government. When PL 93-288 was amended by the Stafford Act, several additional provisions were also added that provide for the availability of significant mitigation measures in the aftermath of Presidential declared disasters. Civil Preparedness Guide 1-3, Chapter 6- Hazard Mitigation Assistance Programs places emphasis on hazard mitigation planning directed toward hazards with a high impact and threat potential.

President Clinton signed the Disaster Mitigation Act of 2000 into Law on October 30, 2000. Section 322, defines mitigation planning requirements for state, local, and tribal governments. Under Section 322 States are eligible for an increase in the Federal share of hazard mitigation (HMGP), if they submit for approval a mitigation plan, which is a summary of local and/or regional mitigation plans, that identifies natural hazards, risks, vulnerabilities, and describes actions to mitigate the hazards risks and vulnerabilities in that plan.

State: The Governor's Emergency Operation Directive, The Robert T. Stafford Disaster Relief and Emergency Assistance Act, amendments to Public Law 93-288, as amended, Title 44, CFR, Federal Emergency Management Agency Regulations, as amended, State Emergency Management Act of 1981, Utah Code 53-2, 63-5, Disaster Response Recovery Act, 63-5A, Executive Order of the Governor, Executive Order 11, Emergency Interim Succession Act, 63-5B.

Local: Local governments play an essential role in implementing effective mitigation, both before and after disaster events. Each local government will review all damages, losses and related impacts to determine the need or requirement for mitigation action and planning whenever seriously affected by a disaster, or when applying for state or federal recovery assistance. In the counties and cities making up the MAG Region, the local executive responsible for carrying out plans and policies are the County Commissioners/Council Members and City Mayors. Local Governments must be prepared to participate in the post disaster Hazard Mitigation Team process and the pre-mitigation planning as outlined in this document.

Association of Governments: The Association of Governments have been duly constituted under the authority of Title XI, Chapter13, Utah Code Annotated, 1953, as amended (The Inter-local Cooperation Act) and pursuant to Section 3 of the Executive Order of the Governor of the State of Utah, dated May 27, 1970, with the authority to conduct planning studies and to provide services to its constituent jurisdictions.

Introduction to Region

Geography

The area's geography is quite varied with desert to the far west and high mountains in the east. The bulk of the population is found in the fertile valleys lying between mountains. Agricultural land supports mainly fruit orchards, some cattle and sheep ranches, grain farms, dairies, hogs, chickens and smaller individual farms. Pine clad slopes and oak brush foothills characterize much of the undeveloped mountain landscape that exists in the area. Development encroachment of hillsides is of real concern to environmentalists, planners, wildlife managers and fire marshals. Only a small percentage of the area's unincorporated land has been developed; however, the potential for new growth is evident. The preservation of open space within urban settings is very crucial to quality of life and community well-being.

Population

The Mountainland area is comprised of three counties located in north central Utah having an estimated combined population of 588,003 residents. Over the past few years each of these counties have experienced widespread growth equaling a 30% growth since the 2000 census. While most growth is infill development within urbanized areas, population is continuing to into areas with increase hazard potential.

According to the 2010 Census, the Mountainland area encompasses 5,050 square miles of geography but, as discussed earlier, the population is mostly confined to incorporated areas.

Population Distribution in the Mountainland Region

Mountainland Region Population By County and Multi-County District 2000-2060

	Census		Short Range Projection			Long Range Projection		
	2000	2010	2015	2020	2030	2040	2050	2060
MOUNTAINLAND REGION	413,487	576,418	629,723	746,796	934,540	1,150,420	1,381,418	1,602,441
SUMMIT COUNTY	29,736	36,324	39,633	45,491	56,890	71,433	88,334	107,671

UTAH COUNTY	368,540	516,564	575,205	668,564	833,101	1,019,828	1,216,695	1,398,074
WASATCH COUNTY	15,215	23,530	29,161	32,741	44,549	59,159	76,389	96,696

Sources: U.S. Bureau of the Census; Utah Population Estimates Committee;
2012 Baseline Projections, Governor's Office of Planning and Budget, UPED Model System.
Notes: AARC is average annual rate of change. 2000 and 2010 populations are April 1 U.S. Census modified age, race and sex (MARS) populations; 2000 populations are April 1 U.S. Census summary file 1 (SF1) populations; all others are July 1 populations.

The resident population of the Mountainland Area has increased steadily since the last census was taken. The region, in 2010, showed an overall population of 576,418 residents, nearly 90% of which live within the boundaries of Utah County. With an annual growth rate of over 2.5% projected through the year 2020 for the region, the area ranks high in population growth compared to almost anywhere else in the United States. An interesting statistic generated by the State of Utah suggests that annual employment growth for the region hovers right at 3% for the same time period, suggesting a possible decrease in the already low unemployment rate, or a significant increase of in-migrating workers to fill the jobs becoming available. A third scenario could be a change in the mix of those in the workforce to include a number from the ranks of those not currently seeking employment, like the elderly, or possibly spouses not now working. Chances are good that the actual reason for the change will be a combination of all three possibilities.

Population by Race and Hispanic Origin
Mountainland Counties, 2010 (most recent available)

	White	Black	Amer. Indian Aleut, Eskimo	Asian or Pac. Isle	Hispanic	% Minority Pop
Summit	33,442	235	243	785	4,190	9.5
Utah	474,695	4,795	5,867	19,240	55,793	10.6
Wasatch	21,584	125	232	338	3,184	8.3
Region	529,721	5,155	6,342	20,363	63,167	8.1

Source: US Census Bureau, Census 2010

Economy

The economy of the area could be characterized as moderate in some sectors, but with several real concerns and challenges to be addressed. The first is the fact that the region has a very low per capita income level. Large families and low pay scales make for a somewhat unique situation which forces skilled labor out of the area, or in many cases, a second wage earner (usually the spouse) takes a low paying, low skill job to help make ends meet. There is a sense that underemployment is a related problem, although trying to measure underemployment is difficult and the usual data providers do not disseminate the numbers if they are tracked. The sense of home and community is strong in Utah and many seem willing to find alternate, less fulfilling employment rather than moving out of state for better positions.

Another challenge to the economy is the uneven distribution of businesses within the district. Utah County mostly drives the region's labor statistics, especially within the Provo-Orem geographical area; however, other parts of the district don't share much in this business boom. Smaller outlying communities in Summit and Wasatch County, and even southern Utah County, may be struggling to find new business growth and don't share in the prosperity of the sales activity and tax distribution of their neighbors. In other words, the district may experience a 4.9% unemployment rate, but a small rural town might struggle with a 10% or higher rate, taking little comfort in knowing the region is doing so well! With 57% of all labor force non-agricultural jobs showing up in the service and retail trade sectors, there is plenty of cause for concern in the future when the demand for such services could wane because personal spending is curtailed. The regional economy has moved forward in many important ways since district designation twenty-two years ago, but further diversification and balance in the types of jobs available within the region would certainly better stabilize the economy to some extent so that in a downturn, large layoffs and reductions in lower paying jobs would not affect so many workers.

The University of Utah's Bureau of Economic and Business Research publishes a report summarizing the economies of each of Utah's twenty-nine (29) counties. Excerpts of that study are shown in each county's section of the Plan to direct some focus on the economic growth that each Mountainland county has experienced in recent years. It shows a fairly substantial rise in income and sales in each case although there may be some signs of slowing, especially in Utah County, where new residential construction seems to be tapering off compared to preceding years. Some slowing of the region economy is likely to occur during the following decade, especially with the events of 9/11, the tech stock bust, corporate corruption and war with Iraq.

Part II
Plan Pre-Requisites

Prerequisite–Resolution by each Jurisdiction

The following table denotes the plan adoption status for all jurisdictions within the MAG Region. Following the table is an example of the adoption resolution. The Appendix contains copies of all adopted resolutions.

MOUNTAINLAND AOG | STATUS OF INDIVIDUAL COMMUNITY | PRE-DISASTER HAZARD MITIGATION ADOPTION RESOLUTION

Community	No Action	In Process	Completed / Not yet adopted	Completed and adopted
Alpine				
American Fork				
Cedar Fort				
Cedar Hills				
Charleston				
Coalville				
Daniels				
Eagle Mountain				
Elk Ridge				
Fairfield				
Francis				
Genola				
Goshen				
Heber				
Henefer				
Hideout				
Highland				
independence				
Kamas				

Lehi				
Lindon				
Mapleton				
Midway				
Oakley				
Orem				
Park City				
Payson				
Pleasant Grove				
Provo				
Salem				
Santaquin				
Saratoga Springs				
Spanish Fork				
Springville				
Summit County				
Utah County				
Vineyard				
Wallsburg				
Wasatch County				
Woodland Hills				

RESOLUTION NO. _____

A RESOLUTION ADOPTING THE MOUNTAINLAND ASSOCIATION OF GOVERNMENTS PRE-DISASTER 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.

WHEREAS, the Disaster Mitigation Act of 2000 requires all jurisdictions to be covered by a Pre-Disaster Hazard Mitigation Plan to be eligible for Federal Emergency Management Agency pre-disaster funds,

WHEREAS, Mountainland Association of Governments (MAG) has been contracted by the State of Utah to prepare a Pre-Disaster Mitigation Plan covering all of the jurisdictions in the MAG Area, and

WHEREAS, the MAG Executive Council approved MAG Staff to write the plan on April 24th 2014, and

WHEREAS, _____City is within the MAG Area, and

WHEREAS, the _____ City Council is concerned about mitigating potential losses from natural disasters before they occur, and

WHEREAS, the plan identifies potential hazards, potential loses and potential mitigation measures to limit loses, and

WHEREAS, the _____ City Council has determined that it would be in the best interest of the community as a whole to adopt the Pre-Disaster Hazard Mitigation Plan as it pertains to the City, therefore

BE IT RESOLVED BY THE _____ CITY COUNCIL THAT:

The attached "Mountainland Association of Governments Pre-Disaster Mitigation Plan" be adopted to meet the requirements of the Disaster Mitigation and Cost Reduction Act of 2000.

This Resolution shall be effective on the date it is adopted.

DATED this _____ day of _____, 2016.

Part III
Planning Process

Process

The Pre-Disaster Mitigation Plan process was presented to the MAG Executive Council (with elected officials for every jurisdiction) in early 2002. The Executive Council unanimously approved the process, which designated MAG staff (Andrew K. Jackson, Andrew Wooley, and Jill Stark) to prepare a multi-jurisdictional plan for adoption by each community. In 2008 the Executive Council was informed that MAG staff (Robert Allen, Andrew Wooley, Kori Iman) would update the plan.

In 2014, the Executive Council was again informed that MAG staff (Robert Allen, Aaron Cloward, and Shauna Mecham) would be updating and renewing the current plan. Meetings were scheduled in each county and municipalities were encouraged to send representatives to learn the mitigation process and renew their strategies. To encourage community participation information packets containing hazard data and maps were customized for each community to aid in identifying and mitigating their more prominent hazards. An example packet is located in the appendix. MAG staff reviewed the previous plan, made additions, corrections, and updates, included hazard history, updated maps and projections, and reviewed and updated mitigation strategies.

Table 3.1 Representatives from each community who participated in the hazard mitigation meetings

Jurisdiction	**Representative**
Alpine	Shane Sorensen
American Fork	Trent Andrus
Cedar Fort	Howard Anderson
Cedar Hills	David Bunker
Charleston	Bob Kowallis
Coalville	Zane Deweese
Daniel	Eric Bunker
Eagle Mountain	Ikani Taumoepeau
Elk Ridge	McKay Lloyd

Fairfield	Brad Swift
Francis	Scott Kettle
Genola	Chris Steele
Goshen	Josh Cummings
Heber	Tony Kohler
Henefer	Robert Richins
Hideout	Carolyn Kuchinsky
Highland	Nathan Crane
Independence	Jodi Hoffman
Interlaken	Lawrence Headley
Kamas	Scott Kettle
Lehi	Scott Sampson
Lindon	Brandon Snyder
Mapleton	Brian Tucker
Midway	Michael Henke
Oakley	Tami Stevenson
Orem	Heath Stevenson
Park City	Hugh Daniels
Payson	Jill Spencer
Pleasant Grove	Ken Young
Provo	Robert Mills
Salem	Jeff Nielsen
Santaquin	Dennis Marker
Saratoga Springs	Spencer Kyle

Spanish Fork	Jered Johnson
Springville	Jeff Anderson
Summit County	Chris Crowley
Utah County	Peter Quittner
Vineyard	Don Overson
Wallsburg	Celeni Richins
Wasatch County	Valerie Cummings
Woodland Hills	Corbett Stephens

Notice given to smaller communities and organizations–Some smaller communities did not have staff available to attend the ad-hoc meetings. These communities were given opportunities to participate by reviewing the draft plan on the web and making comments either in writing, e-mail or over the phone and in individual meetings with the planning staff. Other small community's contract with either the Sheriff's Office or other larger communities for Emergency Services. Since these communities would not be responding to events themselves, they were represented by the agency that actually knows the hazard needs of the community the best. These communities are listed above as being represented by another agency or jurisdiction.

Web Site–Information on the plan and the planning process was also available on MAG's web site including an interactive hazard mapping application. Interested parties could e-mail comments on the draft plan from the web site.

A concerned citizen identifies the location of her home as she reviews Dam Failure Map at Open House.

Open Houses–Open Houses were held on the following dates in conjunction with a Transportation Open House. Over 1000 people attended the Open Houses.

April 29th, July 28th, August 4th, October 29th 2015 |

Identifying Hazards–Mountainland Association of Governments identified several hazards addressed in the Hazard Mitigation Plan. The hazards were identified through a process that included public input, researching past disasters, Geographic Information System (GIS) data, and FEMA's HAZUS-MH software.

The original hazard mitigation plan identified several potential hazards for the region. The list was reviewed, by staff and community representatives, for completeness. Mountainland AOG has a sophisticated GIS that was used to overlay current and future development with hazard data. This data was used to identify which hazards had the greatest risk within the MAG area. These hazards were then presented in greater detail in the following county portions of this plan.

Updating the 2009 Plan

The primary task for MAG staff was to update Mountainland's existing Pre-Disaster Hazard Mitigation Plan. The updates are scattered throughout this plan and target in several key areas.

Background Information - The Mountainland Region has grown and changed since the last plan and regional information has been updated to reflect it.
Hazard Data – All mapping and profiling data for each hazard and was updated using the latest and best available sources.
Population and Housing Stock – Great effort was expended in compiling the most recent demographic and assessors data. A new aspect of the plan was to include future populations, buildings and growth into the plan. This is further discussed in the next chapter.
Mitigation Strategies – An increased emphasis was put on each community to increase their mitigation strategies included in the plan. Specifically, each jurisdiction has incorporated multiple strategies per hazard as required.

Other plans and reports – The plan contains and/or references other mitigation plans, neighboring organizations' reports and state data to provide the most robust picture and technical information available.

While many portions of the plan may seem to look similar to the 2009 plan, each portion has been reviewed and updated to reflect the most current information possible.

Existing Plans, Studies, Reports and Technical Information Reviewed	How Incorporated
Utah State Hazard Mitigation Plan	Comparing MAG counties to the state as a whole and to describe the impact of some hazards not prevalent in MAG counties.
Drought in Utah: Learning from the Past – Preparing for the Future (April 2007) Utah State Water Plan from DNR http://www.water.utah.gov/	Drought description and history; probability data based on tree ring histories.
Water for Utah (2016) Utah Department of Natural Resources, Division of Water Resources. www.water.utah.gov	Used to identify water projects that affect Mountainland communities, positively and negatively.
Community Improvement Projects (see city websites)	Identify desired projects relating to mitigation in various communities
Governor's Office of Planning and Budget (2012 estimates)	Demographic information for Utah counties and cities.
Landslide Maps of Utah (2010) Elliott A. and Harty K. Utah Department of Natural Resources.	Identify location and extent of historic landslides and classify landslide types (comes with GIS files)
DAMVIEW Dam Safety Database Information Viewer (2016). Utah Division of Water Rights. www.waterrrights.utah.gov	Identify and map low, moderate, and high risk dams. Information includes ownership, Emergency Action Plan, and first downstream town.
The Wasatch Fault (1996) Utah Geological Survey Public Information Series 40	Basic understanding of Wasatch Fault, including diagrams specific to the Wasatch Fault which were replicated in this Plan with permission.
Utah Lake Basin Water; Planning for the Future (2014) Utah Division of Water Resources.	Water conservation plans by jurisdiction
West Wide Wildfire Risk Assessment (2008) Council of Western State Foresters	Used in Fire Risk Assessment
National Oceanic and Atmospheric Administration (NOAA) Storm Events Database	Locating storm events, date, location, and magnitude.
The landslide handbook—A guide to understanding landslides (2008) Highland, L.M., and Bobrowsky, Peter,Reston, Virginia, U.S. Geological Survey Circular 1325, 129 p.	Wonderfully explained basics of landslides and how to mitigate. Great graphics.
Economic Snapshot (2016) Department of Workforce Services http://jobs.utah.gov/wi/regions/county/index.html	Economic data tables for each county
FEMA NFIP Inundation Maps	Used to visualize and analyze 100 yr and 500 yr flood risk. Preliminary maps were used for Utah County. Those maps should be official by 2018, requiring some cities to adopt new flood maps and ordinances.

Part IV
Risk Assessment

Hazard Identification

Numerous hazards face the Mountainland region; everything from grasshopper infestation to solar flares. In the interest of creating a plan that is a resource instead of a burden, Mountainland selected natural hazards whose impact is significant according to the history of the region. Hazards were identified through input from city officials, researching past disasters and Geographic Information System (GIS) data. The table below indicates several hazards, their main source of information, and why each was selected or not selected for this Hazard Mitigation Plan.

Identified Hazards

Hazard	Map Availability	Reasons Selected	Sources
Flood	Yes	• Most Frequent Hazard • Historically Highest Cost • Readily available data • Successful Mitigation	FEMA Floodplain maps & HAZUS software
Wildland Fire	Yes	• Historic Data • Current Development Patterns Increase likelihood • Potential Loss of Life • 90% Human Caused	West Wide Wildfire Assessment, US Forest Service, Bureau of Land Management, Utah Division of Forestry, Fire & State Lands
Earthquake	Yes	• High Potential Impacts • Public Awareness • Need for Preparation • Possible High Cost	United States Geological Survey (USGS), University of Utah

Drought	Daily maps available, but scale and variability are inappropriate for county-level maps.	• High Potential • Public Awareness • Historic Data • Current Condition • Growing Population Increases demands • Successful mitigation through planning	US Drought Monitor, Utah Division of Water Resources
Mass Movement (Landslide & Debris Flow)	Yes	• Review of Past Disasters • High Cost of Homes in Areas at Risk • Often Triggered by Other Hazards	United States Geological Survey (USGS)
Avalanche	Coordinates Available	• Public Awareness • Highest Death Count in Every County	National Oceanographic and Atmospheric Administration (NOAA), Utah Avalanche Center
Severe Weather	Scale and variability are inappropriate for county-level maps.	• High Frequency • Public Awareness • Successful Mitigation • Historic Data	National Oceanographic and Atmospheric Administration (NOAA)
Dam Failure	Yes	• High Potential Impacts • Public Awareness • Need for Preparation • Possible High Cost	Utah Division of Water Rights, Army Corps of Engineers
Infestation	Yes	• Historic Data • Public Awareness • State Database	Utah Extension Office

Radon Gas	Yes	• Public Awareness • Second Leading Cause of Cancer	Utah Department of Air Quality
Tornado	Coordinates available	• Historic Data • Because there is nothing above an F1 (up to 112 mph winds), only cursory information provided • Weather events often unsuitable for mapping due to large geographic extent	National Oceanographic and Atmospheric Administration (NOAA)
Volcano	Yes	NOT SELECTED FOR ANALYSIS • No eruptions in Mountainland counties in written history • Little mitigation possible for Supervolcano eruptions such as Yellowstone	United States Geological Survey (USGS)
Terrorism	No	NOT SELECTED FOR ANALYSIS • Not suitable for this Plan, which will be public knowledge • Cities, Police Departments, and Emergency Managers have independent plans with specific objectives	Utah Department of Public Safety
Infectious Disease	No	NOT SELECTED FOR ANALYSIS • Not a Natural (non-human cause) Hazard • City Emergency Managers have independent plans	Center for Disease Control (CDC)

Hazardous Material Spill	No	NOT SELECTED FOR ANALYSIS • Not a Natural (non-human cause) Hazard • City Emergency Managers have independent plans	City and County Emergency Managers
Solar Flare	No	NOT SELECTED FOR ANALYSIS • Little prevention/ pre-disaster mitigation possible other than education • More appropriate for Disaster Response	National Oceanographic and Atmospheric Administration (NOAA) Space Weather Prediction Center

Profiling Hazard Events

Part IV includes general descriptions, definitions, and mitigation strategies for hazards identifies by Mountainland. Parts VI-VIII include hazard analysis and historic events for each county.

The following table identifies the recurrence and frequency of hazards in the State of Utah. Hazard profiles for each of the counties are in each specific county annex.

Hazard Recurrence and Frequency, adapted from Utah 2012 State Hazard Mitigation Plan

Hazard	Number of Events	Years in Record	Recurrence Interval (years)	Hazard Frequency and Probability/Year
Droughts (<0 PDSI)	66	118	1.79	56%
Earthquakes (≥ 5.0)	31	160	5.16	19%
Landslides *	unknown	unknown	unknown	unknown
Floods**	23	129	5.16	18%
Tornadoes (all)	129	62	0.48	208%
Avalanches	111	56	0.5	198%

(fatalities)				
Wildfires (>5000 acres)	79	23	0.29	343%
Lightning (fatalities)	65	64	0.98	102%

PDSI, Drought Years as indicated by NOAA, http://www.ncdc.noaa.gov/temp-and-precip/timeseries/?parameter=pdsi&month=10&year=2010&filter=1&state=42&div=0

Magnitude 5.0 or larger Data from UGS and University of Utah Seismography Station.

* Landslide recurrence intervals cannot be predicted because landslides often have recurrent movement with the same landslides moving each year depending on climate.

**Only large flooding events reported by the USGS and FEMA.

Tornado and Avalanche data courtesy of the NOAA.
http://www.wrh.noaa.gov/slc/climate/tornado.php

http://www.wrh.noaa.gov/slc/projects/disasters/avalanche_deaths.php

Lightning data courtesy of NOAA, http://www.lightningsafety.noaa.gov/stats/59-12_State_Ltg._Fatality_Map-rates.pdf

Earthquakes

An earthquake is the sudden release of tension built up over years as tectonic plates shift all across the earth's surface. Plates tend to rupture along weak zones referred to as faults. When plates rupture they produce seismic waves that are transmitted through the rock outward producing ground shaking. Earthquakes are unique multi-hazard events, with the potential to cause huge amounts of damage and loss. Secondary effects of a sudden release of seismic energy (earthquake) include: ground shaking, surface fault rupture, liquefaction, tectonic subsidence, slope failure, and various types of flooding.

The Intermountain Seismic Belt

The Intermountain Seismic Belt (ISB), which Mountainland is part of, is a zone of pronounced earthquake activity up to 120 miles wide extending in a north south direction 800 miles from Montana to northern Arizona. The Utah portion of the ISB trends from the Tremonton Cache Valley area south through the center of the state, along the Wasatch Front, and the southwest through Richfield and Cedar City concluding in St. George. "The zone generally coincides with the boundary between the Basin and Range physiographic province to the west and the Middle Rocky Mountains and Colorado Plateau physiographic provinces to the east" (*Homebuyers Guide to Earthquake Hazards in Utah*, Eldredge 1996).

Figure 1 Utah Geological Survey

Ground Shaking

Ground shaking causes the most impact during an earthquake because it affects large areas and is the origin of many secondary

effects associated with earthquakes. Ground shaking, which generally lasts 10 to 30 seconds in large earthquakes, is caused by the passage of seismic waves generated by earthquakes. Ground shaking is measured using Peak Ground Acceleration (PGA). The PGA measures the rate in change of motion relative to the established rate of acceleration due to gravity.

Liquefaction

While living directly on a fault line is far from ideal, structures farther away can experience equal or greater damage depending on the underlying soil. Deep sediments, such as those surrounding Utah Lake, increase the frequency of seismic waves, which are more damaging to short, stiff structures like the common home. Loose soils are also more susceptible to liquefaction, when loose soils with a high water table behave like a fluid during episodes of shaking. Liquefaction is possible in earthquakes magnitude 5.0 and higher. Local geologic conditions, such as depth of sediment and sediment make up, affect earthquake waves.

Surface Fault Rupture

During a large earthquake fault movement may propagate along a fault plane to the surface, resulting in surface rupture along the fault plane. The Wasatch fault is a normal (mountain building) fault with regards to movement, meaning the footwall of the fault is pushed upward and the hanging wall slips downward. Thus faulting is on a vertical plain, which results in the formation of large fault scarps. Surface fault rupture along the Wasatch fault is expected for earthquakes with magnitudes of 6.5 or larger. The largest probable earthquake that could strike the Mountainland region is an earthquake with an estimated magnitude between 7.0 and 7.5; an earthquake of this magnitude, based on current research, would create "surface fault rupture with a displacement of between 16 to 20 feet in height with break segments 12 to 44 miles long" (*Homebuyers Guide to Earthquake Hazards in Utah*, Eldredge 1996). In historic time surface fault rupture has only occurred once in Utah; the 1934 Hansel Valley earthquake with a magnitude 6.6 produced 1.6 feet of vertical offset.

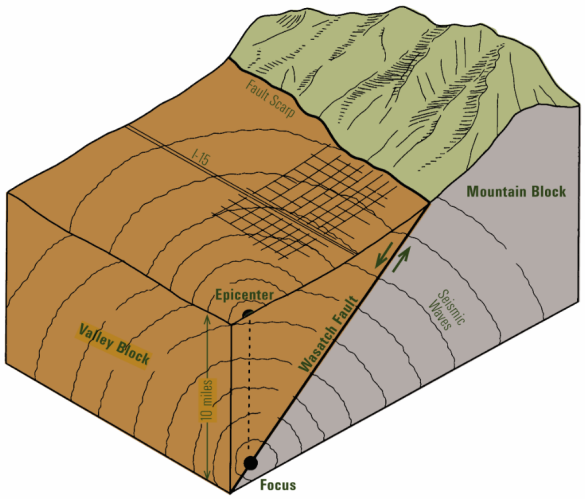


Figure 2 Utah Geological Survey

Surface fault rupture presents several hazards. Anything built on top of the fault or crossing the fault has a high potential to be destroyed in the event of displacement. Foundations will be cracked, buildings torn apart, damage to roads, utility lines, pipelines, or any other utility line crossing the fault. It is almost impossible to design anything within reasonable cost parameters to withstand an estimated displacement of 16 to 20 feet.

Secondary Earthquake Threats

The major secondary effects of earthquakes include liquefaction, avalanches, rock fall, slope failure, and various types of flooding. Since other sections address mass movement and flooding they will not be discussed in depth here. It is important to keep in mind, however, the impact these secondary hazards could have on response to an earthquake.

Various Flooding Issues Specific to Earthquakes

Earthquakes could cause flooding due to the tilting of the valley floor, dam failure and seiches in lakes and reservoirs. Flooding can also result from the disruption of rivers and streams. Water tanks, pipelines, and aqueducts may be ruptured, or canals and streams altered by ground shaking, surface faulting, ground tilting, and landslide.

Seiches

Standing bodies of water are susceptible to earthquake ground motion. Water in lakes and reservoirs may be set in motion and slosh from one end to the other, much like in a bathtub. This motion is called a seiche (pronounced “saysh”). A seiche may lead to dam failure or damage along shorelines.

Modified Mercalli Intensity Scale

Intensity	Effects	Geologic Effects
I	Barely felt by sensitive few.	
II	Felt by few indoors.	
III	Felt by several indoors. Hanging objects may sway.	

IV	Felt by many indoors and few outdoors. Dishes, windows, etc. rattle	Rock falls may be triggered
V	Felt by almost everyone. Some plaster walls crack. Small, unstable objects are displaced. Hanging objects swing greatly.	Liquefaction may be triggered.
VI	Felt by all. Some heavy furniture moved. Damage light.	Strong shaking.
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.	Very strong shaking. Seiche waves may be produced; small slumps and slides along sand and gravel banks.
VIII	Slight damage in specially designed structures; considerable in ordinary substantial buildings with partial collapse; great in poorly built structures.	Severe shaking. Surface rupturing fractures. Spring or well water may change flow rate, etc.

*Adapted from *The Severity of an Earthquake*, a U. S. Geological Survey General Interest Publication.

Probability of Future Damaging Earthquakes

Severe earthquakes, by their nature, are rare disasters. Tectonic plates move fractions of an inch per year, slowly building up tension until they "break". In the case of devastating earthquakes, the process can take decades to centuries. The graphic below depicts how often and how long ago significant earthquakes have occurred along the Wasatch Front. According to the USGS, there is a 57% probability of a magnitude 6.0 or above earthquake occurring along the Wasatch Front in the next 50 years.

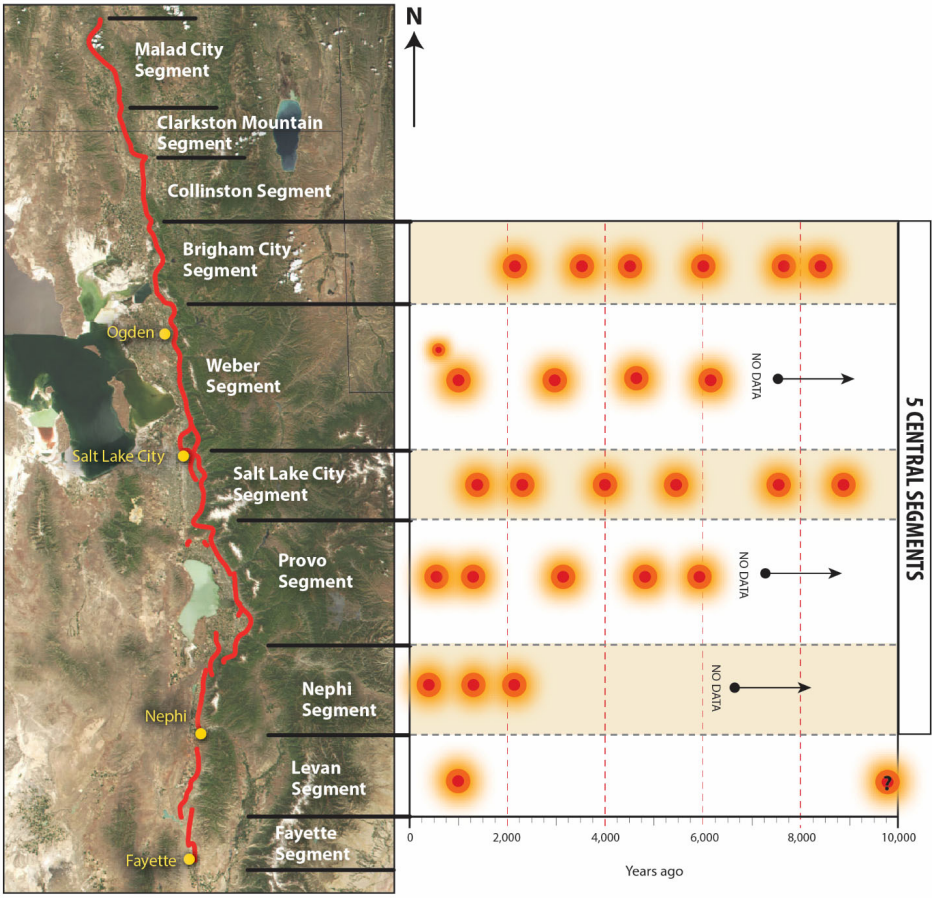


Figure 3 Utah Geological Survey

Potential Mitigation Strategies

The following mitigation strategies are provided so that communities may be aware of measures that could be used to limit the exposure to earthquake related damage.

Objectives	Strategies
Local Planning and Regulations	•Create a seismic safety committee to recommend changes in standards
Adopt & Enforce Building Codes	• Adopt International Building Code (IBC)
Incorporate Earthquake Mitigation into Local Planning	• Offer financial incentives to home and business owners who retrofit • Inventory vulnerable public and commercial buildings
Map and Assess Community Vulnerability to Seismic Hazards	• Use GIS to map shaking and secondary hazards • Incorporate seismic strengthening into Capital Improvement Plan
Conduct Inspections of Building Safety	• Require the hazardous materials be located outside areas of seismic hazards
Structure and Infrastructure Projects	•Use flexible piping to extend water, sewer, or natural gas service
Protect Critical Facilities and Infrastructure	• Retrofit critical public facilities • Brace generators, elevators, and other equipment
Implement Structural Mitigation Techniques	• Install shutoff valves where water mains cross fault lines • Install window film to prevent injuries from shattered glass
Education and Awareness	•Encourage homeowners to install latches on cabinets and drawers
Increase Earthquake Risk Awareness	• Offer GIS mapping online for residents and design professionals
Conduct Outreach to Builders, Architects, Engineers and inspectors	• Conduct information sessions on seismic code • Train building staff on form ATC-20 (Applied Technology Council)
Provide Information on Structural and Non-Structural Retrofitting	• Develop outreach to encourage homeowners to secure tall furniture • Establish a library of technical documents on structural mitigation options.

Adapted from FEMA's "Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (2013)

Flooding

Figure 4 Sandbagging in Provo during the 1983 floods

Humans have always sought out water for survival; drinking, agriculture, travel and energy. Some features like basins, plains, and alluvial fans appear ideal for homes built on flat ground or a gentle slope. Periodic flooding in riverine areas carries nutrients to soil ideal for agricultural production. The problem arises when builders expect the water that has shaped the very land they sit on to stop routine flooding and stay predictably within its bounds. The attraction to water plus effects of urbanization contribute to floods being the most common hazard in the United States.

Flooding is a temporary overflow of water onto lands not normally inundated by water producing measurable property damage or forcing evacuation of people and vital resources. Floods frequently cause loss of life; property damage and destruction; damage and disruption of communications, transportation, electric service, and community services; crop and livestock damage and loss, and interruption of business. Floods also increase the likelihood of hazard such as transportation accidents, contamination of water supplies, and health risk increase after a flooding event.

Several factors determine the severity of floods including rainfall intensity, duration, and rapid snow melt. A large amount of rainfall over a short time span can result in flash flood conditions. Small amounts of rain can also result in flooding at locations where the soil has been previously saturated or if rain concentrates in an area having, impermeable surfaces such as large parking lots, paved roadways, or post burned areas with hydrophobic soils. Topography and ground cover are also contributing factors for floods. Water runoff is greater in areas with steep slopes and little or no vegetative ground cover.

Frequency of inundation depends on the climate, soil, and channel slope. In regions where substantial precipitation occurs during a particular season or in regions where annual flooding is due to spring melting of winter snow pack, areas at risk may be inundated nearly every year.

The Mountainland region can experience both rapid snow melt in the Spring and severe summer storms. As Summit, Utah, and Wasatch counties grow they must take into account the effects of urbanization on

the ability of soil to absorb rainfall. The diagram below demonstrates how a built-up environment alters water dynamics.

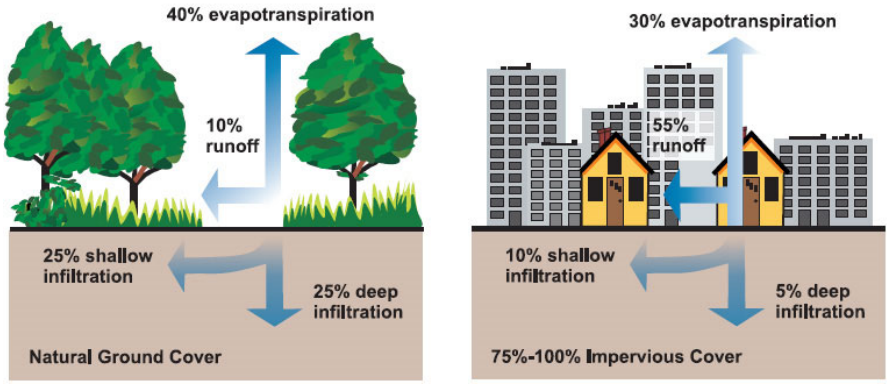


Figure 5 Effects of Urbanization (EPA)

Conditions which may exacerbate floods:

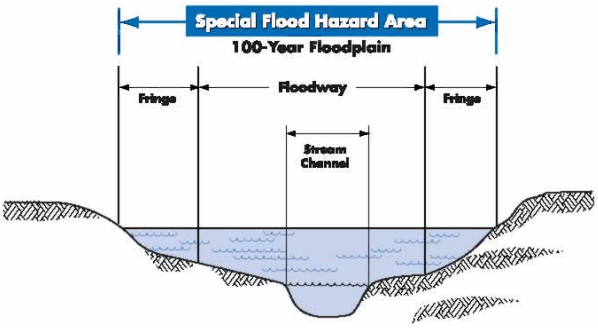
Impermeable surfaces	Debris
Steeply sloped watersheds	Contamination
Constrictions	Soil saturation
Obstructions	Velocity

Explanation of Common Flood Terms

FIRM: Flood Insurance Rate Map

100-year flood: Applies to an area that has a 1 percent chance, on average, of flooding in any given year. However, a 100-year flood could occur two years in a row, or once every 10 years. The 100 year-flood is also referred to as the base flood.

Base Flood Elevation (BFE): As shown on the FIRM, is the elevation of the water surface resulting from a flood that has a 1% chance of occurring in any given year. The BFE is the height of the base flood, usually in feet, in relation to the National Geodetic Vertical Datum (NGVD) or 1929, the North American Vertical Datum (NAVD) of 1988, or other datum referenced in the FIS report.



National Flood Insurance Program (NFIP): The NFIP is a Federal program enabling property owners in participating communities to purchase insurance as a protection against flood losses in exchange for State and community floodplain management regulations that reduce future flood damages. Participation in the NFIP is based on an agreement between communities and the Federal Government. If a community adopts and enforces a floodplain management ordinance to reduce future flood risk to new construction in floodplains, the Federal Government will make flood insurance available within the community as a financial protection against flood losses. This insurance is designed to provide an insurance alternative to disaster assistance to reduce the escalating costs of repairing damage to buildings and their contents caused by floods.

Special Flood Hazard Area (SFHA): Is the shaded area on a FIRM that identifies an area that has a 1% chance of being flooded in any given year (100-year floodplain).

Floodway: Is the stream channel and that portion of the adjacent floodplain that must remain open to permit passage of the base flood without raising that water surface elevation by more than one foot.

Potential Mitigation Strategies

The following mitigation strategies are provided so that communities may be aware of measures that could be used to limit the exposure to flood related damage.

Objective	Strategies
Local Planning and Regulations	
Improve Compliance with NFIP	• Complete and maintain FEMA elevation certificates for buildings
Incorporate Flood Mitigation into Local Planning	• Use "green infrastructure" program to link, manage, & expand greenways • Mitigate hazards during infrastructure planning
Limit or Restrict Development in Floodplain Areas	• Develop stream buffer ordinance or limit impervious surfaces • Prohibit or limit floodplain development
Adopt and Enforce Building Codes	• Require the hazardous materials be located outside areas of seismic hazards
Improve Storm Water Management	• Complete a storm water drainage study for known problem areas
Structure and Infrastructure Projects	
Preserve Floodplains as Open Space	• Allow developers to increase density in another area to keep flood area vacant
Conduct Regular Maintenance for Drainage Systems and Flood Control	• Routinely clean and repair storm water drains • Detect and prevent illegal discharges into storm water and sewer systems
Protect and Restore Natural Flood Mitigation Measures	• Retain thick vegetation on public lands flanking rivers • Protect and enhance landforms that serve as natural barriers
Protect Critical Facilities	• Require critical facilities to be built above 500-year flood elevation
Education and Awareness	
Educate Property Owners	• Provide accurate floodplain maps

*Adapted from FEMA's "Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (2013)

Dam Failure

Dams are frequently built for recreation, flood control, fire protection, irrigation and water storage. Most dams are small earthen works on private property, causing limited damage if they fail. Summit, Utah, and Wasatch counties have hundreds of dams, but only 48 are likely to put life at risk should they fail. The most hazardous of these are the Deer Creek and Jordanelle Dams, which could engulf entire communities in Wasatch and Utah counties.

Dam failures are defined as the failure of a man made water impoundment structure, which sometimes results in catastrophic down grade flooding. The diagram below depicts common features of dams.

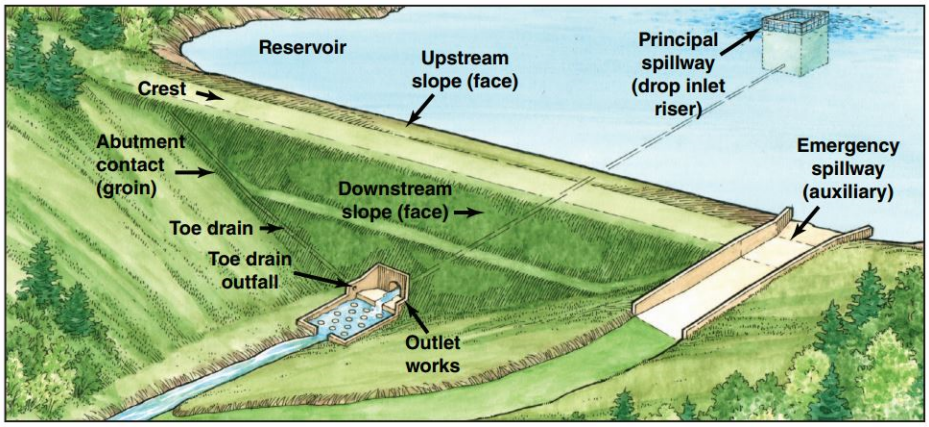


Figure 6 Dam Features. Created by the Forest Service and FEMA

Dam failure can have many causes, as seen below. Overtopping, or when water comes over the top of the dam after a significant rain event or because of a low area in the crest of a dam, can quickly erode the crest, slope, and toe of the dam quickly leading to failure. Overtopping is specifically mentioned as a possibility if the Jordanelle dam fails due to piping, then raises the water level in the Deer Creek dam until it experiences overtopping. Earthquakes can instigate many of the problems a dam normally faces, such as mass movement (a slump or landslide), cracking, and/or liquefaction leading to stability failure.

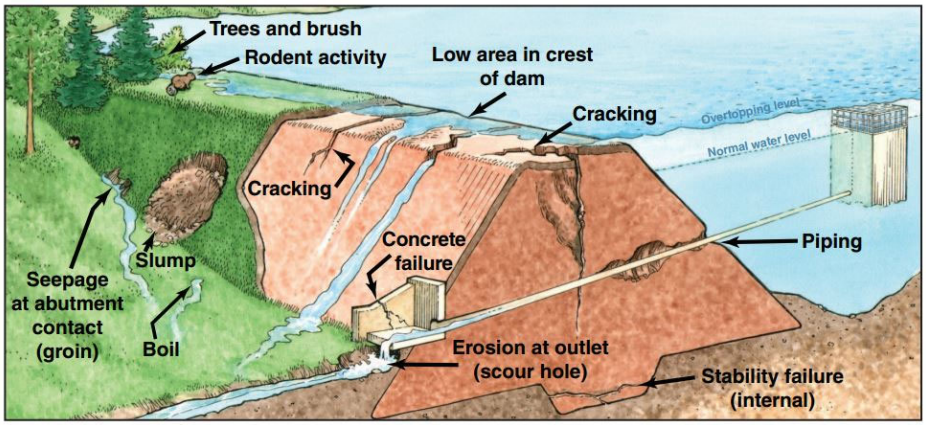


Figure 7 Possible dam problems. Graphic creates by the Forest Service & FEMA.

According to the Bureau of Reclamation, the Jordanelle Dam is built to withstand a 7.5 magnitude earthquake on the Wasatch Fault 19 miles to the west or a 6.5 magnitude earthquake directly beneath the dam. Deer Creek dam also experienced extensive renovations from 2003-2008, and is now much less likely to suffer serious adverse effects in the event of an earthquake. The Utah State Engineer has been charged with regulating non-federal dams in the State since 1919. The Engineer ensures that all non-federal dams are inspected routinely and that the results of those inspections are available to the public. With the passing of the Federal Dam Safety Act in the 1970's, Utah created a Dam Safety Section responsible for all non-federal dams.

The State Dam Safety Section has developed a hazard rating system for all non-federal dams in Utah. Downstream uses, the size, height, volume, and incremental risk/damage assessments of dams are all variables used to assign dam hazard ratings in the Dam Safety classification system. Using the hazard ratings systems developed by the Dam Safety Section, dams are placed into one of three classifications high, moderate, and low. Dams receiving a low rating would have insignificant property loss due to dam failure. Moderate hazard dams would cause significant property loss in the event of a breach. High hazard dams would cause a possible loss of life in the event of a rupture. The frequency of dam inspection is designated based on hazard rating with the Division of Water Rights inspecting high-hazard dams annually, moderate hazard dams biannually and low-hazard dams every five years. There are more than 150 dams in the Mountainland Region of which 48 have received a high hazard rating by Dam Safety.

The following information regarding a failure of both Jordanelle and Deer Creek Dams and resulting loss was prepared by the United States Department of the Interior Bureau of Reclamation entitled "Dam Failure and Maximum Operational Release, Inundation Study: Deer Creek Dam" completed, February 2002.

Commented [SM5]: I found a document from the 1980's, but nothing from 2002.

Introduction and Purpose

On February 27, 1995, the Commissioner of the Bureau of Reclamation (Reclamation) issued a policy statement regarding establishing an Emergency Management Program at Reclamation dams. This policy stated that Reclamation would offer technical support and assistance to communities and jurisdictions downstream of Reclamation dams to ensure that adequate dam-specific emergency operation plans are in place. Directives for the emergency management program state that Emergency Actions Plans (EAP) shall be developed and are to contain descriptions of potentially affected areas in the flood plain with inundation maps wherever appropriate. Studies are designed to assess the worst case scenario, when a reservoir at full capacity suddenly experiences an instantaneous failure. More often than not, dam owners have enough forewarning of a problem to remedy it or at least give warning. The dam failure study below was prepared to meet the goals and objectives of the Commissioner's directives.

The purpose of the study was to identify potential flood hazard areas resulting from the unlikely events of "sunny day" failure of Deer Creek Dam (referring to an event that occurs when severe weather, earthquakes, or other extreme events are not present), the maximum operational release of Deer Creek Dam and the "sunny day" failure of Jordanelle Dam resulting in the failure of Deer Creek Dam due to overtopping.

These studies are standard practice within Reclamation and therefore do not reflect in any way upon the integrity of either Jordanelle or Deer Creek Dams.

Previous Studies

The Denver Office completed a previous Flood Inundation Study in June of 1990. It addressed two conditions, 1) a PMF (Probable Maximum Flood) causing the failure of Deer Creek Dam; and 2) a PMF (Probable Maximum Flood) causing the failure of Jordanelle Dam, which then results in the failure of Deer Creek Dam. Both scenarios were accomplished using the National Weather Service (NWS)

DAMBRK model. Cross sections and some dam breach parameters were obtained from these studies for use in this report.

Description of Jordanelle Dam

Jordanelle Dam and reservoir is located on the Provo River in Wasatch County in north central Utah about 5 miles north of Heber City, Utah. The reservoir has a storage capacity of 311,000 acre-feet at active conservation, and a total reservoir storage capacity of 361,500 acre-feet.

The primary purpose of the reservoir is to provide Municipal and Industrial water for use in Salt Lake City and northern Utah County. Additional project purposes include flood control, recreation, Heber Valley irrigation water, and fish and wildlife enhancement.

Description of Deer Creek Dam

Deer Creek Dam and reservoir are located on the Provo River about 16 miles northeast of Provo, Utah and about 10 miles southwest of Heber City, Utah. Deer Creek Dam consists of a zoned earthfill structure, spillway and outlet works. The reservoir has a storage capacity of 152,570 acre-feet at the top of the gates, which is elevation 5,417 feet. The reservoir is part of a collection system, which stores and releases water from the Duchesne River, Weber River, and also the Provo River drainage. The primary recipients of the water are cities and farms along the Wasatch Front. It also provides year-round power generation and is used heavily for recreational purposes.

Study Results

The results indicate that flooding resulting from the sunny day failures of either Jordanelle or Deer Creek Dams will inundate the residential areas along the Provo Canyon corridor and in Orem and Provo, which could result in the loss of life. In addition, parts of Springville located within the flood plain south of Provo, Utah as well as major highways and road crossings would be heavily impacted by the floodwaters.

The routings of the floods were terminated at approximately 10 hours for the sunny day failure of Jordanelle and Deer Creek Dams. About 10 hours after flooding begins, most of the floodwaters are safely contained by Utah Lake. The results of the flood routing are listed in the attached tables.

Sunny day failure of Jordanelle Dam resulting in the failure of Deer Creek Dam due to overtopping, identifies results obtained from the sunny day failure of Jordanelle Dam modeled as a piping failure. The table includes the maximum water surface, peak flows, and flood arrival times from the beginning of the failure of Jordanelle Dam to the flood arrival at Provo City.

Sunny day failure of Jordanelle Dam

River Miles Downstream of Deer Creek Dam	Maximum Water Surface Elev (Feet)	Depth Above Streambed (Feet)	Arrival Time of Leading Edge (Hrs)	Arrival Time of Peak Flow (Hrs)	Maximum Flow (CFS)	Location
0.0	5439	165	River Miles Downstream of	2.5	3,573,000	Deer Creek Dam
10.0	4926	104	2.0	2.9	3,124,000	Mouth of Provo Canyon
14.5	N/A	N/A	2.5	3.0	3,085,000	Provo City

*****Arrival times are from the beginning of Jordanelle Dam failure
*****Mile 0.0 is at the downstream toe of Deer Creek Dam

Sunny day failure of failure of Deer Creek Dam identifies results obtained from the sunny day failure of Deer Creek Dam modeled as a piping failure. The table includes the maximum water surface, peak flows, and flood arrival times from the beginning of the failure of Deer Creek Dam to the flood arrival at Provo City.

Sunny day failure of Deer Creek Dam

River Miles Downstream of Deer Creek Dam	Maximum Water Surface Elev (Feet)	Depth Above Streambed (Feet)	Arrival Time of Leading Edge (Hrs)	Arrival Time of Peak Flow (Hrs)	Maximum Flow (CFS)	Location

0.0	5381	107	0.1	0.7	1,550,000	Deer Creek Dam
10.0	4915	93	0.8	1.1	1,397,000	Mouth of Provo Canyon
14.5	N/A	N/A	0.9	1.2	1,386,000	Provo City

*Arrival times are from the beginning of Deer Creek Dam failure
*Mile 0.0 is at the downstream toe of Deer Creek Dam

Maximum operational release of Deer Creek Dam identifies the results of the maximum operational release from Deer Creek Dam to the mouth of Provo Canyon, based on the maximum release of 13,500 cfs. The table includes the maximum water surface, depth above streambed, and peak flows obtained at the cross sections modeled.

Maximum operational releases of Deer Creek Dam (Releases are based on continuous flow of 13,500 cfs)

River Miles Downstream of Deer Creek Dam	Maximum Water Surface (Elev)	Depth Above Streambed (Feet)	Maximum Flow (CFS)
0.0	5289	15	13,500
10.0	4836	14	13,500

*Mile 0.0 is at the downstream toe of Deer Creek Dam

Inundation Maps

Inundation maps produced from this study are shown on U.S. Geological Survey Quadrangle maps (Scale 1:24,000). They combine flood inundation boundaries from both the National Weather Service's (NWS) DAMBRK one dimensional model, which was used to route flows between Deer Creek Dam and the mouth of Provo Canyon, and MIKE 21, the two dimensional model which terminates at Utah Lake. The flood inundation boundaries shown on the maps for each scenario were taken from the 1993 study and are located in the county annexes.

Mitigation

Local Planning and Regulations	
Include Dam Failure scenarios into Local Planning	• Designate multiple escape routes for inundation zone • Require the hazardous materials be located outside inundation zone
Map and Assess Community Vulnerability to Dam Failure	• Use GIS to map inundation zones for high-risk dams (if not previously done) • Incorporate seismic strengthening into Capital Improvement Plan
Include Dam Owners in Planning Process	• Use dam's Emergency Response Plan in city emergency response plan • Invite dam owners to attend planning workshops when applicable
Structure and Infrastructure Projects	
Conduct seismic retrofitting	• Incentivize dam owners to retrofit high-risk dams
Partner with dam owners for upgrades	• Designate a dam liaison from the public works department to talk to owners
Education and Awareness	
Educate the Public on their Risk	• Make maps and reports readily available
Review Inspection Results Regularly	• Designate employee to review inspection results on a yearly basis

*Adapted from FEMA's "Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (2013)

Wildland Fire

Identifying Hazards

A wildfire is an uncontrolled fire spreading through vegetative fuel often exposing or consuming structures. Wildfires often begin unnoticed and spread quickly and are usually sighted by dense smoke. Wildfires are placed into two classifications Wildland and Wildland-Urban Interface. Wildland fires are those occurring in an area where development is essentially nonexistent, except for roads, railroads, or power lines. Wildland-Urban Interface fire is a wildfire in a geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels. As the populations of the MAG region grow, residents build farther into wildland areas. This can pose problems for local fire departments as they endeavor to extend their services to new homes.

When discussing wildland fire, it is important to remember that fires are part of a natural process and are needed to maintain a healthy ecosystem. If fires are suppressed for longer than the ecosystem is accustomed to and debris collects in the understory, any wildland fire that occurs will have more fuel to burn and be more difficult to control. Land Management agencies across the state try to keep the fuel low load through controlled burns, manual removal, and other practices. Three basic elements are needed for a fire to occur (1) a heat source (2) oxygen and (3) fuel. Two of the three sources are readily available in the counties making up the Mountainland region. Major ignition sources for wildfire are lightning and human causes such as arson, prescribed burns, recreational activities, burning debris, sparks from equipment, and carelessness with fireworks. About half of all wild fires started in Utah can be attributed to human activities, with the other half caused by lightning. Once a wildfire has started, vegetation, topography and weather are all conditions having an affect wildfire behavior.

Potential Mitigation Strategies

The following mitigation strategies have been provided so that communities may be aware of measures that could be used to limit the exposure to Wildland Fire related damage.

Objective	Strategies
Local Planning and Regulations	
Map and Assess Vulnerability to Fire	• Use GIS mapping to analyze planning decisions, zoning, development, etc
Reduce Risk through Land Use Planning	• Designate high-risk areas and specify conditions for use and development
Develop a Wildland-Urban Interface Code	• Involve Fire Protection agencies in determining standards for development • Address access, signage, fire hydrants, water availability, vegetation, etc
Structure and Infrastructure Projects	
Create Defensible Space Around Structures	• Create defensible space around power lines, oil and gas lines, etc • Replace flammable vegetation with less flamable species
Conduct Maintenance	• Arson prevention cleanup in areas of abandoned structures, trash, etc.
Natural Systems Protection	
Implement a Fuels Management Program	• Perform maintenance including fuel management: pruning, selective logging, etc • Sponsor local "slash and clean-up" days to reduce fuel loads along the WUI
Education and Awareness	
Participate in Firewise Program	• Consult Firewise guidance in encouraging best practices for the community
Increase Wildfire Risk Awareness	• Organize local fire department tour to show officials vulnerable areas
Educate Property Owners about Wildfire Mitigation Techniques	• Install fire mitigation systems such as interior and exterior sprinklers • Remove dead or dry leaves and other combustibles near/on homes

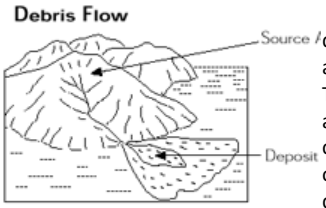
*Adapted from FEMA's "Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (2013)

Landslides

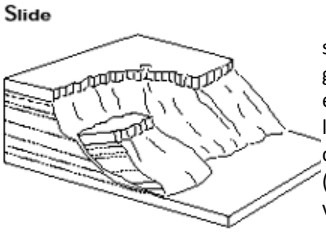
Many hazards are characteristically intertwined. Lightning may start a Wildfire or excessive rain could lead to a dam failure. Landslides are no exception. Landslides, often referred to as mass movement, occur any time the driving forces of gravity outweigh the resisting forces (friction, cohesion, strength of material) of a slope. This can be accelerated by a fire, which destroys the vegetation keeping soil in places, or a flood that lubricates soil particles and decreases the friction holding them in place. Earthquakes can also instigate movement of an unstable slope. Any area with a slope could be a site of mass movement. Mountain slopes with the spectacular views sought by many a homeowner are especially susceptible to landslide activity. Though there have been fewer catastrophic landslide disasters than flood or fire, there are numerous events where a few homes are damaged or made to undertake extensive mitigation measures because the land under their foundation is slowly creeping out of place.

Mass movement can occur at a snail's pace or faster than a flood. The speed depends on the composition of the mass being moved and the cause of the movement. There are several types of mass movement, the most relevant of which are explained below.

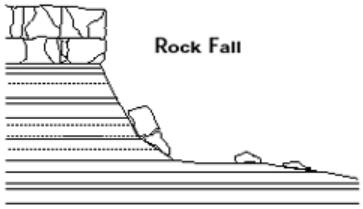
Three Common Types of Landslides in Utah



Debris flows consist of sediment-water mixtures that flow down a streambed or hillside, commonly depositing sediment at canyon mouths in fan-like deposits know as alluvial fans. These often occur during episodes of heavy rain, especially if a slope has experienced de-vegetation from fire or construction. Debris flows can start with just a few cubic feet of material and gain huge quantities as they quickly flow downhill.



Slides are down slope movements of soil or rock on slopes. They can occur so slowly that the only evidence is gradual cracking of a home's walls and foundations or fast enough to kill. There are several activities that increase the likelihood of this type of mass movement occurring, such as cutting into the toe of a slope, overwatering, adding weight (such as a house) to the top of a slope, and removing vegetation (especially trees).



Rock falls consist of rock(s) falling from a cliff or cut slope and are very common in the canyon country of southern Utah. Rock falls, by definition, involve material travelling through the air and happen very quickly. Earthquakes are often a trigger, as is repeated freezing and thawing which expands cracks within the rock.

Potential Mitigation Strategies

The following mitigation strategies are provided so that communities may be aware of methods that could be used to limit the exposure to landslide/Problem Soils related damage.

Objective	Strategies
Local Planning and Regulations	
Manage Development in Landslide Hazard Areas	• Locate utilities outside landslide areas • Limit new development in steep slope/high-risk areas
Open Space	• Leave open space or setbacks on and near at-risk slopes
Warn inhabitants after triggering events	• Monitor at-risk slopes after fire, intense rainfall, or other events
Map and Assess Community Vulnerability to Landslides	• Assess vegetation in wildfire-prone areas to prevent landslides after fires • Inventory infrastructure in areas vulnerable to landslides
Structure and Infrastructure Projects	
Prevent Impacts to Roadways	• Apply soil stabilization measures on steep, publicly-owned slopes
Install drain fields	• Install drains on slopes with naturally poor drainage
Remove Existing Buildings and Infrastructure from Hazard Areas	• Acquire at-risk buildings and infrastructure • Enforce permanent restrictions on development
Education and Awareness	
Educate Public on Hazardous areas	• Make public hazard maps
Real Estate disclosure	• Ensure that homebuyers know risk before purchasing homes on slopes

Educate the public on correct watering practices and slope vegetation	• Disperse guidelines for correct watering practices to those in vulnerable areas • Recommend services and plants to those living on or near steep slopes

*Adapted from FEMA's "Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (2013)

Part V
Regional Hazards

Introduction

Many hazards are difficult to map at a county level due to their unpredictability or wide-spread effects. Severe weather, infestations, and drought have been recognized as regional hazards for this plan. Identifying one portion of the region being more prone to these hazards than another is impossible due to the lack of specific spatial data and their widespread nature. Each individual jurisdiction has the opportunity to address these hazards on an individual mitigation level.

Severe Weather

Utah, Summit, and Wasatch counties have an ideal site and situation for a variety of severe weather events. Utah's distance from the moderating effects of oceans results in hot summers and cold winters, unlike coastal areas that enjoy less extreme temperatures. In addition, the mountains create opportunity for precipitation which can be severe. The benefit of the mountains (other than providing necessary water) is that they prevent more severe tornados by breaking up the bodies of warm, moist air and cool, dry air necessary for formation. Numerous opportunities for recreation in the Wasatch and Uintah mountains place a greater number of people at risk during severe weather events, whether it be summer hikers struck by lightning or skiers caught in a snow storm.

"Severe weather" includes the following events grouped for convenience.

Hazard	National Weather Service Guidelines for Event Type
Winter Weather, Blizzard, Snow Storm	A winter storm which produces the following conditions for 3 hours or longer: (1) sustained winds or frequent gusts 30 knots (35 mph) or greater, and (2) falling and/or blowing snow reducing visibility frequently to less than 1/4 mile, on a widespread or localized basis. -OR- A winter precipitation event that causes a death, injury, or a significant impact to commerce or transportation but does not meet locally/regionally defined warning criteria. A Winter Weather event could result from one or more winter precipitation types (snow, or blowing/drifting snow, or freezing rain/drizzle), on a widespread or localized basis
Cold, Wind Chill, Extreme Cold	Period of low temperatures or wind chill temperatures reaching or exceeding locally/regionally defined advisory (typical value is -180 F or colder) conditions, on a widespread or localized basis. There can be situations where advisory criteria are not met, but the combination of seasonably cold temperatures and low wind chill values (roughly 150 F below normal) must result in a fatality. Normally, cold/wind chill

	conditions should cause human and/or economic impact.
Dense Fog	Water droplets suspended in the air at the Earth's surface, over a widespread or localized area, reducing visibility to values equal to or below locally/regionally established values for dense fog (usually 1/4 mile or less) and impacting transportation or commerce. No direct fatalities.
Hail	Hail 3/4 of an inch or larger in diameter will be entered. Hail accumulations of smaller size which cause property and/or crop damage, or casualties, should be entered.
Heavy Rain	Unusually large amount of rain which does not cause a flash flood or flood, but causes damage, e.g., roof collapse or other human/economic impact.
High Wind, Thunderstorm Wind, Strong Wind	Sustained non-convective winds of 35 knots (40 mph) or greater lasting for 1 hour or longer or winds (sustained or gusts) of 50 knots (58 mph) for any duration (or otherwise locally/regionally defined), on a widespread or localized basis. In some mountainous areas, the above numerical values are 43 knots (50 mph) and 65 knots (75 mph), respectively. -OR- Non-convective winds gusting less than 50 knots (58 mph), or sustained winds less than 35 knots (40 mph), resulting in a fatality, injury, or damage. -OR- Winds, arising from convection (occurring within 30 minutes of lightning being observed or detected), with speeds of at least 50 knots (58 mph), or winds of any speed (non-severe thunderstorm winds below 50 knots) producing a fatality, injury, or damage.
Lightning	A sudden electrical discharge from a thunderstorm, resulting in a fatality, injury, and/or damage.
Tornado, Funnel Cloud	A rotating, visible, extension of a cloud pendant from a convective cloud with circulation not reaching the ground. The funnel cloud should be large, noteworthy, or create strong public interest to be entered. -OR- A violently rotating column of air, extending to or from a cumuliform cloud or underneath a cumuliform cloud, to the ground, and often (but not always) visible as a condensation funnel. Literally, in order for a vortex to be classified as a tornado, it must be in contact with the ground and extend to/from the cloud base, and there should be some semblance of ground-based visual effects such as dust/dirt rotational markings/swirls, or structural or vegetative damage or disturbance.

Lightning

During the development of a thunderstorm, the rapidly rising air within the cloud, combined with the movement of the precipitation within the cloud, causes electrical charges to build. Generally, positive charges build up near the top of the cloud, while negative charges build up near the bottom. Normally, the earth's surface has a slight negative charge. However, as the negative charges build up near the base of the cloud, the ground beneath the cloud and the area surrounding the cloud becomes positively charged. As the cloud moves, these induced positive charges on the ground follow the cloud like a shadow. Lightening is a giant spark of electricity that occurs between the positive and negative charges within the atmosphere or between the atmosphere and the ground. In the initial stages of development, air acts as an insulator between the positive and negative charges. When the potential between the positive and negative charges becomes too great, there is a discharge of electricity that we know as lightning.

Heavy Snowstorms

A severe winter storm deposits four or more inches of snow during a 12-hour period or six inches of snow during a 24-hour period. According to the official definition given by the U.S. Weather Service, the winds must exceed 35 miles per hour and the temperature must drop to twenty degrees Fahrenheit 20° F or lower. All winter storms make driving extremely dangerous.

Hail Storms

Hailstones are large pieces of ice that fall from powerful thunderstorms. Hail forms when strong updrafts within the convection cell of a cumulonimbus cloud carry water droplets upward causing them to freeze. Once the droplet freezes, it collides with other liquid droplets that freeze on contact. These rise and fall cycles continue until the hailstone becomes too heavy and falls from the cloud.

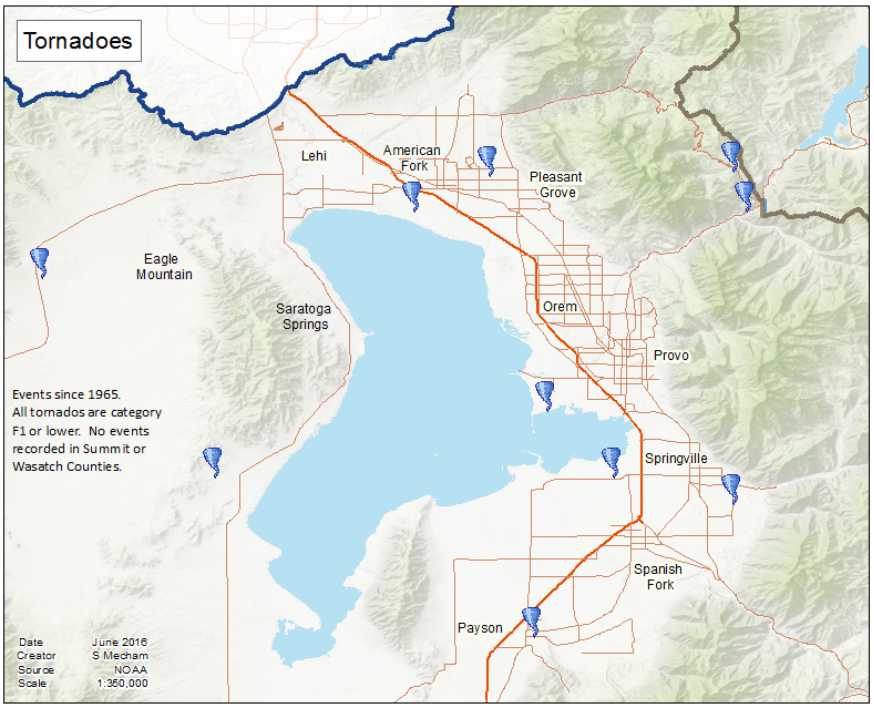
Tornados

A tornado is a violently rotating column of air extending from a thunderstorm to the ground. Tornados often occur at the edge of an updraft or within the air coming down from a thunderstorm. Due to the Mountainland region's topography, it has only experienced tornadoes category F1 and lower. The most destructive tornado in the state of Utah occurred in 1999, striking downtown Salt Lake City and resulting in 1 death, dozens of injuries and $170 million in damage. Even so, that tornado was only an F2 and dissipated upon reaching the foothills.

Fujita Scale

Tornadoes are classified by wind damage using the Fujita Scale. The National Weather Service has used the Fujita Scale since 1973. This scale uses numbers from 0 through 5 with higher numbers assigned based on the amount and type of wind damage.

Category F0	Gale tornado (40-72 mph)	Light damage. Some damage to chimneys; break branches off trees; push over shallow-rooted trees; damage to sign boards.
Category F1	Moderate tornado (73-112 mph)	Moderate damage. The lowers limit is the beginning of hurricane wind speed; peel surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off roads.
Category F2	Significant tornado (113-157 mph)	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
Category F3	Severe tornado (158-206 mph)	Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; cars lifted off ground and thrown.
Category F4	Devastating tornado (207-260 mph)	Devastating damage. Well-constructed houses leveled; structure with weak foundation blown off some distance; cars thrown and large missiles generated.
Category F5	Incredible tornado (261-318 mph)	Incredible damage. Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobiles-size missiles fly through the air in excess of 100 yards; trees debarked; incredible phenomena will occur.



Avalanches

Avalanches are a rapid down-slope movement of snow, ice, and debris. Snow avalanches are a significant mountain hazard in Utah, and nationally account for more deaths each year than earthquakes. Avalanches are the result of snow accumulation on a steep slope and can be triggered by ground shaking, sound, or a person. Avalanches consist of a starting zone, a track, and a run-out zone. The starting zone is where the ice or snow breaks loose and starts to slide. The Track is the grade or channel down which an avalanche travels. The run-out zone is where an avalanche stops and deposits the snow.

The two main factors affecting avalanche activity include weather and terrain, large frequent storms combined with steep slopes result in avalanche danger. Additional factors that contribute to slope stability are the amount of snow, rate of accumulation, moisture content, snow crystal types and the wind speed and direction. In Utah, the months of January through April have the highest avalanche risk.

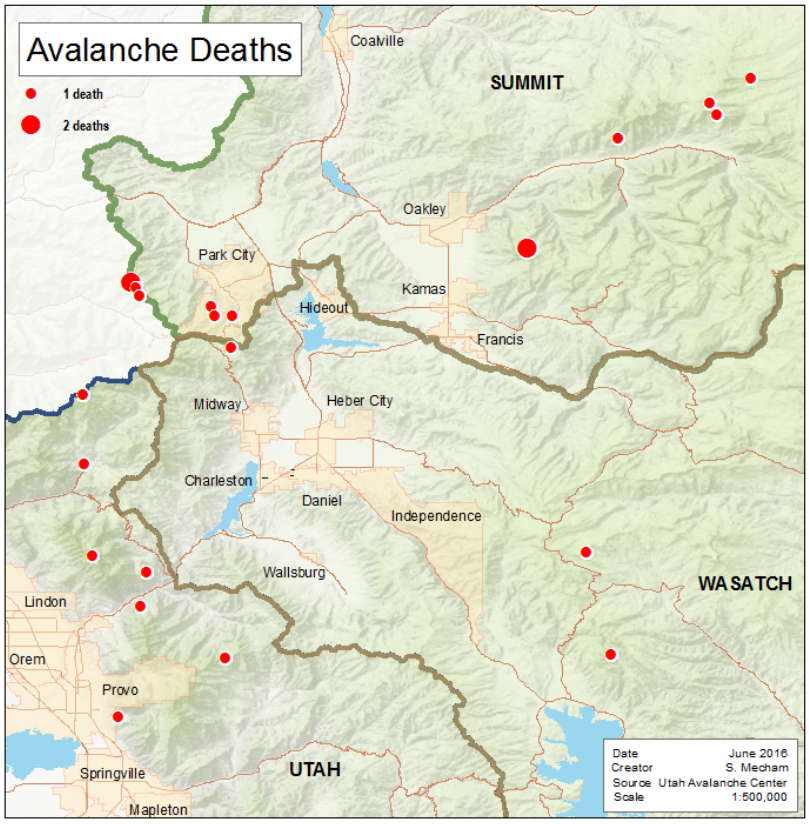
Topography plays a vital role in avalanche dynamics. Slope angles between 30 to 45 degrees are optimum for avalanches with 38 degrees being the bulls-eye. Slopes with an angle above 45 degrees

continually slough eliminating large accumulation. The risk of avalanches decreases on slope angles below 30 degrees.

Types of Avalanches Common in Utah:

Dry or slab avalanches occur when a cohesive slab of snow fractures as a unit and slides on top of weaker snow, breaking apart as it slides. Slab avalanches occur when additional weight is added quickly to the snow pack, overloading a buried weaker layer. Dry snow avalanches usually travel between 60-80 miles per hour, reaching this speed within 5 seconds of the fracture, resulting in the deadliest form of snow avalanche.

Wet avalanches occur when percolating water dissolves the bonds between the snow grains in a pre-existing snow pack, decreasing the strength of the buried weak layer. Strong sun or warm temperatures can melt the snow and create wet avalanches. Wet avalanches usually travel about 20 miles per hour.



Potential Mitigation Strategies

The following mitigation strategies are provided so that communities may be aware of methods that could be used to limit the exposure to Severe Weather/Avalanche related damage.

Objective	Strategies
Local Planning and Regulations	
Adopt and Enforce Building Codes	• Enforce building codes for roof snow loads
Adopt Zoning Codes in Avalanche Areas	• Limit development in avalanche risk areas
Create Early Warning Systems	• Make National Weather Service warnings easily accessible to residents
Structure and Infrastructure Projects	
Protect Power Lines	• Install redundancies and loop-feeds, design lines to fail in small sections
Protect Critical Facilities and Equipment	• Install lightning protection on critical infrastructure and surge protection
Reduce Impacts to Roadways	• Use snow fences or rows of vegetation to limit blowing and drifting snow • Install sheds over roads below avalanche terrain
Education and Awareness	• Encourage homeowners to install CO monitors and alarms
Conduct Winter Weather Risk Awareness	• Distribute family and traveler emergency preparedness information
Assist Vulnerable Populations	• Identify and organize outreach to vulnerable populations
Educate Property Owners about Freezing Pipes	• Educate homeowners on locating water pipes inside insulated areas • Inform homeowners on allowing a faucet drip during extreme cold

*Adapted from FEMA's "Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (2013)

Assessing Vulnerability

Severe weather can be a regular part of living in the Mountainland Region. Fortunately, the intensity of severe weather in the region has been limited to moderate levels. Some vulnerability assessment is made in the County Profiles based on previous losses.

Development Trends

In some instances, growth in certain areas such as mountainsides and canyons can decrease accessibility and increase other risks such as avalanche. Communities should develop education requirements as part of the development process. Other hazards such as lightning and hail are relatively independent of small-scale geography and are not exacerbated by development. Climate change could increase the amount of energy in the air, resulting in more powerful summer storms and their related hazards. It will take decades, however, to separate permanent change from the normal variation in weather experienced over the last centuries.

Profile

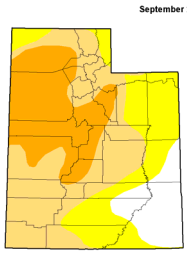
Frequency	Frequent. Multiple events happen each year.
Severity	Moderate
Location	Region wide with some locations more frequent due to geography.
Seasonal Pattern	All year depending upon the type of event.
Duration	Seconds to Days
Speed of Onset	Immediate
Probability of Future Occurrences	Extremely likely. All counties average multiple damaging severe weather events every year.

History

Due to the large number of incidents that have been recorded the history table was omitted from this section and a summary is in each County Profile.

Drought

Drought is a normal recurrent feature of climate, although many people in Utah erroneously consider it a rare and random event. It occurs in virtually all climatic zones, but has greater effects in semi-arid zones (such as Utah) where consistently lower levels of precipitation decrease the margin of tolerance for lengthy events. Droughts are slow-onset hazards, which result from long periods of below normal precipitation. Drought is a temporary aberration and differs from aridity since the latter is restricted to low rainfall regions and is a permanent feature of climate.



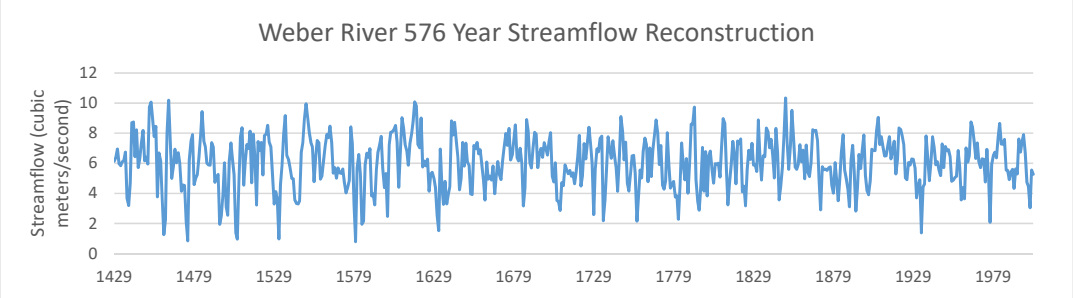
Conditions at the start of the water year per U.S. Drought Monitor

A common measure of drought is the Palmer Drought Severity Index (PDSI), which quantifies the existence of a drought through measures of soil moisture. A caveat of the PDSI is that it does not account for human access to water, such as reservoir levels. The PDSI may show no drought while human and agricultural sources are still recovering from multiple years of water storage depletion.

Palmer Drought Severity Index PDSI	Description	Possible Impacts
-1.0 to -1.9	Abnormally Dry	Short-term dryness slowing planting, growth of crops/pastures
-2.0 to -2.9	Moderate Drought	Some damage to crops/pastures Streams, reservoirs, or wells low Voluntary water-use restrictions requested
-3.0 to -3.9	Severe Drought	Crop/pasture losses likely Water shortages common Water restrictions imposed
-4.0 to -4.9	Extreme Drought	Major crop/pasture losses Widespread water shortages or restrictions
-5.0 or less	Exceptional Drought	Shortages of water in reservoirs, streams, and wells creating water emergencies Exceptional and Widespread crop/pasture losses

*Adapted from U.S. Drought Monitor

Tree ring data can also be used to extend the drought record far beyond the instrumental record. Correlating tree ring widths from hundreds of trees across the region provides a much broader sample of precipitation variability going back hundreds of years. In fact, tree ring data suggests that the instrumental record has actually been relatively drought-free compared to the entire record. For example, the following reconstruction of the Weber River (which correlates well with all three counties) shows the 20th century having the fewest severely dry years of the entire record.



Matthew F. Bekker, R. Justin DeRose, Brendan M. Buckley, Roger K. Kjelgren, and Nathan S. Gill . 2014. A 576-Year Weber River Streamflow Reconstruction from Tree Rings for Water Resource Risk Assessment in the Wasatch Front, Utah. Journal of the American Water Resources Association. doi: 10.1111/jawr.12191 https://www.ncdc.noaa.gov/paleo/study/16416. Accessed 11 July 2016

Profile

Frequency	Frequent
Severity	Severe primarily to agriculture
Location	Region wide
Seasonal Pattern	Summer
Duration*	Average: 11 years, longest in record: 44 years
Speed of Onset	Incremental with impact increasing.
Probability of Future Occurrences*	Moderate: 0.191 (PDSI -2.0 or lower) Severe: 0.118 (PDSI -3.0 or lower)

*Estimates according to the Utah State Water Plan (2007) based on centuries-long tree-ring data.

Assessing Vulnerability

Drought is a condition that affects every corner of the Mountainland Region. In the developed world, droughts no longer threaten the availability of drinking water and do not put lives at risk. The same cannot be said for a person's livelihood. As most of the agriculture in the region is irrigated, low water levels can have the greatest effect on rural communities where farming is still prominent. As growth occurs, water will continue to be converted to non-agricultural uses and therefore increasing remaining farmer's vulnerability to drought. Each of the three counties has rural communities that could be affected. Droughts also stress wildlife and heighten the risk of wildfire.

Development Trends

As the state and region continue to be among the fastest growing in the U.S., drought will become a more pronounced threat. Existing water development projects such as reservoirs have been able to minimize the effects of drought on people and agriculture to this point. Both future and current water users will need to develop more sustainable practices to ensure that droughts will continue to have only moderate effects on the region. Climate change will certainly have an effect on the region, but what that effect is remains to be seen. It is possible that additional heat will result milder winter with less snow and more rainfall in the spring, but it will take decades to determine the effects of climate change vs normal variation in weather patterns experienced in the last several centuries.

Current Mitigation

The following cities have already taken measures to mitigate the effects of drought through the Utah State Water Plan.

Best Management Practices recommended by the Division of Water Resources	Alpine	American Fork	Cedar Hills	CUWCD	Eagle Mountain	Elk Ridge	Highland City	Lehi	Lindon	Manila	Mapleton	Orem City	Payson	Pleasant Grove	Provo	Salem	Santaquin	Saratoga Springs	Spanish Fork	Springville	Heber	Midway
Update Required	2014																					
Comprehensive Water Conservation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Universal Metering			X		X	X		X	X			X	X	X	X	X	X	X	X			X
Incentive Water Conservation Pricing	X	X	X		X	X	X	X			X			X		X	X	X	X	X	X	X
Water Conservation Ordinances		X			X		X	X	X								X	X			X	X
Water Conservation Coordinator				X	X		X								X	X		X				
Public Information Program	X	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X	X	X
System Water Audits, Leak Detection & Repair	X				X		X	X	X			X	X	X		X	X			X	X	X
Large Landscape Conservation Programs and Incentives				X	X			X					X		X			X	X			
Water Survey Programs for Residential Customers				X																		
Plumbing Standards				X		X				X							X	X		X		
School Education Programs				X				X		X		X		X							X	
Commercial, Industrial and Institutional Customers																	X		X			
Reclaimed Water Use								X							X					X	X	
"Smart Controller" Technology				X				X							X	X		X				

**Adapted from "Utah Lake Basin Water; Planning for the Future" (2014) Utah Division of Water Resources. See www.water.utah.gov*

Potential Mitigation Strategies

The following mitigation strategies are provided so that communities may be aware of measures that could be used to limit the exposure to drought related damage.

Objective	Strategies
Local Planning and Regulations	
Monitor Water Supply	• Regularly check for leaks to minimize water supply losses
Plan for Drought	• Develop agreements for secondary water sources
Require Water Conservation During Drought Conditions	• Develop an ordinance to restrict public water use for non-essential items • Adopt ordinances to prioritize water use, especially for emergencies

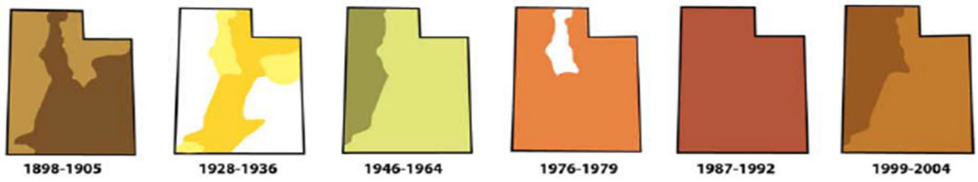
Identify Secondary Effects of Drought	• Identify potential for wildfire due to drought
Prevent Overgrazing	• Establish grazing policy or permitting to prevent overgrazing
Structure and Infrastructure Projects	
Retrofit Water Supply Systems	• Upgrade water delivery systems to eliminate breaks and leaks
Natural Systems Protection	
Enhance Landscaping and Design Measures	• Incorporate drought tolerant or xeriscape practices into landscape ordinances • Use permeable surfaces to reduce runoff and promote groundwater recharge
Protect Water Sources	• Legislate to protect stream flows and aquifers
Education and Awareness	
Educate Residents on Water Saving Techniques	• Install low-flow showerheads and toilets • Encourage installation of graywater systems in homes for water reuse
Educate Farmers on Soil and Water Conservation Practices	• Rotate crops by growing on the same fields every season to reduce soil erosion • Use zero and reduces tillage to minimize soil disturbance
Purchase Crop Insurance	• Encourage agricultural interests to purchase insurance to cover drought loss

*Adapted from FEMA's "Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (2013)

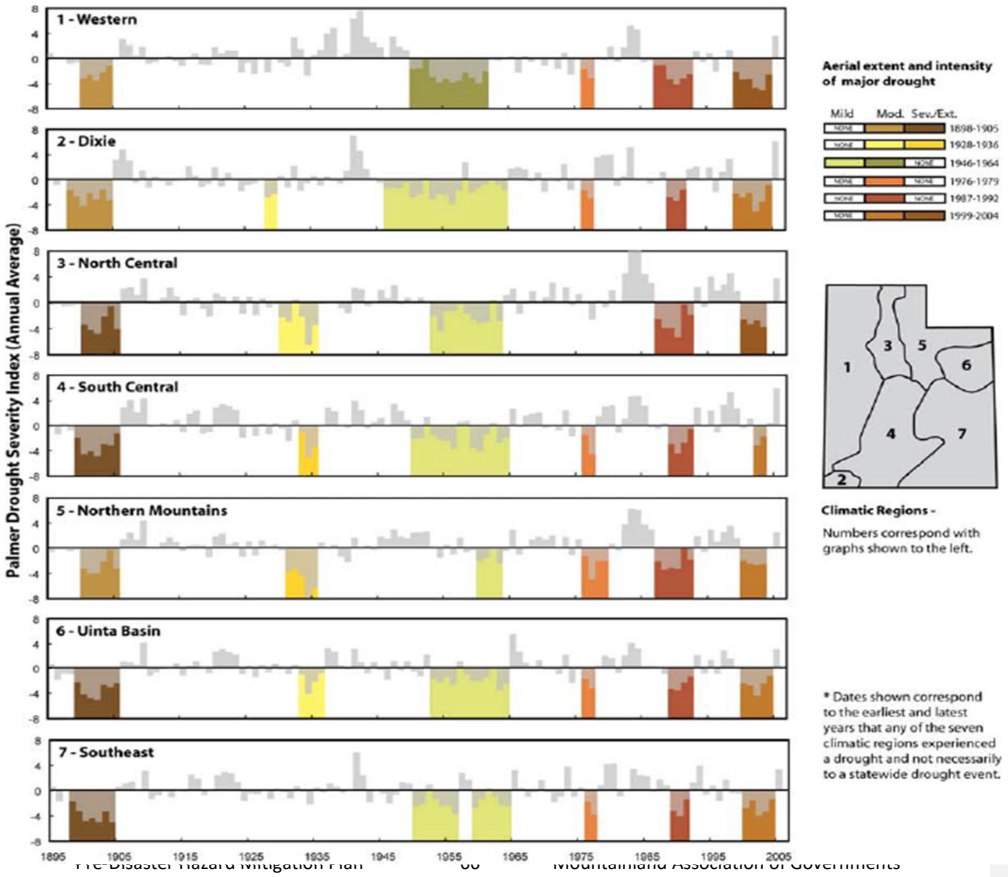
History

The following report from the Utah Division of Water Resources Analysis (2006) as well as the drought beginning in 2012 and extending through the present (2016) represent droughts since the late 1800's.

Areal Extent of Historical Drought *



Palmer Drought Severity Index by Region



Aerial extent and intensity of major drought

Climatic Regions -

Numbers correspond with graphs shown to the left.

* Dates shown correspond to the earliest and latest years that any of the seven climatic regions experienced a drought and not necessarily to a statewide drought event.

Pests

Utah, "The Beehive State", has an agricultural industry valued at over a billion dollars. Insects such as the honeybee are generally a vital and positive part of the ecological system that makes agriculture possible. However, there are instances when an insect population much larger than average (such as Grasshopper/Cricket Infestations) or insects from outside the region (such as the invasive Emerald Ash Borer) destabilize the ecosystems where occur. The Utah Department of Agriculture and Food monitors numerous pests, conducts pest control, and educates the public on identification and mitigation. Other insects are vectors, or travelling hosts, for diseases that can contracted by humans. Mosquitos and ticks are the most common carriers of disease.

Profile

Frequency	Frequent
Severity	Severe primarily to agriculture.
Location	Region Wide - especially agricultural areas and around lakes and reservoirs.
Seasonal Pattern	Spring and Summer
Duration	Days to Years
Speed of Onset	Incremental.
Probability of Future Occurrences	Very High – Crop/Forest damage due to infestations is reported every year. Vector borne illnesses are reported every year.

Development Trends

Regarding infestations of crop and range land, as land use shifts from agriculture to housing there will be less impact from infestations on the agricultural sector simply because there will be less agriculture. On the other hand, individual homeowners are less reliable when it comes to eliminating pests than large agricultural areas owned by informed persons that depend on pest removal for their livelihood. As development occurs there is more opportunity for weeds to take hold at the edges of disturbed land. Numbers of invasive species may also increase as Utah markets increase participation in global markets.

Agricultural Pest Risks

Below is a short list of pests having high potential damage according to the Utah Department of Agriculture and Food (UDAF). For more information on pest control, behavior, statistics, and experts see UDAF's website at www.ag.utah.gov

Summary of Invasive and Native Pest Risks in the State of Utah

Asian Defoliators	Significant potential threat to Utah's forests and related industries
Emerald Ash Borer	Threaten to kill all ornamental and native ash trees in Utah
European Corn Borer	Potential to devastate Utah's $25 million corn harvest
Gypsy Moth	Potential to disrupt Utah's $2 million honey industry; health risks to humans and livestock
Honey Bee Pests and Diseases	Potential to destroy Utah's watersheds, coniferous forests, and residential landscapes
Japanese Beetle	Potential to damage Utah's $128 million nursery and floriculture industry, and $34 million fruit industry
Mormon Cricket & Grasshopper	Potential to significantly reduce Utah's $509 million small grain and field crop industry
Orchard Pests	Fruit industry pest, potential to devastate Utah's $34 million fruit industry
Red Imported Fire Ant	Economic damage caused in the US exceeds $5 billion and a public health risk

*Adapted from Utah Department of Agriculture and Food's 2015 Insect Report

Mormon Crickets and Grasshoppers merit a special mention in terms of their history in Utah This devastating insect plagued the early pioneers. Today, 150 years later, the Mormon cricket still economically devastates some parts of Utah.

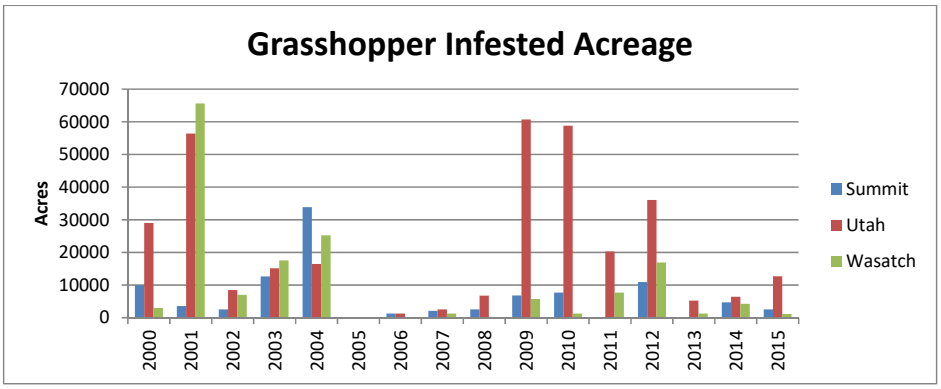


Figure 8. Utah Mormon Cricket and Grasshopper Report 2015, UDAF

In June of 2003, Utah Governor Mike Leavitt declared a State of Emergency in 18 of Utah's 29 counties, where crickets and grasshoppers had eaten 1.5 million acres. Problems associated with cricket infestations usually deal with crop loss as well as loss of rangeland for cattle and sheep. Consumption of residential landscaping is also a problem and more homes are built in western Utah County in which is in the path of crickets. The crickets usually travel from west to east, starting in Nevada. In some instances, the cricket mass is so large and dense that cars and trucks lose traction on roads. Vehicles sliding off of roads can cause property damage and personal injury.

Potential Mitigation Strategies

Mitigation strategies for pests range from poisoned bait and tilling to expose buried eggs to aerial spraying. The most effective method depends on each species' behaviors and physiology, but certain methods like aerial insecticides can have adverse effects on non-target species such as bees. Contact your local extension office of the Utah Department of Agriculture and Food for site and species specific strategies.

Health Risks

Biting insects have long been carriers of disease. Mosquitos carrying malaria and ticks with Lyme's disease have plagued countries for centuries. Even though Utah's cold winters effectively kill large numbers of infected vectors, there are still occurrences of West Nile Virus and Rocky Mountain Spotted Fever from time to time. It's a given that other vector borne illnesses will develop or be introduced in the future.

West Nile Virus (WNV) is transmitted to humans through mosquito bites. Mosquitoes become infected when they feed on infected birds that have high levels of WNV in their blood. Infected mosquitoes can then transmit WNV when they feed on humans or other animals. WNV is not transmitted from person to person and there is no evidence that handling live or dead infected birds can infect a person. Most WNV infected humans have no symptoms. A small proportion develops mild symptoms and less than 1% of infected people develop more severe illness that includes meningitis (inflammation of one of the membranes covering the brain and spinal cord) or encephalitis. Of the few people that develop encephalitis, a small proportion die but, overall, this is estimated to occur in less than 1 out of 1000 infections. Fortunately, the incidence of WNV in human and animal populations has been very low in Summit, Utah, and Wasatch counties for the past several years.

West Nile Virus Positive Samples in Summit, Utah, & Wasatch Counties

	2010	2011	2012	2013	2014	2015
Human	0	0	1	0	0	0
Horse	0	0	0	0	0	0
Mosquito Pools	0	0	2	2	5	0

*Adapted from the Utah Department of Health West Nile Virus Reports

Rocky Mountain Spotted Fever (RMSF) is contracted by exposure to ticks infected with Rickettsia rickettssii. According to the CDC, there is a higher rate of exposure in the Southern Atlantic states and generally less than 20 cases per million persons occur in Utah. Individuals may experience a rash, fever, nausea, muscle pain, lack of appetite and conjunctival injection (red eyes). Antibiotics have proven effective treatment when RMSF is identified early (especially in the first 5 days. RMSF has a mortality rate of 30% in untreated patients.

Potential Mitigation Strategies

For diseases transmitted by mosquitos and ticks, the best prevention is to use insect repellants with DEET or Permethrin and cover exposed skin. Those going into wooded areas should try to find and remove ticks as soon as possible, both on the body and on clothes, gear, and pets. Standing water serving as breeding grounds for mosquitos should be eliminated or water changed regularly. Early identification and treatment is always important when infection is possible.

Radon Gas

According to the EPA, Radon is a colorless, odorless gas emitted in the natural breakdown of uranium in soil, rock, and water. It is the second leading cause of lung cancer behind smoking, responsible for about 21,000 lung cancer deaths yearly. Radon gas has been detected in every state in the U.S., with 30% of homes tested in Utah exceeding the EPA recommended action level of 4 pCi/L (picoCuries of radon per liter of air). The following table from the EPA's Health Risks of Radon compares the risk of dying from radon exposure to other events.

Radon Risk If You Have Never Smoked

Radon Level	If 1,000 people who never smoked were exposed to this level over a lifetime*...	The risk of cancer from radon exposure compares to**...	WHAT TO DO:
20 pCi/L	About 36 people could get lung cancer	35 times the risk of drowning	Fix your home
10 pCi/L	About 18 people could get lung cancer	20 times the risk of dying in a home fire	Fix your home
8 pCi/L	About 15 people could get lung cancer	4 times the risk of dying in a fall	Fix your home
4 pCi/L	About 7 people could get lung cancer	The risk of dying in a car crash	Fix your home

2 pCi/L	About 4 people could get lung cancer	The risk of dying from poison	Consider fixing between 2 and 4 pCi/L
1.3 pCi/L	About 2 people could get lung cancer	(Average indoor radon level)	(Reducing radon levels below 2 pCi/L is difficult.)
0.4 pCi/L		(Average outdoor radon level)	

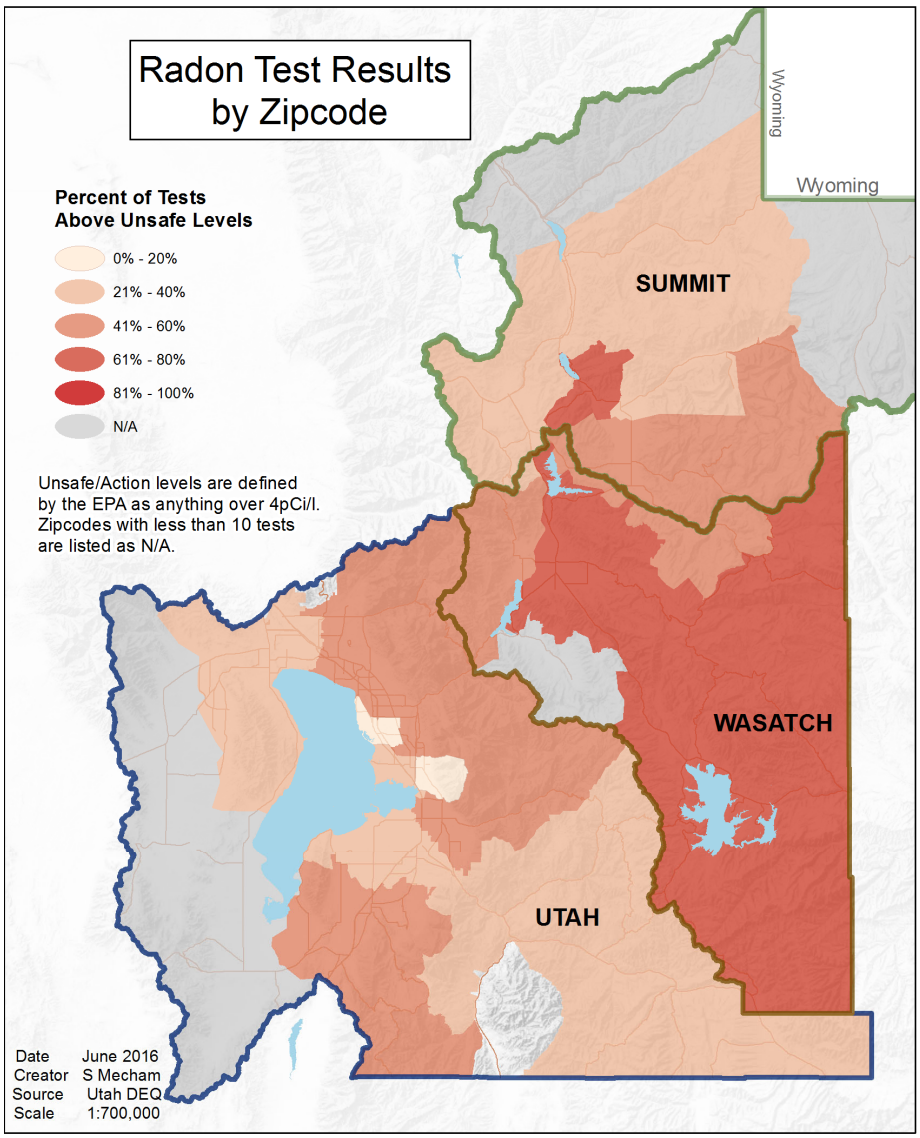
Note: If you are a former smoker, your risk may be higher.
* Lifetime risk of lung cancer deaths from EPA Assessment of Risks from Radon in Homes (EPA 402-R-03-003).
** Comparison data calculated using the Centers for Disease Control and Prevention's 1999-2001 National Center for Injury Prevention and Control Reports.

Profile

Frequency	Permanent
Severity	Moderate to human health
Location	Region Wide
Seasonal Pattern	Ongoing, but more problematic in the winter
Duration	Ongoing
Speed of Onset	Permanent
Probability of Future Occurrences	Certain

Assessing Vulnerability

The level of Radon Gas in a home is as much a factor of home construction as it is geographic location. Radon travels from the soil into a home with lower pressure through openings in the foundation, be they cracks or the gaps around pipes. This occurs in old and new homes, though newer homes with moisture-control generally have fewer crevices in the foundation or basement walls. According to a survey in 2011 of 497 individuals, though 58% had heard of Radon Gas, only 12.5% had their homes tested. There are public education efforts underway to remedy the problem.



Development Trends

As more homes are built, more people could be exposed to Radon Gas. There is some lobbying in Utah Congress for more funds to be allocated to awareness campaigns and for more construction standards.

Potential Mitigation Strategies

There are several mitigation strategies for reducing Radon Gas levels within a building.

Objective	Strategies
Local Planning and Regulations	
Require Developers to Offer Radon Reductions Systems to Homebuyers	• Choose developers who offer Radon-reducing construction • Require developers to discuss Radon mitigation options with buyers
Require Radon Tests in State-Owned Buildings	• Regularly test schools and other public facilities • Install mitigation measures when necessary
Structure and Infrastructure Projects	
Install Soil Suction Systems	• Use suction to remove radon from beneath the foundation to outdoor air
Fortify Foundations	• Seal cracks and openings in any wall or floor below grade
Ventilate home	• Open doors and windows to temporarily lower levels of Radon
Education and Awareness	
Encourage Home Testing	• Provide low-cost Radon test kits
Educate Public on Radon Risks	• Provide and distribute the EPA's "A Citizen's Guide to Radon"

Part VI
Summit County
Profiles and Mitigation

Background

Area: 1,849 square miles; *county seat:* Coalville; *origin of county name*: the county includes high mountain summits that form the divides of the Weber, Bear, and Green River drainage areas; *points of interest*: Park City area ski resorts, Park City Historic District, Rockport State Park, Echo Reservoir, High Uinta Wilderness Area; *economy*: skiing, tourism, lumbering, livestock.

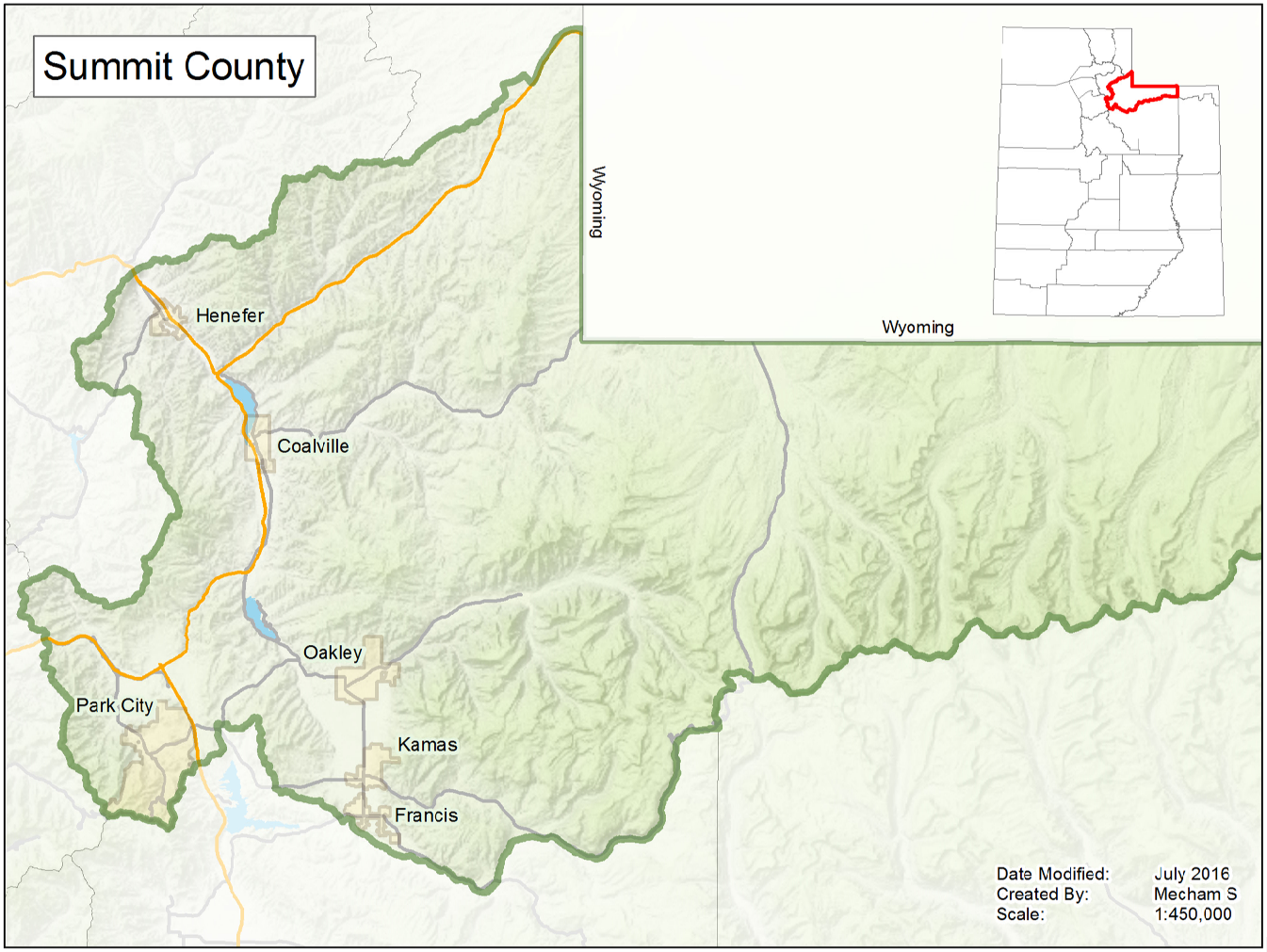
Summit County was created in 1854 from Green River and Great Salt Lake counties. The Uinta Mountains dominate the eastern portion of the county, and the western section is a high back valley of the Wasatch Mountains.

The first white men to visit the area were fur trappers and traders in the 1820s and 1830s. Until the arrival of the Mormons in 1847, Summit County was hunting grounds for Northern Shoshone Indians. In 1846 Lansford W. Hastings, a California promoter announced a new cutoff on the California Trail that would eliminate several hundred miles and many days of travel. The cutoff turned southwest from Fort Bridger, Wyoming, and entered Utah and the northeastern corner of Summit County through Echo Canyon. It followed the Weber River to Salt Lake Valley, went around the south shore of the Great Salt Lake, and then west into Nevada. The first group to take this new cutoff was the Donner-Reed party in 1846. Blazing a road through the Wasatch Mountains cost them many days, and when they reached the Sierra they ran into early snow, with well-known tragic results. Many lost their lives. A year later, the pioneering Mormons adopted part of the Hastings Cutoff, but when they reached the Weber River they turned southwest to Emigration Canyon. This became the main trail for the immigration of the Mormons to Utah. In 1869 the Union Pacific Railroad, builder of the eastern portion of the transcontinental railroad, followed the Hastings Cutoff, and today part of Interstate 80 follows the Hastings and Mormon trails and the Union Pacific route through northern Summit County.

The first settlers in Summit County arrived at Parley's Park in 1850. Wanship was settled in 1854, followed by Coalville, Hoytsville, and Henefer in 1859. When coal was discovered near Coalville, the Mormons established a mission there. During the 1860s, wagons hauled tons of coal from Coalville to the Salt Lake Valley settlements. In 1873 the Utah Eastern Railroad built a line from Echo Junction to Coalville to haul coal. This line eventually became part of the Union Pacific Railroad.

The discovery of silver, lead, and zinc in the Wasatch Mountains in the 1870s soon overshadowed the settlement and economic activities of the rest of the county. Park City, a mining town founded in 1872, continued to expand into the twentieth century. Many individuals made fortunes from the Park City mines. Mansions on South Temple in Salt Lake City reflect some of this wealth. Mining continued until the 1950s, at which time it no longer was profitable. For several decades Park City was on the verge of becoming a ghost town, but the area's rugged terrain and deep snow led to its rebirth as a winter sports center. Skiing currently is a major economic activity in western Summit County, while the rest of the county is still noted for its farming and ranching. Other recreational opportunities, including boating, fishing, and tourism add to the county's diversified economy.

(Source: Utah Historical Encyclopedia, Craig Fuller, author)


Summit County
Wyoming
Wyoming
Henefer
Coalville
Oakley
Park City
Kamas
Francis
Date Modified: July 2016
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Population

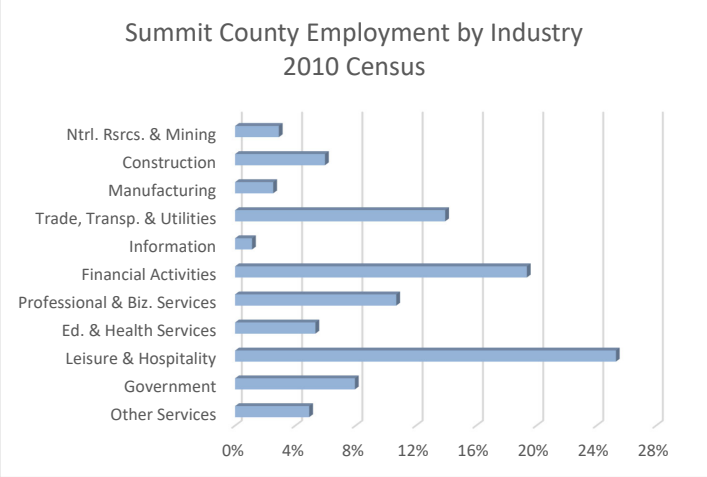
The following table shows historic, current, and projected population data:

	Census			Short Range Projection			Long Range Projection	
	1990	2000	2010	2020	2030	2040	2050	2060
Mountainland Region	291,606	417,321	579,448	746,796	934,540	1,150,420	1,381,418	1,602,441
Summit County	15,693	30,034	36,473	45,491	56,890	71,433	88,334	107,671
Utah County	265,764	371,873	519,307	668,564	833,101	1,019,828	1,216,695	1,398,074
Wasatch County	10,149	15,414	23,668	32,741	44,549	59,159	76,389	96,696

*2012 Baseline Projections, Governor's Office of Planning and Budget. Produced using results from the 2010 Census as the base. See http://gomb.utah.gov/

Economy

Summit County has been the recipient of many new businesses, much residential and commercial development, and a thriving ski and tourism economy that defines its character and atmosphere. Summit County's local economy is largely driven by the activities of Park City and the Snyderville Basin. Eastern Summit County and its cities also face numerous growth and development pressures, although not exhibiting anywhere near the level of investment that is pushing the western half of the county. With numerous venues of the 2002 Winter Olympics within the Mountainland Region, economic growth should continue in the future.



Summit County	2010	2011	2012	2013	2014	2015
Employment:						
Average civilian labor force	N/A	21,218	21,547	22,097	22,594	23,128
Average employment	N/A	19,923	20,480	21,178	21,820	22,376
Income:						
Average wages and salaries ($)	36,162	37,063	38,078	38,656	40,378	N/A
Per capita personal income ($)	70,248	78,581	91,982	94,077	96,766	N/A
Taxes:						
Gross Taxable Sales ($ thousands)	1,189,659	1,324,336	1,360,925	1,469,760	1,570,920	N/A
Construction (permit-authorized):						
Dwelling unit permits (number)	N/A	95	119	184	221	247

Change in nonresidential construction	N/A	-42%	+157%	-75%	+445%	-24%
Value of total construction	N/A	-12%	+36%	-22%	+134%	-22%
Miscellaneous:						
Payment in Lieu of Taxes Act ($ thousands)	2,185	2,543	2,710	3,063	2,262	N/A

*Adapted from US BLS, Utah DWS, Utah State Tax Commission, Utah Bureau of Economic and Business Research

Social Characteristics	Estimate	Percent	U.S.
Average household size	2.79	(X)	2.58
Average family size	3.22	(X)	3.14
Population 25 years and over	23,628		
High school graduate or higher	(X)	93.3	86.30%
Bachelor's degree or higher	(X)	50.1	29.30%
Disability status	1,977	5.2	12.3%
Foreign born	4,005	10.6	13.10%
Speak a language other than English at home (population 5 years and over)	4,502	12.7	20.9%
Household population	37,672	(X)	(X)
Economic Characteristics	Estimate	Percent	U.S.

In labor force (population 16 years and over)	20,911	72.5	63.90%
Mean travel time to work in minutes (workers 16 years and over)	24.6	(X)	25.7
Median household income	89,886	(X)	53,482
Median family income	100,271	(X)	86,963
Per capita income	45,461	(X)	28,555
Individuals below poverty level	(X)	6.8	14.80%
Housing Characteristics	Estimate	Percent	U.S.
Total housing units	26,545		
Occupied housing units	12,990	48.9	88.60%
Owner-occupied housing units	9,897	76.2	65.1%
Renter-occupied housing units	3,093	23.8	34.90%
Vacant Housing Units	13,555	51.1	11.40%
Median value (dollars)	496,800	(X)	175,700
Median of selected monthly owner costs			
With a mortgage (dollars)	2,196	(X)	1,522
Without a mortgage (dollars)	528	(X)	457
Demographic Characteristics	Estimate	Percent	U.S.
Male	18,724	51.5	49.20%
Female	17,600	48.5	50.80%
Median age (years)	37.1	(X)	37.2
Under 5 years	2,486	6.8	6.50%
18 years and over	26,254	72.3	76.00%

65 years and over	2,768	7.6	13.00%
One race	35,727	98.4	97.1%
White	32,890	90.5	72.4%
Black or African American	154	0.4	12.60%
American Indian and Alaska Native	122	0.3	0.90%
Asian	446	1.2	4.80%
Native Hawaiian and Other Pacific Islander	38	0.1	0.20%
Some other race	2,077	5.7	6.20%
Hispanic or Latino (of any race)	4,190	11.5	16.30%

Source: 2010 American Community Survey 5-year estimates

Hazards Compared

Hazard Matrix

Probability	Negligible	Limited	Critical	Catastrophic
Highly Likely		Winter Weather, Avalanche		
Likely	Hail	Flood, Drought, Lightning, Wind	Fire	
Possible		Landslide		
Unlikely		Tornado	Dam Failure	Earthquake

Severity

Probability Calculations for Summit County

Hazard	Number of Events	Years in Record	Recurrence Interval (years)	Hazard Frequency and Probability/Year	Source
Avalanche (Injuries or damages)	44	19	0.45	2.32	NOAA
Drought (Moderate, PDSI<-2)	N/A	N/A	5.20	0.19	Utah State Water Plan
Earthquakes 3.0 and greater	4	52	13.25	0.08	University of Utah Dept of Seismology
Floods	12	65	5.50	0.18	Various
Hail	9	60	6.78	0.15	NOAA
Landslides causing damage	2	51	26.00	0.04	SHELDUS
Lightning (fatalities and injuries)	4	19	5.00	0.21	NOAA
Wildfires (over 300 acres)	5	54	11.00	0.09	Utah Division of Forestry Fire and State Lands and BLM
Wildfires (over 50 acres)	16	54	3.44	0.30	
Urban Interface Fires	Unknown	Unknown	Unknown	Unknown	
Wind (with injuries or $ damages)	30	60	2.03	0.50	NOAA (High Wind and Thunderstorm Wind with bodily harm or $ damages)
Winter Weather (with injuries or $ damages)	46	19	0.43	2.42	NOAA (Blizzards/Snow/Winter Weather/Cold/Wind Chill with bodily harm or $ damages)
Tornadoes (all)	0	65	#DIV/0!	0.00	NOAA
Volcanoes	700	5,000,000	7142.86	Negligible	

Recurrence interval: (number of years in record +1)/number of events.

Frequency: Number of events/Number of years in record.

Flooding

Overview

Although Utah is considered a dry desert state, flooding does occur. Most floods have occurred either from snow melt or severe thunderstorms. Often times flooding is increased by soils that are more impervious due to either wildfire or drying out. Floods occur on a regular basis in Summit County. Most of the communities within the county are built around or near a stream or river such as the Provo or Weber. Each of these communities share a similar susceptibility to flooding.

Flood Profile

Frequency	Flooding happens within Summit County on almost a regular basis.
Severity	Moderate
Location	Primarily along streams, rivers and bodies of water.
Seasonal Pattern	Spring time due to snow melt. Isolated events throughout the year due to severe weather (microburst).
Duration	A few hours to a few weeks depending upon conditions
Speed of Onset	Sudden to 12 hours
Probability of Future Occurrences	High - for delineated floodplains there is a 1% chance of flooding in any given year.

Development Trends

As development occurs on the mountainous terrain and along the shores of reservoirs, or along river and stream corridors more homes will be in danger of floods. Communities need to make developers and homeowners aware of the danger as well as contribute to mitigation actions. Cities should review every development that it is in compliance with NFIP guidelines.

The following table identifies the communities in Summit County with their NFIP Status.

Communities Participating in NFIP

CID	Community Name	Current Effective Map Date	Actions taken
490135	Coalville	(NSFHA)	No special flood hazard area
490199	Francis	3/16/2006	Current, maps available online

490136	Henefer	3/16/2006	Current, maps available online
490137	Kamas	3/16/2006	Current, maps available online
490138	Oakley	3/16/2006	Current, maps available online
490134	Summit County	3/16/2006	Current, maps available online
490139	Park City	7/16/1987	No special flood hazard area

Source: FEMA Utah State Division of Emergency Management

The primary goal for non-participating communities is to become a participating member.

Assessing Vulnerability: Addressing Repetitive Loss Properties

There are no repetitive loss properties in Summit County (FEMA, 2016).

History

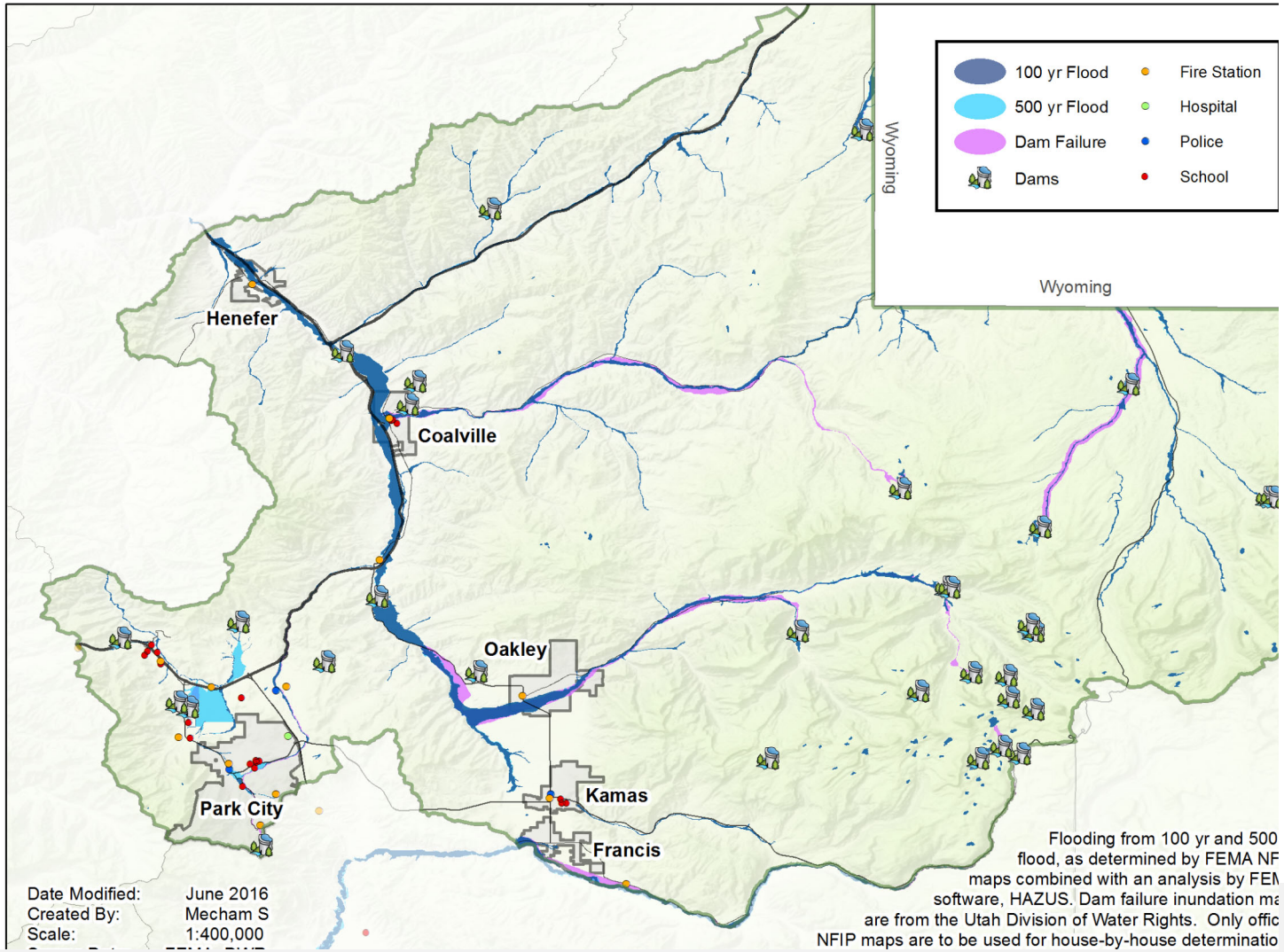
Flooding

Location/Extent	Date	Fatalities	Damages	Source	Details
Summit	7/29/1969	0	$1,250	SHELDUS	
Summit County	4/30/1983	0	$4,761,905	FEMA Disaster Declaration	
Summit County	8/17/1984	0	$0	FEMA Disaster Declaration	
Summit County	6/7/1986	0	$50,000	SHELDUS	
Summit, Wasatch, Morgan, Weber	5/15/1997	0	$0	NOAA	
Western Unita Mountains (Zone)	12/26/1998	0	$2,000	NOAA	
Summit, Rich, Cache, Weber, Most of Morgan, Salt Lake, Box Elder (Zone)	4/28/2005	0	$0	NOAA	
Summit and Wasatch Counties (Zone)	4/15/2006		$50,000	NOAA	

Peoa	6/6/2010	0	$5,000,000	NOAA	Heavy Rain/ Snow Melt
Coalville	4/19/2011	0	$0	NOAA	Heavy Rain/ Snow Melt
Peoa	6/24/2011	0	$20,000	NOAA	Heavy Rain/ Snow Melt
Peoa	7/1/2011	0	$50,000	NOAA	Heavy Rain/ Snow Melt
Coalville	2/9/2014	0	$40,000	NOAA	Heavy Rain

Summit County has received a total of $85,392.68 in FEMA Flood claims since 1978

Summit County and its cities in the NFIP program have 0 repetitive loss facilities


100 yr Flood
500 yr Flood
Dam Failure
Dams
Fire Station
Hospital
Police
School
Wyoming
Wyoming
Henefer
Coalville
Oakley
Kamas
Park City
Francis
Date Modified: June 2016
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Scale: 1:400,000
Flooding from 100 yr and 500
flood, as determined by FEMA NF
maps combined with an analysis by FEM
software, HAZUS. Dam failure inundation ma
are from the Utah Division of Water Rights. Only offic
NFIP maps are to be used for house-by-house determinatio

Wildland Fire

Overview

Wildfire is the most frequently occurring natural hazard within the Summit County area. It can also pose the most eminent danger to current and future residents. Each jurisdiction is surrounded by mountains and have structures abutting forested areas.

Development Trends

As development occurs on the bench areas of Summit County more homes will be in danger of wildfire. Communities need to make developers and homeowners aware of the danger. Cities and the county should also require firebreaks and access roads along urban/wildland interfaces. Although development brings homes closer to areas of potential wildfire, it also brings water and access for firefighters closer to the urban fringe. Firewise community development principles, such as not storing firewood near homes, installing fire resistant roofing and cleaning debris from rain gutters will reduce potential loses.

Profile

Frequency	Multiple wildland fires occur in Utah County Every year.
Severity	Moderate
Location	Hillsides and mountainous areas, open grass and range lands.
Seasonal Pattern	Summer and fall depending on weather conditions.
Duration	A few hours to a few weeks depending upon conditions
Speed of Onset	1 to 48 hours
Probability of Future Occurrences	High Major Fires: 0.09 (300 acres and larger) All Fires: 0.3 (50 acres and larger)

History

Fires

Fire Name	Start Date	Acres	Cost	Source	Fire Cause
East Fork	6/28/2002	14204.70	$14,200,000	FS	

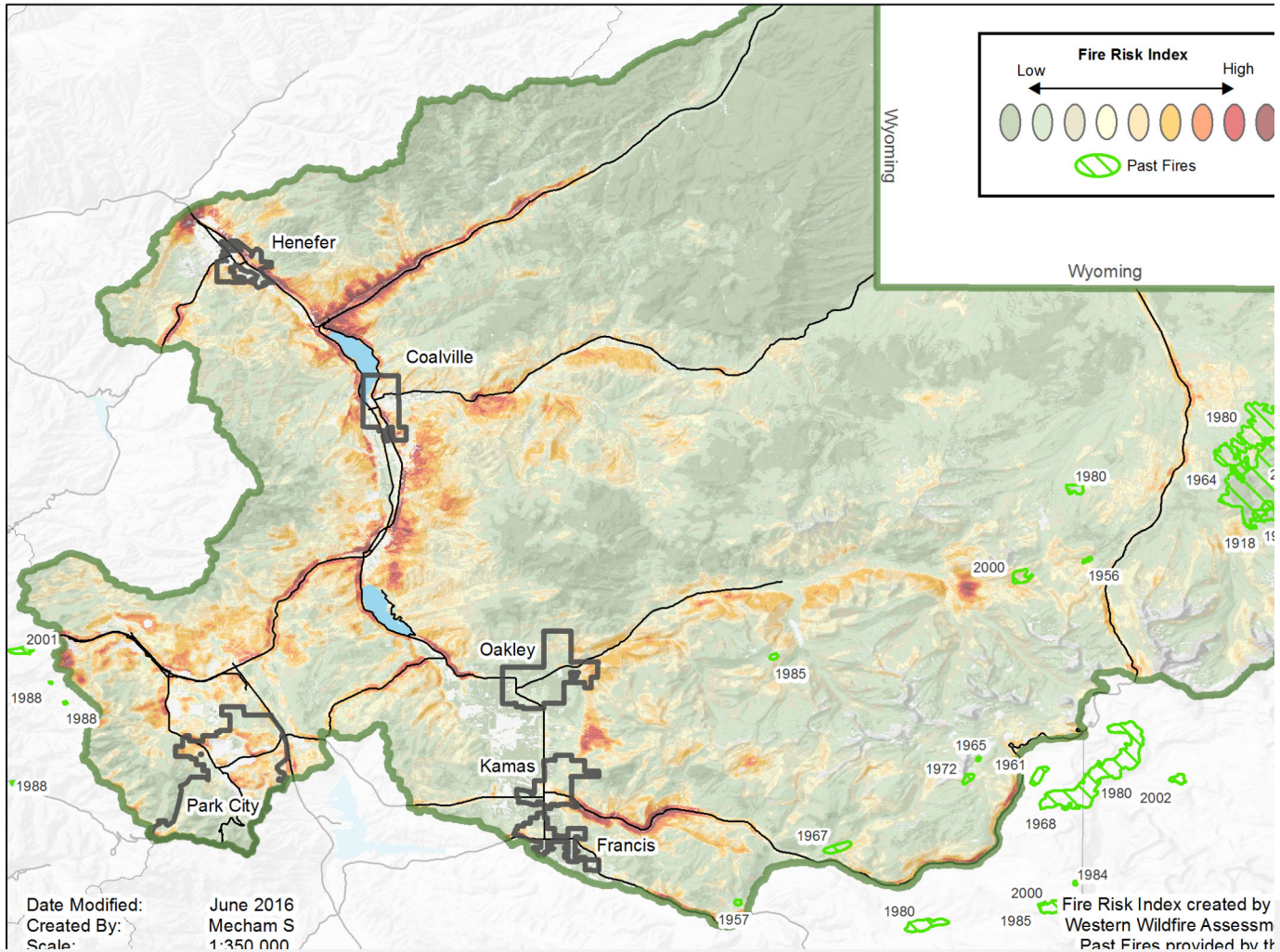
Eagle Canyon	7/24/1999	3744.00		BLM	Human
Lily Lake	6/23/1980	3260.77	$0	FS	
Echo	7/21/2000	750.00		BLM	Human
Echo	8/14/2003	300.00		BLM	Human
Total Fires 300 Acres and larger 5		22259.48	$14,200,000		
Echo Canyon	8/16/2007	294.00		BLM	Human
Boy Scout	6/27/1994	221.55	$125,000	FS	
Dry Fork	9/6/2000	200.91	$1,300,000	FS	
North Fork Provo	1967	195.36	$0	FS	
1918 Fire	1918	185.72	$0	FS	
S. S. HELL	8/18/1986	150.00		BLM	Human
Deer Creek Fire	1980	141.03	$0	FS	
Coal Mine	6/12/2006	99.55	$75,000	FS	
Haystack Mountain	1972	74.37	$0	FS	
Phone Booth	8/21/2007	56.00		BLM	Human
1964 Fire	10/11/1964	55.19	$0	FS	
Total Fires over 50 acres 16		23933.16	$15,700,000		

Mitigation

The FFSL has helped communities develop Community Fire Plans. According to the FFSL, the purpose of community fire planning is to:

- Empower communities to organize, plan, and take action on issues impacting community safety
- Enhance levels of fire resistance and protection to the community
- Identify the risks of wildland/urban interface fires in the area
- Identify strategies to reduce the risks to homes and businesses in the community during a wildfire

Community Name	Date Signed
Alpine Acres (Near Oakley)	Sep 2008
Aspen Mountain/Aspen Acres (In Weber Canyon)	Aug 2006
Beaver Springs Ranch (aka Beaver Creek Ranch in Weber Canyon)	Nov 2015
Canyon Rim (Near Oakley)	Aug 2006
Cherry Canyon (Near Wanship)	Jun 2008
Colony at White Pine Canyon (Park City)	Sep 2006
Echo Creek Ranches (Echo)	Aug 2014
Hidden Lake (Weber Canyon)	Aug 2006
Holiday Park (Weber Canyon)	Aug 2006
Manorlands (North Central County)	Sep 2014
Monviso (North Central County)	Oct 2011
Moose Hollow (Weber Canyon)	Sep 2008
Park City	Oct 2014
Pine Mtn. (Weber Canyon)	Sep 2006
Pine Plateau (North Central County)	Unfinished
Pinebrook Master HOA (Park City)	Oct 2006
Pines Ranch (Weber Canyon)	Jul 2014
Rockport (State Park)	Jul 2006
Samak	Aug 2006
Silver Creek (Park City)	Unfinished
South Fork (Provo Canyon)	May 2007
Stagecoach Estates (Park City)	Aug 2007
Summit Park (N of Park City)	Aug 2014
Tollgate Canyon CWPP (Near Park City)	Jul 2008
Uintalands (North Central County)	Sep 2011


Fire Risk Index
Low
High
Past Fires
Wyoming
Wyoming
Henefer
Coalville
Oakley
Kamas
Park City
Francis
2001
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Date Modified: June 2016
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Scale: 1:350,000
Fire Risk Index created by
Western Wildfire Assessm
Past Fires provided by th

Landslide

Overview & Development Trends

Park City, the economic center of Summit County, boasts the largest ski areas in the United States with five-star lodges and numerous condos tucked into the hillside. Park City's success is largely due to its picturesque slopes, and future development will most assuredly be related to scenic views and resort development. Due to the high value of much of the development occurring in the area, measures should be taken to reduce the potential for loss. Increased analysis and geotechnical reports should become an integral part of the development and building process. Careful consideration should be given to ensure cutting and filling for any project is minimized.

Profile

Frequency	Movement likely occurs nearly every year.
Severity	Moderate; several structures have been condemned.
Location	Along most mountains and hillsides.
Seasonal Pattern	Spring when ground saturation is at its peak.
Duration	Minutes to years.
Speed of Onset	Seconds to days.
Probability of Future Occurrences	High – Due to terrain and construction within sloped areas.

History

Location	Date	Damages	Source
Summit County	1/1/1983	$8,603,666.52	SHELDUS database
Summit County	1/1/1984	$1,471,256.97	SHELDUS database

Note that only events of great magnitude are recorded in National databases. Numerous events involving few structures have occurred but not recorded in disaster databases.

Earthquake

Overview

As development occurs in Summit County, more buildings and people will be in danger from earthquakes. However, newer buildings will be built to better standards, which will decrease the risk of damage compared to older structures. It is interesting to note that when most residential structures are engineered, out the three categories of design criteria; seismic zone, wind shear and snow load; the design criteria for wind shear over-rules the other criteria.

Development Trends

Due to Summit County being outside of the Wasatch Fault zone the severity of a potential earthquake is thought to be lower. Recent development trends have been to build on steeper slopes and benches which can lessen the potential for liquefaction but increase susceptibility to earthquake triggered landslides. Ultimately, new construction in the area equals more structures that are susceptible to earthquakes. Each construction project should be thoroughly reviewed for resistance to ground shaking and other earthquake related hazards.

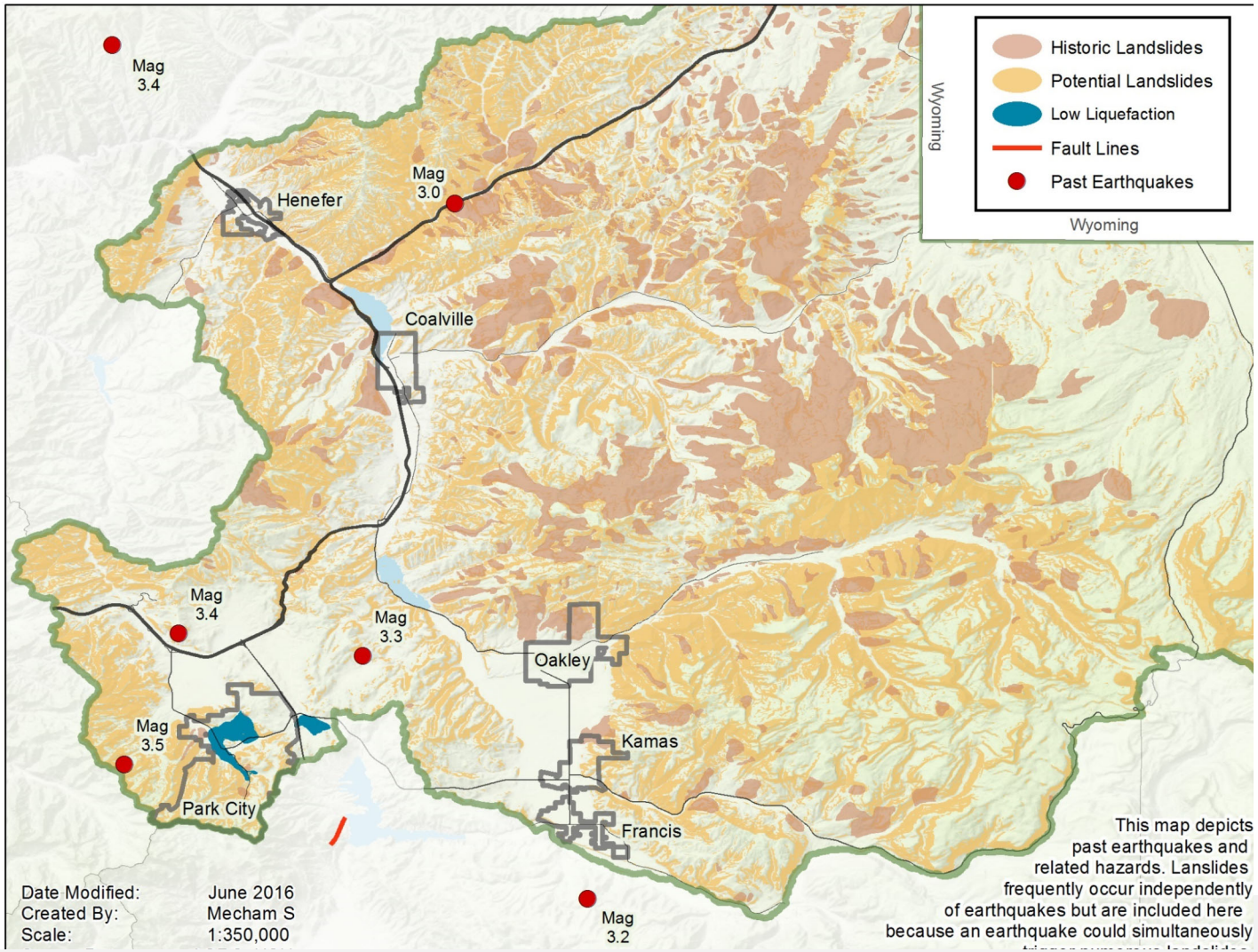
Profile

Frequency	Low: Events above 3.0 on the Richter scale are rare. Minor events (below 3.0) occur every month.
Severity	High (up to 5.0)
Location	Some faults throughout the county.
Seasonal Pattern	None
Duration	1 to 6 minutes excluding aftershocks.
Speed of Onset	Seconds
Probability of Future Occurrences	Low: 0.08 (events above 3.0)

History

Location	Magnitude	Date
E of Snyderville, Summit County	3.3	11/6/1988
Kimball Junction, Summit County	3.4	12/6/1995
W of Park City, Summit County	3.5	6/30/1999
SW of Emery	3	9/5/2005

*United States Geologic Survey: earthquake.usgs.gov/earthquakes/search


Historic Landslides
Potential Landslides
Low Liquefaction
Fault Lines
Past Earthquakes
Wyoming
Wyoming
Mag 3.4
Henefer
Mag 3.0
Coalville
Mag 3.4
Mag 3.3
Oakley
Mag 3.5
Park City
Kamas
Francis
Mag 3.2
This map depicts past earthquakes and related hazards. Lanslides frequently occur independently of earthquakes but are included here because an earthquake could simultaneously
Date Modified: June 2016
Created By: Mecham S
Scale: 1:350,000

Severe Weather

Overview

Summit County's mountainous terrain makes it particularly susceptible to Winter Weather. Add to the topography those who seek snowy slopes for recreation and disaster can ensue, as seen in the table below. Avalanches, typically a voluntary risk, have caused the most deaths in Summit County, particularly around areas like Park City during recreational activities. These numbers will only increase as development in tourism-centered areas grows. Snow/Winter Weather is responsible for the most injuries and monetary damages of any type of severe weather. Summit County government actively emphasizes household accountability and preparation as individuals from less rural settings move into the area.

Profile

Frequency	Frequent Multiple events happen each year.
Severity	Moderate
Location	Region wide with some locations more frequent due to geography.
Seasonal Pattern	All year depending upon the type of event.
Duration	Seconds to Days
Speed of Onset	Immediate
Probability of Future Occurrences	Very Probable. Avalanche and Winter Weather have the highest probability of occurrence of all weather hazards facing Summit County.

History

NOAA Extreme Weather Events Summary

Countywide	Deaths			Injuries			Property Damage			Crop Damage		
	1950-1999	2000-2009	2010-2015	1950-1999	2000-2009	2010-2015	1950-1999	2000-2009	2010-2015	1950-1999	2000-2009	2010-2015
Hail	0	-	-	0	-	-	$0	-	-	$200	-	-
Wind	1	-	-	6	-	-	$223,000	-	-	$0	-	-
Avalanche	2	28	14	7	15	1	$50,000	$20,000	$0	$0	$0	$0
Snow/Winter Weather	11	1	0	53	13	0	$704,500	$822,550	$50,000	$8,600	$20,000	$0

Cold/Wind Chill/Extreme Cold	0	0	-	0	0	-	$0	$0	-	$0	$0	-
High and Strong Wind	0	0	0	6	1	1	$223,000	$19,800	$30,000	$0	$0	$0
Lightning	-	4	0	-	7	1	-	$0	$0	-	$0	$0
Thunderstorm Wind	1	0	0	0	0	0	$0	$0	$0	$0	$0	$0

Damage Assessment and Mitigation

Overview

Listed below are the damage assessments for each of the participating jurisdiction followed by an update of the community's mitigation strategies from the 2010 plan, after which are the strategies the community wishes to pursue in the course of this plan. Damage assessments were calculated using the methodologies mentioned in the Methods section. Strategies were developed by each community with assistance from MAG as requested. The subsequent county and city strategies reflect the advancement of local and regional goals and continue the community's vision for the security and prosperity of the region. These goals include:

- Reducing the impact of natural hazards on life, property, and preserving the environment
- Minimizing damage to infrastructure and services and protecting their ability to respond
- Preventing potential hazards from affecting area or mitigating its effects
- Increasing public awareness, capabilities and experience
- Ensuring the safety of citizens and visitors
- Enabling cooperation between citizens and emergency and public services
- Maintaining cooperation with, and adherence to, FEMA guidelines
- Developing zoning and other plans that decrease development in hazardous areas

Summit Unincorporated	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	501	$87,019,002	5934.7
500 Year Flood	1038	$382,586,953	6860.9
Dam Failure	742	$290,439,865	5649.7

Fire-High and Moderate Risk	4178	$1,504,764,115	26307.2
Landslide	774	$93,692,535	7345.2
Liquefaction	0	0	0.0

Statement of Vulnerabilities: Many cities in Summit County don't prioritize hazard mitigation and county-wide emergency management efforts get poor response. To counter this, a Community Emergency Planning group has been formed which meets quarterly to address Emergency Management concerns.

Addressing the Floodplain: County ordinance 212-A, "Floodplain development", includes comprehensive Floodplain management objectives and building requirements. See the example in Section X, Policy and Program Capability for more information.

Protecting Current Residents and Structures (2010)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	Yes	
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Yes	
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS	Yes	

Protecting Future Residents and Structures (2010)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes	
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	Yes	
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes	

Summit County

Protecting Current Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	USDI – Bureau of Reclamation, Local Government UDEM, FEMA, UDHS, MAG
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government, MAG, UDEM, FEMA

Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, Utah Div of FFSL, County Fire Districts
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Med	1 year	TBD	Local Cash, Grants	Local Government, UGS, UDEM, MAG, FEMA
All-Hazards Planning	CEMPC –(Community Emergency Management Planning Committee)	High	Ongoing	Minimal	Local Cash, Grants	Local Government UDEM, FEMA
HazMat Planning	LEPC	High	Ongoing	Minimal	Local Cash, Grants	Local Government UDEM, FEMA

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	USDI – Bureau of Reclamation, Local Government UDEM, FEMA, UDHS, MAG
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, MAG, UDEM, FEMA
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government, Utah Div of FFSL, County Fire Districts
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, UDEM, MAG, FEMA
All-Hazards Planning	CEMPC (Community Emergency Management Planning Committee)	High	Ongoing	Minimal	Local Cash, Grants	Local Government UDEM, FEMA
HazMat Planning	LEPC—(Local Emergency Planning Committee)	High	Ongoing	Minimal	Local Cash, Grants	Local Government UDEM, FEMA

Coalville	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	201	$22,411,483	166.2
500 Year Flood	209	$23,587,575	169.3
Dam Failure (Joyce Boyer Lake)	113	$10,359,114	84.8
Fire-High and Moderate Risk	93	$16,422,326	371.9
Landslide	1	$3,552	6.8
Liquefaction	0	0	0.0

Statement of Vulnerabilities: Coalville City has identified a few areas of concern and vulnerability. The existing culinary water system is in need of operational upgrades. A large vulnerability the city has identified is insufficient fire flow protection for its residents in various areas of the city. A water masterplan has been completed and those areas are defined in that plan. Steps are currently being taken to remedy the insufficient fire flow problems.

There are also areas of town along south Main Street that are subject to minor flooding during rain events as well as an area located in the Indian Hills Subdivision. These are generally minor flooding events that are not caused by river flows but mainly by surface flows from adjacent land. FEMA has completed a detail study showing the flood plain boundaries and an area along 50 North that is subject to flooding in the 100 year event.

In addition to the above mentioned there are residents along Chalk Creek Road and Border Station road that have limited evacuation routes. There are two directions; however, if the direct route into town were impeded the alternate route is less traveled and subject to county maintenance.

Addressing the Floodplain: Floodplain development requires strict permitting process. Development Code Title 10 chapter 22 addresses floodplains in relation to development on Sensitive Lands. It prohibits any alteration of Wetlands, Lake Shores, Stream or River Corridors, Floodplains and Drainage ways without express permission, institutes setbacks and runoff controls approved by the City Engineer.

Protecting Current Residents and Structures (2010)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, USDA Grant and Loan	Local Government	Yes	
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Yes	
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS	No	The city has a Sensitive Lands ordinance that covers this information. No specific public education campaign.

Protecting Future Residents and Structures (2010)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping	High	2 years	TBD	Local Cash, Grants	Local Government	Yes	Waiting on the new approved FEMA Flood Maps

	and incorporate them into general plans and ordinances.					FEMA, UDHS		
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government UGS, USGS	Yes	
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	Somewhat	Health, Safety, Nuisance ordinances addresses many landscaping/weed removal requirement to help reduce wildfires.
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	1 years	Minimal	Local Cash, Grants	Local Government UGS, USGS	In the process.	The city is waiting on the approved FEMA Flood Maps so that they can do it all at once.

Protecting Current Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Bridge/Culvert Expansion along Chalk Creek	High	4 years	$800,000	Grants and Local Cash	Local Government
Wildfire	Fire Restriction ordinance	High	6 months	No cost	N/A	Local Government
Landslide	Incorporate Landslide maps into Hazards Lands Map	High	1 year	Minimal	Local Cash	Local Government
Earthquake	Conduct seismic retrofitting assessments for critical public facilities most at risk to earthquakes. (public works building and city building)	Medium	2 years	Minimal	Local Cash	Local Government

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Wildfire	Review and update Sensitive Land Ordinance so that it specifically addresses and incorporates FIREWISE landscaping requirements and allows for creating defensible zones around power lines, oil and gas lines and other infrastructure systems.	Medium	2 years	Minimal	Local Cash, Grants	Local Government
Wildfire	When updating the General Plan and future land use map include considerations for wildfire hazards within land use, public safety, and other elements of the General Plan.	Medium	2 years	Minimal	Local Cash	Local Government
Landslide	Incorporate, within development ordinances and reviews, setback requirements on parcels near high risk areas for landslides.	Medium	2 years	Minimal	Local Cash	Local Government, USGS, UGS
Landslide	Enforces existing restrictions and/or limit activity that would strip slopes of essential top soil and vegetation.	Medium	2 years	Minimal	Local Cash	Local Government, USGS, UGS
Flooding	Evaluate and incorporate drainage capacities with detention and retention basins, keeping ditches clear by requiring debris removal, plan for necessary bridge and culvert modification.	High	2 years	$50,000	Local Cash	Local Government
Flooding	Better understand the capacity of the city storm water system by updating the city's Storm water Master Plan.	High	2 years	$70,000	Local Cash/Grants	Local Government

Francis	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	10	$1,445,499	28.8
500 Year Flood	10	$1,445,499	28.8
Dam Failure	0	0	0.0
Fire-High and Moderate Risk	18	$3,307,733	34.7
Landslide	0	0	0.0
Liquefaction	0	0	0.0

Statement of Vulnerabilities: Francis City is currently receiving a large number of development and annexation requests. As the population grows, there will be an increase to the potential impacts from natural and man-made disasters. Francis has a proposed development in the wildfire interface zone.

Addressing the Floodplain: Development code chap 6.15 "The Planning Commission may, upon recommendation of the Town Engineer and when it deems it necessary for the health, safety, or welfare of the present and future population of the area and necessary to the conservation of water, drainage, and sanitary facilities, prohibit the subdivision of any portion of the property which lies within the one hundred year flood plain of any stream or drainage course. These flood plain areas should be preserved from any and all destruction or damage resulting from clearing, grading, or dumping of earth, waste material, or stumps, except at the discretion of the Planning Commission." Planning Commission may also approve buildings constructed 12" above 100 yr flood elevator if they have proper, unobstructed overflow adjacent.

Protecting Current Residents and Structures (2010)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes, Francis has been working with residents that are within the flood plain to let them know that they are in the flood plain.	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No	Have not taken the time to do the inventory
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Yes, Francis is currently working with South Summit Fire District to come up with information to give to residents within the wildland urban interface zone.	
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS	No	Francis has not had the resource to educate the residents.

Protecting Future Residents and Structures (2010)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	

Flooding/ Dam Failure	Canal safety program.	High	3 years	TBD	Local Cash, Grants	Local Government	No	Still need to work on this
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Still need to work on this
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	Yes	
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Still need to work on this

Protecting Current Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS
Flooding/ Dam Failure	Canal safety program.	High	3 years	TBD	Local Cash, Grants	Local Government
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS

Henefer	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	38	$4,357,953	96.5
500 Year Flood	46	$5,206,343	125.4
Dam Failure	0	0	0.0
Fire-High and Moderate Risk	42	$6,644,986	675.6
Landslide	0	0	0.0
Liquefaction	0	0	0.0

Statement of Vulnerabilities: Henefer lacks a communication method to quickly and effectively contact all residents in the event of a threat.

Addressing the Floodplain: Henefer Town Code Chapter 9 "Sensitive Area & Floodplain Regulations" includes sections on Methods of Reducing Flood Losses, Special Flood Hazard Area-Approval, Floodways, and Development Standards. No structures are allowed in the 100 year flood plain and buildings will have adequate setback from drainage channels. The Planning Director is responsible to review all applications, verify elevation and ensure adequate protections (floodproofing, anchoring, openings in basements, foundations heights, etc.) during development. Any alteration of floodways is prohibited unless certification by a professional engineer demonstrates the encroachments shall not result in any increase in flood levels during a discharge.

Protecting Current Residents and Structures (2010)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	Yes, Echo Dam retrofitted	
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	No	Resources
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS	No	Lack of Resources

Protecting Future Residents and Structures (2010)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	No	Waiting on new FEMA maps
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	No	
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Coordination efforts fell through

Protecting Current Residents and Structures (Henefer)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding	Timely notification system, organized equipment and aid	Med	1 year	Minimal	Local Cash	Local Government
Drought	Monitor Spring flows, reservoir storage and usage	Moderate	Ongoing	Minimal	Local Cash, private owners	Local Government, private owners
Earthquake	Inspect structures and utilities. Facilitate repairs	High	4 years	High	Local Cash, Grants, Insurance	Local Government, FEMA, Insurance

	and clean up					
Hazardous Materials spill	Notification system for citizens and education	Moderate	1 year	Minimal	Local Government	Local Government
Infectious Disease	Notification system	Moderate	1 year	Minimal	Local Government	Local Government
Wildfire	Provide water for fire suppression	Moderate	Ongoing	Moderate	Local Government	Local Government

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
All Hazards	Timely notification system, organized equipment and aid	Med	1 year	Minimal	Local Cash	Local Government
Wildfire	Provide water for fire suppression	Moderate		Moderate	Local Government	Local Government

Kamas	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	0	0	0.0
500 Year Flood	0	0	0.0
Dam Failure	0	0	0.0
Fire-High and Moderate Risk	15	$2,650,275	42.7
Landslide	1	$307,732	11.2
Liquefaction	0	0	0.0

Statement of Vulnerabilities: Kamas City is starting to see development within or close to the wildfire interface zone. Also, the FEMA floodplain maps are currently being updated within the Kamas City boundaries. Once the maps are approved by FEMA, Kamas will have a defined flood zone along Beaver Creek.

Addressing the Floodplain: Municipal Code 13.20 includes comprehensive measures for floodplain management. See Section X Policy and Program Capability of this document for an example.

Protecting Current Residents and Structures (2010)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes, Kamas has been working with the State to update the FEMA flood plain map within the City Limits.	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No	Still need to work on this.
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	No	Still need to come up with the information to educate the property owners within the urban wildland fire interface zone.
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS	No	We need to identify the area that have the potential for landslides so we can education the residents.

Protecting Future Residents and Structures (2010)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	Yes, we have been working with the State to update the FEMA flood plain map. Once approved by FEMA, we will incorporate into our general plan.	
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Still need to come up with a plan.
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	No	Will work on when we update our ordinances.
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	no	Still need to work on this.

Protecting Current Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS

Oakley	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	168	$29,156,053	381.6
500 Year Flood	171	$29,701,996	383.9
Dam Failure- Smith and Morehouse, Abes Lake	132	$21,068,743	362.1
Fire-High and Moderate Risk	20	$9,593,550	309.1
Landslide	12	$16,113,719	619.6
Liquefaction	0	0	0.0

Statement of Vulnerabilities: Low water availability impedes firefighting and drought mitigation and it is difficult to allocate funds to a new well.

Addressing the Floodplain: Municipal Code 8.01 & 8.01, "Flood Control" & "Flood Prevention", see Section X Policy and Program Capability of this document for an example. Many provisions for building within 100 yr floodplain, designated Floodplain Administrator, etc.

Protecting Current Residents and Structures (2010)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes/Ongoing	

Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No	Lack of resources
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	No	Lack of resources
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS	No	Lack of resources

Protecting Future Residents and Structures (2010)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	No	Lack of resources
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Lack of resources
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	No	Lack of resources
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Coordination efforts fell through

Protecting Current Residents and Structures (Oakley)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Promote NFIP participation	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS
Earthquake	Inventory current critical facilities for Seismic standards	High	3 years	TBD	Local Cash, Grants	Local Government FEMA, USGS
Wildfire	Educate homeowners on FIREWISE practices	High	Ongoing	Minimal	Local Cash, Grants	Local Government

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances	High	3 years	TBD	Local Cash, Grants	Local Government, FEMA, USGS
Earthquake	Promote earthquake awareness	High	Ongoing	Minimal	Local Cash	Local Government

Park City	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	336	$100,118,941	34.7
500 Year Flood	811	$250,021,185	128.8
Dam Failure	44	$20,895,617	65.9
Fire-High and Moderate Risk	388	$304,481,408	315.0

Landslide	139	$172,256,628	241.8
Liquefaction- low	2767	$1,112,844,403	774.1

Statement of Vulnerabilities: Park City has a community in the Wildland Fire Urban Interface with only two evacuation routes and a potential single point of failure. Park City also has a large visitor and second-home population that can be difficult to direct and/or communicate with.

Addressing the Floodplain: Municipal Code 8.01 "Flood Control and Prevention" is comprehensive, an example of which can be found in Section X Policy and Program Capability of this document. Park City also has an excellent Storm Water Master Plan.

Protecting Current Residents and Structures (2010)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA UDHS	Limitedly	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	In process	
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	In process	
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Med	1 year	TBD	Local Cash, Grants	Local Government, UGS	In process	

Protecting Future Residents and Structures (2010)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/Dam Failure	FEMA Firm was integrated into Park City's Environmental GIS system for Building/Planning Dept.	High	2 years	10,000	Park City	Park City	Completed	
Flooding/Dam Failure	PCMC implemented a WebGIS allowing the public to research local flood plain issues on the Web.	High	2 years	15,000	319 CWA Grant	Park City	Completed	
Flooding/Dam Failure	http://dagrc.utah.gov/ParkCityGIS/				319 CWA Grant	Park City	Maps online, website N/A	
Flooding/Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	In Process	
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Ongoing with Shakeout	
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	In Process	
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	City Engineer	

Protecting Current Residents and Structures (Park City)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding	New Storm Water Utility	High	3-5 years	3 Million	Local Cash	Local Government
Flooding	Update FIRM	Med	Ongoing, see City Engineer	Minimal	Local Cash, FEMA	Local Government, State, FEMA
Fire	Create Community Wildfire Protection Plan with PCFD	High	Completed 2014, now implementing	2-50 thousand	Local Cash, Grants	Local Government, Fire Department
Earthquake	Upgrade City Buildings	Medium	Ongoing	Significant	Local Cash, Grants	Local Government

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk	Medium	1 year	Minimal	Local Cash, Grants	Local Government

Other City Participation

The following jurisdictions attended the first physical meeting to discuss the Hazard Mitigation Plan. Every jurisdiction was contacted by phone and email on multiple occasions. Chris Crowley, Summit County's Emergency Manager, allowed us to present to several other cities and entities at an emergency planner's meeting on June 14, 2016.

Hazard Mitigation Plan Review
Summit County, Feb 9, 2016

Name	City	Email	Phone
CHRIS CROWLEY	Summit Co.	CCROWLEY@summitcounty.org	801-718-4628
Ray Milliner	Summit Coun	rmilliner@summitcounty.org	435 336-3118
Kirsten Whetstone	Park City	Kirsten@parkcity.org	435-645-5066

Other Contact:

Coalville	Cindy Gooch	801-547-0393	cgooch@jub.com	01 Nov, called 03 Jan, spoke with Shane and received strategies in February 2017
Francis	Scott Kettle	435-654-2226	skettle@horrocks.com	Confirmation from Marcy Burrell than Francis was reviewing documents in Feb. Scott Kettle of Horrocks engineers was hired, emailed and spoke with Scott on multiple occasions to explain plan and give example of strategies.
Henefer	Town Clerk	435-336-5365	henefertown@allwest.net	Emailed City/County analysis 01 March. Received their strategies via email 19 April. Spoke with Tami on multiple occasions to explain plan and discuss strategies and vulnerabilities.
Kamas	Scott Kettle	435-654-2226	skettle@horrocks.com	Scott Kettle of Horrocks engineers was hired, emailed and spoke with Scott on multiple occasions to explain plan and give example of strategies.
Oakley	Tami Stevenson	435-783-5734	oakley@allwest.net	Spoke several times with Tami over the phone, received their strategies 07 Sep via email. Phone call 03 Jan for Statement of Vulnerabilities.

Part VII
Utah County
Profiles and Mitigation

Background

Area: 2,014 square miles; *county seat*: Provo; *origin of county name*: after the Ute Indians; *economy*: technology industry, light manufacturing, agriculture; *points of interest*: Fairfield Stagecoach Inn, historic downtown Provo, Brigham Young University (Monte L. Bean Life Sciences Museum, Museum of People and Culture, Harris Fine Arts Center), Utah Lake, Timpanogos Cave National Monument, Springville Museum of Art, Hutchings Museum of Natural History in Lehi, McCurdy Historical Doll Museum in Provo, Bridal Veil Falls, Sundance ski resort.

The most striking geographical features of Utah County are the Wasatch Mountains along the eastern boundary, and Utah Lake, the state's largest fresh-water lake. The high mountains, rising over 11,000 feet, receive heavy snowfall which feeds the numerous rivers and creeks that flow into the lake. Though large in surface area, Utah Lake is very shallow--18 feet at its deepest point.

Before the valley was settled by Mormon pioneers in the 1840s and 1850s it was the home of the Ute Indians. They lived along the eastern shore of the lake and used fish from the lake as their main food source. The Spanish Catholic priests Dominguez and Escalante, who observed them in 1776, described these Indians as peaceful and kind. Dominguez and Escalante were trying to find a route between Santa Fe, New Mexico, and what is now southern California. When they came down Spanish Fork Canyon in the summer of 1776 they were the first non-Indians to enter Utah Valley.

Mormon pioneers began settling Utah Valley in 1849. Like the Indians before them, they chose to settle on the fertile, well-watered strip of land between the mountains and Utah Lake. More than a dozen towns were established between Lehi on the north and Santaquin on the south. Provo, named for the French fur trapper Etienne Provost, has always been the largest town and the county seat.

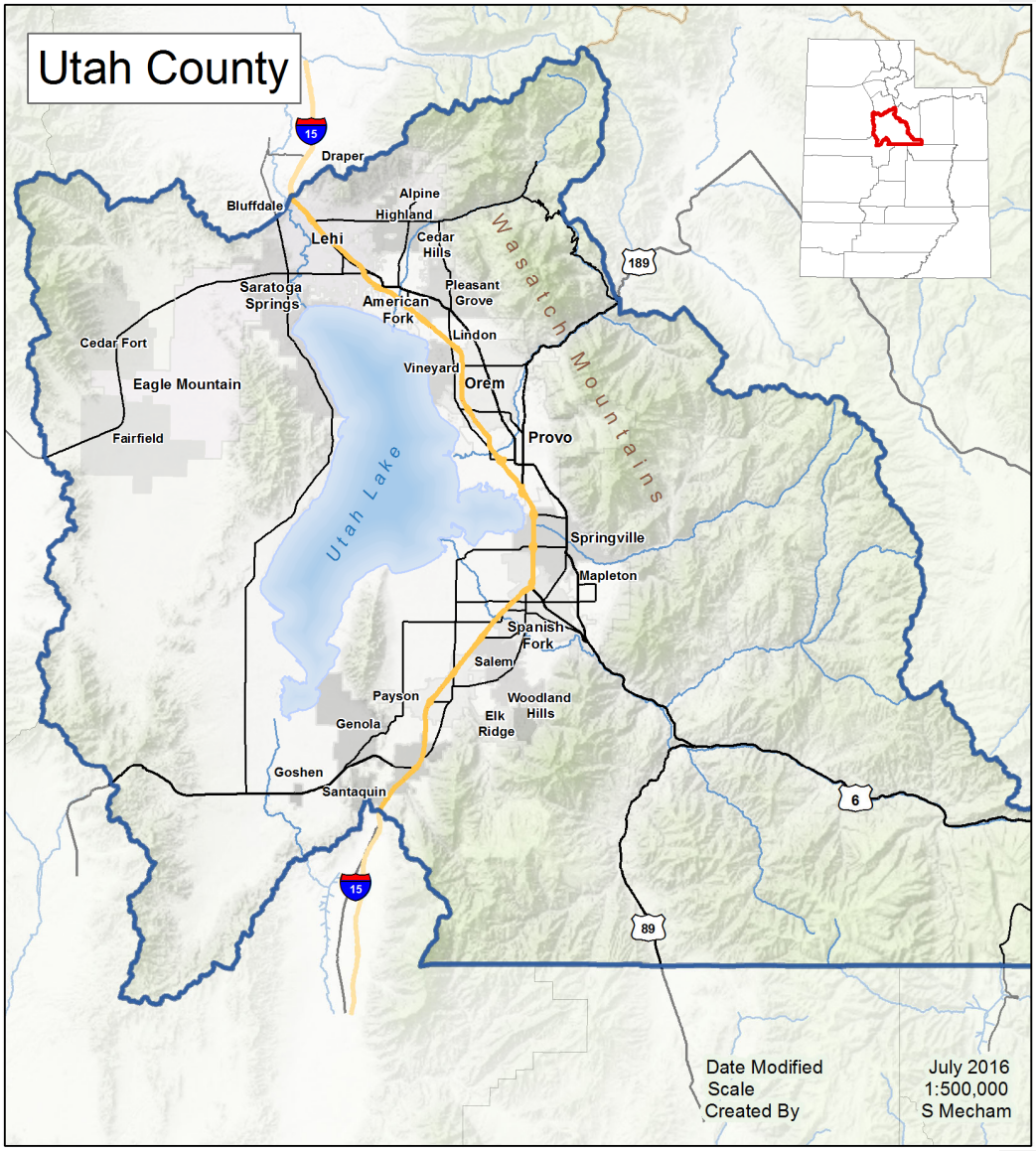
In March 1849 thirty-three families, composed of about 150 people, were called to go to Utah Valley under the leadership of John S. Higbee to fish, farm, and teach the Indians. During the next two years - 1850 and 1851 - communities were established at Lehi, Alpine, American Fork, Pleasant Grove, Springville, Spanish Fork, Salem, and Payson.

Farming was the most important early industry in the county, with fruit growing and the processing of sugar beets being especially important. The first large-scale sugar beet factory in Utah was built in Lehi in 1890. In recent years, the center of the fruit industry in the county has shifted from Orem to the south end of the valley, where orchards are not threatened by housing developments.

Mining was also an important industry in Utah County. In the late 1800s and early 1900s there were many successful mines in American Fork Canyon and in the Tintic mining district centered near Eureka, Juab County but included part of western Utah County. Many of the fine homes and business buildings in Provo were constructed with mining money.

Today, Utah County is best known as the home of Brigham Young University. BYU was established in 1875 as a small high-school level "academy," but it has grown to become a major university with 29,000 students in 2014. The Utah Valley University at Orem has grown rapidly to nearly 31,000 students as

well. Other major Utah County employers include Omniture Corporation and Novell, two companies that began in Utah County and have become international leaders in the computer software industry. Each of the major communities in the county have high schools and libraries. A culturally active area, the county has its own symphony--the Utah Valley Symphony, and one of the state's finest art museums: the Springville Art Museum. Provo's Fourth of July Celebration is the largest in the state and other special community celebrations include Pleasant Grove Strawberry Days, the Lehi Round-up, Steel Days in American Fork, Fiesta Days in Spanish Fork, Golden Onion Days in Payson, Pony Express Days in Eagle Mountain and the World Folkfest in Springville.


Utah County
15
Draper
Bluffdale
Alpine
Highland
Lehi
Cedar Hills
Wasatch Mountains
189
Saratoga Springs
American Fork
Pleasant Grove
Lindon
Cedar Fort
Vineyard
Eagle Mountain
Orem
Fairfield
Provo
Utah Lake
Springville
Mapleton
Spanish Fork
Salem
Payson
Woodland Hills
Elk Ridge
Genola
Goshen
Santaquin
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89
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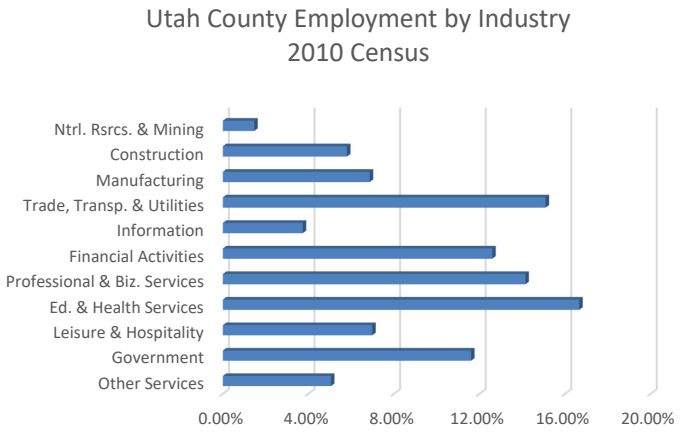
Population

	Census			Short Range Projection			Long Range Projection	
	1990	2000	2010	2020	2030	2040	2050	2060
Mountainland Region	291,606	417,321	579,448	746,796	934,540	1,150,420	1,381,418	1,602,441
Summit County	15,693	30,034	36,473	45,491	56,890	71,433	88,334	107,671
Utah County	265,764	371,873	519,307	668,564	833,101	1,019,828	1,216,695	1,398,074
Wasatch County	10,149	15,414	23,668	32,741	44,549	59,159	76,389	96,696

2012 Baseline Projections, Governor's Office of Planning and Budget. Produced using results from the 2010 Census as the base. See http://gomb.utah.gov/

Economy

Utah County recovered relatively quickly from the 2009 Great Recession. Strong job growth, particularly in the technology sectors near the Point of the Mountain, has attracted numerous employees. The county unemployment levels are lower than the state's average and average monthly wages continue to increase.



Utah County	2010	2011	2012	2013	2014	2015
Employment:						
Average annual employment	212,729	216,768	227,084	238,806	246,942	257,594
Labor Force	229,820	231,334	239,088	249,399	255,870	266,078
Unemployment Insurance Compensation	121,996	80,953	58,694	44,690	31,162	N/A
Unemployment Rate	7.40%	6.30%	5.00%	4.20%	3.50%	3.20%
Income:						
Per capita personal income ($)	27,441	29,025	30,875	31,272	32,274	
Sales and Use Tax						86,391,946
Gross taxable sales ($ thousands)	1,189,659	1,324,336	1,360,925	1,469,760	1,570,920	
Construction (permit-authorized):						
Dwelling Unit Permits	N/A	1,865	2,464	3,240	4,946	$4,455
Miscellaneous:						
Payment in Lieu of Taxes Act ($ thousands)	$1,566	$1,576	$1,623	$1,677	$1,713	$1,745

*Adapted from US BLS, Utah DWS, Utah State Tax Commission, Utah Bureau of Economic and Business Research

Population Characteristics

Social Characteristics	Estimate	Percent	U.S.
Average household size	3.62	(X)	2.58
Average family size	3.94	(X)	3.14

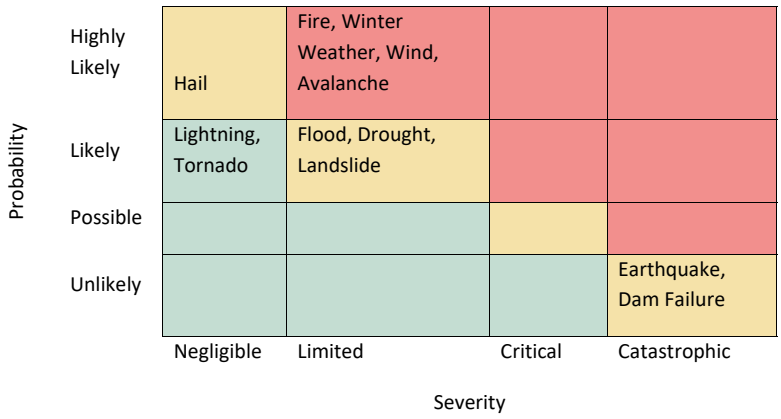
Population 25 years and over	262,767		
High school graduate or higher	245,815	93.6	86.30%
Bachelor's degree or higher	96,981	36.9	29.30%
Disability status	38,650	7.2%	12.3%
Foreign born	38,752	7.2%	13.10%
Speak a language other than English at home (population 5 years and over)	63,858	13.2%	20.9%
Household population	527,182	(X)	(X)
Economic Characteristics	Estimate	Percent	U.S.
In labor force (population 16 years and over)	249,061	67.6%	63.90%
Mean travel time to work in minutes (workers 16 years and over)	21.3	(X)	25.7
Median household income	60,830	(X)	53,482
Median family income	66,063	(X)	86,963
Per capita income	20,973	(X)	28,555
Individuals below poverty level	(X)	12.6%	14.80%
Housing Characteristics	Estimate	Percent	U.S.
Total housing units	152,545		
Occupied housing units	145,469	95.4%	88.60%
Owner-occupied housing units	97,920	67.3%	65.1%
Renter-occupied housing units	47,549	32.7%	34.90%
Vacant Housing Units	7,076	4.6%	11.40%
Median value of Owner-occupied (dollars)	222,300	(X)	175,700
Median of selected monthly owner costs			
With a mortgage (dollars)	1,496	(X)	1,522

Without a mortgage (dollars)	393	(X)	457
Demographic Characteristics			
Male	258,761	50.1	49.20%
Female	257,803	49.9	50.80%
Median age (years)	24.6	(X)	37.2
Under 5 years	58,362	11.3	6.50%
18 years and over	334,587	64.8	76.00%
65 years and over	33,457	6.5	13.00%
One race	502,528	97.3	97.1%
White	461,775	89.4	72.4%
Black or African American	2,799	0.5	12.60%
American Indian and Alaska Native	3,074	0.6	0.90%
Asian	7,032	1.4	4.80%
Native Hawaiian and Other Pacific Islander	3,905	0.8	0.20%
Some other race	23,943	4.6	6.20%
Hispanic or Latino (of any race)	55,793	10.8	16.30%

*Source: 2010 American Community Survey 5-year estimates

Hazards Compared

Hazard Matrix



Probability Calculations for Utah County

Hazard	Number of Events	Years in Record	Recurrence Interval (years)	Hazard Frequency and Probability/Year	Source
Avalanche (Injuries or damages)	26	19	0.8	1.4	NOAA
Drought (Moderate, PDSI<-2)	N/A	N/A	4.4	0.3	Utah State Water Plan
Earthquakes 3.0 and greater	11	115	10.5	0.1	University of Utah Dept. of Seismology
Floods	30	51	1.7	0.6	Various
Hail (all events)	42	19	0.5	2.2	NOAA
Landslides causing damage	13	51	4.0	0.3	SHELDUS

Lightning (fatalities and injuries)	3	19	6.7	0.2	NOAA
Wildfires (over 300 acres)	74	55	0.8	1.3	Utah Division of Forestry Fire and State Lands and BLM
Wildfires (over 50 acres)	140	55	0.4	2.5	Utah Division of Forestry Fire and State Lands and BLM
Urban Interface Fires	Unknown	Unknown	Unknown	Unknown	
Wind (with injuries or $ damages)	66	60	0.9	1.1	NOAA (High Wind and Thunderstorm Wind with bodily harm or $ damages)
Winter Weather (with injuries or $ damages)	39	19	0.5	2.1	NOAA (Blizzards/Snow/Winter Weather/Cold/Wind Chill with bodily harm or $ damages)
Tornadoes (all)	15	65	4.4	0.2	NOAA
Volcanoes	700	5,000,000	7142.9	0.0	

Recurrence interval: (number of years in record +1)/number of events.

Frequency: Number of events/Number of years in record.

Flooding/Dam Failure

Overview

Although Utah is considered a dry desert state, flooding does occur. Ranging from Most floods are occurring either from snow melt or severe thunderstorms. Often times flooding is increased by soils that are more impervious due to either wildfire or drying out. Floods occur on a regular basis in Utah County.

Profile

Frequency	Some flooding happens within Utah County on almost a yearly basis.
Severity	Moderate
Location	Primarily along streams, rivers and along the shores of Utah Lake
Seasonal Pattern	Spring time due to snow melt. Isolated events throughout the year due to severe weather (microburst).
Duration	A few hours to a few weeks depending upon conditions
Speed of Onset	1 to 12 hours
Probability of Future Occurrences	High - for delineated floodplains there is a 1% chance of flooding in any given year.

Development Trends

As development occurs on the bench areas of Utah Valley, along the shore of Utah Lake, or along river and stream corridors, more homes will be in danger of floods. Communities need to make developers and homeowners aware of the danger as well as contribute to mitigation actions. Cities should review every development that it is in compliance with NFIP guidelines.

The following table identifies the communities in Utah County with their NFIP Status.

Communities Participating in NFIP

490228#	Alpine	4/4/1983	Current, maps available online
490152#	American Fork	11/25/80(M)	Current, maps available online
490153	Cedar Fort	(NSFHA)	No special flood hazard area
490258	Eagle Mountain		Participating in NFIP Emergency program as of 2011
490154	Genola	(NSFHA)	No special flood hazard area
490254#	Highland		Current, maps available online
490209#	Lehi	7/17/2002	Current, maps available online
490210#	Lindon	02/19/86(M)	Current, maps available online
490156#	Mapleton	12/16/80(M)	Current, maps available online
490216#	Orem	09/24/84(M)	Current, maps available online
490157#	Payson	1/6/1981	Current, maps available online
490235	Pleasant Grove City	(NSFHA)	No special flood hazard area
490159#	Provo	9/30/1988	Current, maps available online
490160#	Salem	7/16/1979	Current, maps available online
490227	Santaquin	(NSFHA)	No special flood hazard area
490250#	Saratoga Springs	7/17/2002	Current, maps available online
490241#	Spanish Fork	02/19/86(M)	Current, maps available online
490163#	Springville	2/15/1985	Current, maps available online
495517#	Utah County	7/17/2002	Current, maps available online
490244#	Draper	9/25/2009	Current, maps available online

Adapted From FEMA's National Flood Insurance Program Community Handbook

The primary goal for non-participating communities is to become a participating member of the NFIP.

Assessing Vulnerability: Addressing Repetitive Loss Properties

There are no repetitive loss properties in Utah County (FEMA, 2016).

Utah County Flood and Dam Failure History

Flooding

Begin Date	Fatalities	$ Damages	Details	Source
12/23/1964	0	$545	Rain, flood, wind	SHELDUS
7/18/1965	0	$51,000	Heavy rains and flash floods	SHELDUS
7/30/1965	0	$12,750	Heavy rains and flash floods	SHELDUS
8/17/1965	0	$3,750	Flash floods	SHELDUS
8/21/1965	0	$1,500	Lightning, heavy rains and flash floods	SHELDUS
9/5/1965	0	$4,000	Lightning, hail, heavy rain, and local flooding	SHELDUS
8/27/1971	0	$1,000	Flash floods	SHELDUS
8/28/1971	1	$6,375	Heavy rains and flash floods	SHELDUS
5/1/1983	0	$7,142,857	Flood	SHELDUS
8/14/1983	0	$167	Flash Flood	SHELDUS
8/18/1983	0	$12,500	Flood	SHELDUS
4/16/1984	0	$1,250	Landsides and Flooding	SHELDUS
5/14/1984	0	$16,667	Landslide/Flood	SHELDUS
8/15/1984	0	$250	Flash Flooding	SHELDUS

7/18/1985	0	$5,000	Flash Flood, Thunderstorm Winds	SHELDUS
2/17/1986	0.09	$45,455	Flooding	SHELDUS
2/19/1986	0	$29,412	Flooding	SHELDUS
6/9/1986	0	$83	Flooding	SHELDUS
8/20/1986	0	$10,000	Flash Flooding	SHELDUS
5/22/1988	0	$5,000	Flash Flood	SHELDUS
8/26/2000	0	$10,000	Flood	SHELDUS
9/6/2002	0	$200,000		SHELDUS
9/12/2002	0	$3,200,000		SHELDUS
7/16/2004	0	$400,000		SHELDUS
7/17/2004	0	$350,000		SHELDUS
5/21/2005	0	$2,500	Flood	SHELDUS
4/15/2006	0	$25,000	Flood	SHELDUS
8/1/2010	0	$10,000		SHELDUS
4/18/2011		$452,859		SHELDUS
7/26/2011	0	$50,000		FEMA
9/7/2013	0	$2,943,600	Heavy rain esp. on burn scars. Provo, Alpine, Santaquin, and Pleasant Grove had over $250,000 in damages each.	Utah Co. Emergency Manager

Utah county and cities have received a total of $671,397.02 in NFIP claims since 1978.

Utah County and its cities in the NFIP program have 0 repetitive loss facilities


Dam Failure
Deer Creek Dam Failure
Jordanelle Dam Failure
100 yr Flood
500 yr Flood
Silver Lake Flat Dam
Tibble Fork Dam
Draper
Northwest Pressure Irrigation
Alpine
Bluffdale
Dry Creek
Highland
Highland City Pressure Pond
Lehi
Lehi Sandpit Reservoir
Cedar Hills
Pleasant Grove
Grove Creek Debris Basin
Saratoga Springs
American Fork
Battle Creek
Lindon City Irrigation Projects
Lindon
Dry Canyon Debris Basin
Cedar Fort
Israel Canyon
Vineyard
Orem
Eagle Mountain
Rock Canyon Debris Basin
Fairfield
Provo
Slate Canyon Dams 2 & 3
Springville
Hobble Creek Debris Basin
Mapleton
Spanish Fork
Spanish Fork Pressure Irrigation Pond
Salem
Payson
Elk Ridge
Woodland Hills
Payson Reservoir and Debris Basin
Genola
Maple Lake
Goshen
Santaquin
Santaquin Debris Basin & Irrigation Reservoir
Winward Dam
Big East, Box Lake & McClellan Lake Dams
Date Modified June 2016
Scale 1:350,000
Created By S Mecham
Sources FEMA, Utah DWR & Army Corps of Engineers
Flooding represented here is a combination of official FEMA NFIP maps and modelling by HAZUS software, created by FEMA. Only NFIP maps can be officially used for insurance determinations.

Wildland Fire

Overview

Wildfires occur on a regular basis in Utah County. Most fires occur in the late summer to early fall. Although many fires occur from natural causes such as lightning, humans cause over half of all fires. Sparks from trains traveling on the railroad cause many small fires in south Utah County. People riding ATV's, using fireworks and campfires also start a number of fires in the area.

Profile

Frequency	Multiple wildland fires occur in Utah County Every year.
Severity	Moderate/Limited
Location	Hillsides and mountainous areas, open grass and range lands.
Seasonal Pattern	Summer and fall depending on weather conditions.
Duration	A few hours to a few weeks depending upon conditions
Speed of Onset	1 to 48 hours
Probability of Future Occurrences	High Major Fires: 1.3 (300 acres and larger) Moderate Fires: 2.5 (50 acres and larger)

Development Trends

As development occurs on the bench areas of Utah Valley more homes will be in danger of wildfire. Communities need to make developers and homeowners aware of the danger. Cities should also require firebreaks and access roads along urban/wildland interfaces. Although development brings homes closer to areas of potential wildfire, it also brings water and access for firefighters closer to the urban fringe. FIREWISE community development principles, such as not storing firewood near homes, installing fire resistant roofing and cleaning debris from rain gutters will reduce potential loses.

History

Fires 300 Acres and Over

Fire Name	Date	Acres	Source
Mona	12/31/2000	33852.69	BLM
Soldier Pass	6/20/1996	8915.04	FS
West Mountain 4	7/2/1966	8825.96	FS
M&M Complex	7/29/2007	8495.43	BLM
Mollie	8/18/2001	8021.38	FS
Cherry Creek 2	10/25/2003	6033.92	FS
Tenmilepas	8/6/2000	5867.00	BLM
Pinyon	8/11/2012	5766.59	BLM
Dump	6/26/2012	5502.40	BLM
Mercer	6/25/2007	5184.65	BLM
Nebo Creek	7/2/2001	4377.74	FS
Clay Pit	8/14/1999	4367.00	BLM
Moffida	6/29/2007	3342.00	BLM
Tunnel Road	6/13/2006	3201.00	BLM
Bismark	7/26/2000	3181.00	BLM
Tank Fire	8/5/1996	3031.65	FS
Trojan II	9/10/1994	2975.42	FS
Longridge	6/12/1996	2615.50	BLM
Pelican Point	8/25/2005	2574.61	BLM
Springville	6/30/2002	2259.12	FS
Quail	7/3/2012	2217.46	FS
Lake Fork	7/2/2009	2121.00	BLM
West Mountain 3	6/25/1999	2058.07	FS
Crooked	8/13/2003	2050.81	BLM
Cedar Fort	6/16/2007	1985.00	BLM
Red Bull	7/29/2004	1835.63	FS
East Vivian	7/26/2000	1833.60	FS
Elberta South	8/22/2006	1800.30	BLM
Red Ledges	8/19/2012	1682.83	FS
Ar Fire	6/1/2012	1678.80	BLM
Chaparral	8/7/2011	1597.72	BLM
Government Creek	8/24/2005	1547.47	BLM
Knowls	6/5/1994	1500.00	BLM
Hancock	10/4/2011	1405.51	BLM
Squaw Creek	8/5/1987	1369.57	FS
Westmt#2	9/18/1998	1315.00	BLM
Tourch 2	8/10/1985	1200.00	BLM
West Mtn	9/4/1995	1118.00	BLM
Goose_Nest	2011	1078.67	BLM
Longridge	7/24/1999	1025.00	BLM
Bell	6/20/2006	989.92	BLM

Oak Hill	7/30/2000	911.22	FS
Impact	9/19/2006	860.00	BLM
Gra	7/24/1992	818.17	FS
Wing	6/10/2000	813.08	FS
Spring Lake	8/1/2008	762.00	BLM
Hells Kitchen	9/21/2005	671.46	BLM
West Mtn.	8/28/1997	650.00	BLM
Lake Mtn	8/11/1982	640.00	BLM
Orem Park	7/20/1960	604.03	FS
Box Elder Canyon	7/2/1961	599.57	FS
Middle Slide Canyon	9/2/1989	554.39	FS
West Mtn. 2	8/22/2006	553.58	BLM
Concrete	9/17/2004	544.24	BLM
Allen Rnch	8/10/1996	543.00	BLM
Dyno	2011	503.78	BLM
Y Mountain	7/21/2001	461.38	FS
Oak Brush	9/30/1976	447.31	FS
Tower	7/5/1983	428.18	FS
Big Jane	6/30/1987	416.61	FS
Vivian Park	8/11/1996	382.09	FS
West Mountain	9/15/2007	378.00	BLM
Clay Pit 2	8/29/1999	373.00	BLM
Pinyon	8/13/2003	369.03	BLM
Brimhall	8/6/1976	354.03	FS
Whitmore	8/2/1973	349.39	FS
Lake Mtn	8/26/2002	348.00	BLM
Fort Canyon Fire	8/31/1988	343.34	FS
Keigley West Mountain	9/21/2001	339.14	BLM
Highway	8/30/2008	323.00	BLM
Santaquin	8/4/1981	321.47	FS
Sierra	8/31/2006	316.56	BLM
Lott Canyon	9/10/2005	309.71	BLM
Dyno	6/5/2007	305.00	BLM

Total Fires 300 Acres and Over: 74

Total Acres: 178,394.24

Fires 50-300 acres

Fire Name	Date	Acres	Source
Goshen Can	6/21/2005	298.00	BLM
Diamond Fork	8/19/1985	291.98	FS
West Mountain	6/14/1998	278.40	FS
Dead Cow	6/20/1980	275.00	BLM
Waterwell	9/9/2009	260.00	BLM
Water Tank	8/10/2006	259.45	BLM
Little Cove	6/20/2006	257.00	BLM
Dry Creek	6/29/1992	255.18	FS

Bridal Falls 2	7/24/2008	246.00	BLM
Thistle	6/24/2007	244.00	BLM
Bear Canyon	7/20/1961	241.70	FS
Paysondump	8/25/2004	236.00	BLM
Clay Pit	6/1/2012	227.41	BLM
Wiley	6/17/2012	207.41	BLM
Keigley	8/26/2002	198.12	BLM
Pg	6/28/2007	198.00	BLM
Slate Jack	7/29/2012	194.35	BLM
Fairfield	7/27/2001	183.21	BLM
M31	7/15/2007	182.01	BLM
Pumpkin	8/6/2012	180.55	FS
Fairfield	7/9/2005	165.00	BLM
Springville	10/2/2005	157.83	FS
Hobble Creek	8/17/2009	157.00	BLM
Rock Canyon	7/5/1992	155.49	FS
Cathill	8/6/1983	150.00	BLM
Eureka	8/11/1983	150.00	BLM
Orchard	6/25/1983	150.00	BLM
Crowd Fire	8/10/2003	145.92	FS
Third Water	8/6/2013	132.56	FS
Bunnells Fork	4/27/1996	127.89	FS
Broadmouth	6/3/2007	127.68	BLM
Jacob Ranch	7/12/2003	124.18	BLM
Geneva Taylor	4/7/2005	122.43	BLM
Miner	10/3/1999	118.00	BLM
Yellowbrsh	9/13/1997	107.00	BLM
Little Cove	7/14/2007	105.00	BLM
Little Rock Canyon	8/15/2003	102.77	FS
Cedar Fire	7/5/1983	102.62	FS
West Mtn	9/1/2002	101.00	BLM
Oak Spring	8/3/2009	100.00	BLM
Mapleton 1	8/17/2009	98.00	BLM
Pelican	7/16/2006	98.00	BLM
Tank	9/2/2012	97.33	FS
Tank	8/11/2013	95.08	FS
Beehive Fire	7/18/1998	90.37	FS
Hobble Creek	6/5/2006	82.50	FS
Broad Hollow	7/15/1983	82.43	FS
Dog Canyon	7/1/1989	80.00	BLM
Wanrhoades	8/1/1996	71.16	FS
Israel Canyon 2	10/2/2003	69.44	BLM
Willey_Fire	8/22/2005	69.20	BLM
Soldier	8/13/2003	64.56	BLM
Lott	6/12/2006	64.41	BLM
Wignal	7/16/2013	62.72	FS
Lake	8/1/2004	61.28	BLM
Lake Mtn	7/9/1989	60.00	BLM

Explosion	8/10/2005	58.84	FS
Sagehen Spring	10/18/1970	57.81	FS
Slide Canyon	7/7/1979	55.20	FS
P Fire	7/21/2005	51.37	FS
Brimhall	7/17/2002	50.91	FS
Long Hollow	7/13/1982	50.36	FS

Island Com	7/3/2004	50.00	BLM
Railroad	7/1/2000	50.00	BLM
Sandhill	8/21/2005	50.00	BLM
Wales	6/28/1986	50.00	BLM

Total Fires 50 acres and over: 140

Total acres 187,481.36

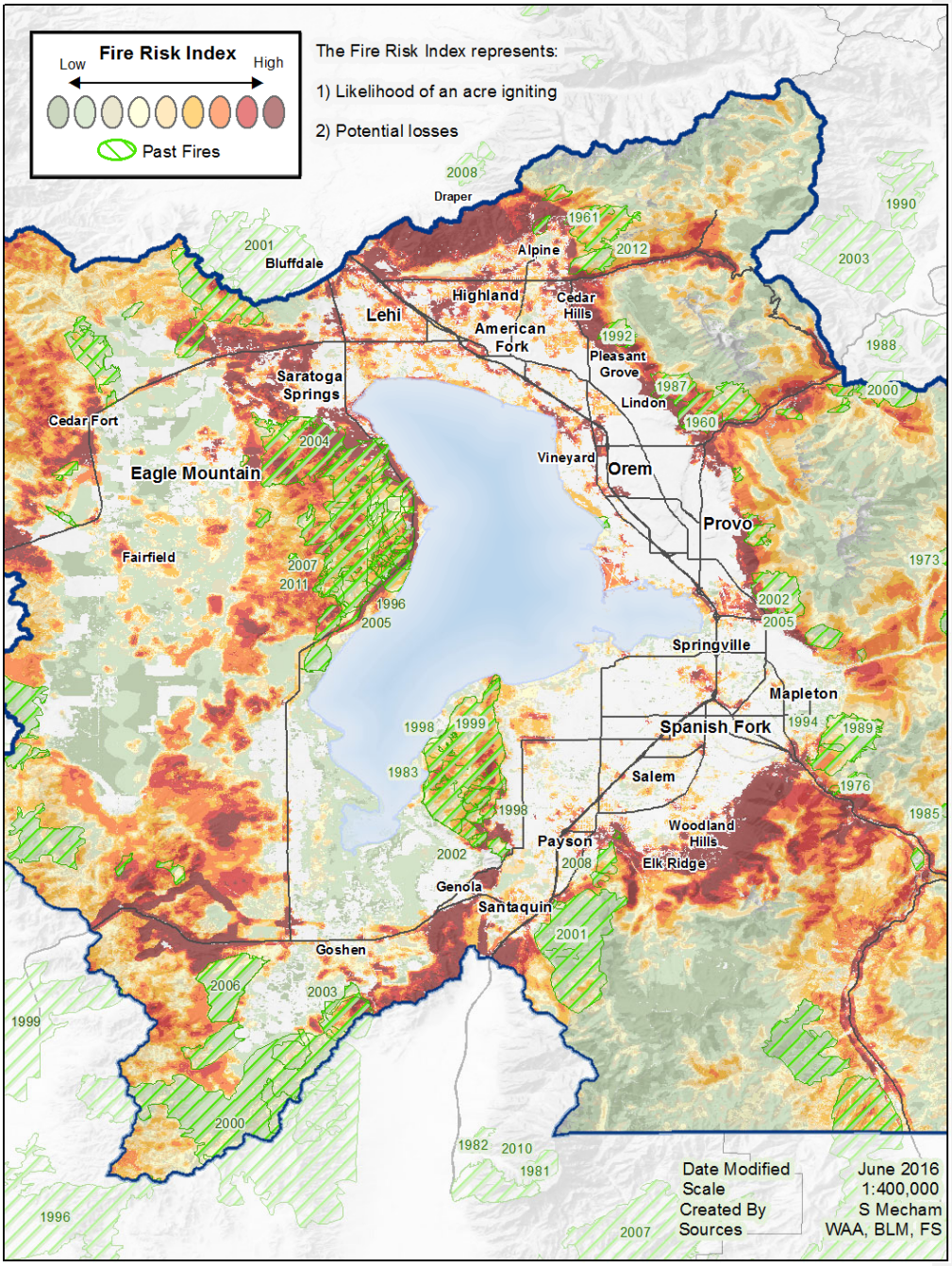
Mitigation

The FFSL has helped communities develop Community Fire Plans. According to the FFSL, the purpose of community fire planning is to:

- Empower communities to organize, plan, and take action on issues impacting community safety
- Enhance levels of fire resistance and protection to the community
- Identify the risks of wildland/urban interface fires in the area
- Identify strategies to reduce the risks to homes and businesses in the community during a wildfire

Community Name	County	Date Signed
Cedar Fort	Utah	Dec 2016
Covered Bridge (Between Spanish Fork and Thistle)	Utah	2002
Eagle Mountain	Utah	2014
Saratoga Springs	Utah	Dec 2003
Sundance*	Utah	April 1999
Woodland Hills*	Utah	Mar 2011
Santaquin	Utah	Aug 2014

- Nationally recognized as Firewise communities


Fire Risk Index
Low
High
Past Fires
The Fire Risk Index represents:
1) Likelihood of an acre igniting
2) Potential losses
Draper
Bluffdale
Alpine
Highland
Cedar Hills
Lehi
American Fork
Pleasant Grove
Lindon
Saratoga Springs
Cedar Fort
Eagle Mountain
Vineyard
Orem
Provo
Fairfield
Springville
Mapleton
Spanish Fork
Salem
Woodland Hills
Payson
Elk Ridge
Genola
Santaquin
Goshen
Date Modified
Scale
Created By
Sources
June 2016
1:400,000
S Mecham
WAA, BLM, FS

Earthquake

Overview

Utah County is particularly susceptible to earthquakes and their secondary hazards due to its situation between (or in many cases, on top of) the fault line and Utah Lake's unstable soils. While Summit and Wasatch counties may see some damage due to shaking and certainly a few landslides, Utah County is certain to have mass movement along the bench and liquefaction in the numerous homes (and utilities) built near the lake in addition to the normal collapse of chimneys and broken glass from an earthquake magnitude 5.0 and above. Fires are also common following earthquakes in urbanized areas as gas lines break, electrical shorts occur, and response capabilities of firefighters are overwhelmed by the number of incidents and possibly damaged streets and water lines.

Profile

Frequency	Low: Events above 3.0 on the Richter scale are rare. Minor events (below 3.0) occur every month, but generally aren't felt.
Severity	High (up to 7.0)
Location	Multiple faults throughout the county with the primary Wasatch Fault along the mountain benches.
Seasonal Pattern	None
Duration	1 to 6 minutes excluding aftershocks.
Speed of Onset	Seconds
Probability of Future Occurrences	93% probability that an earthquake Magnitude 5 or higher will occur somewhere along the Wasatch Front in the next 50 years

Development Trends

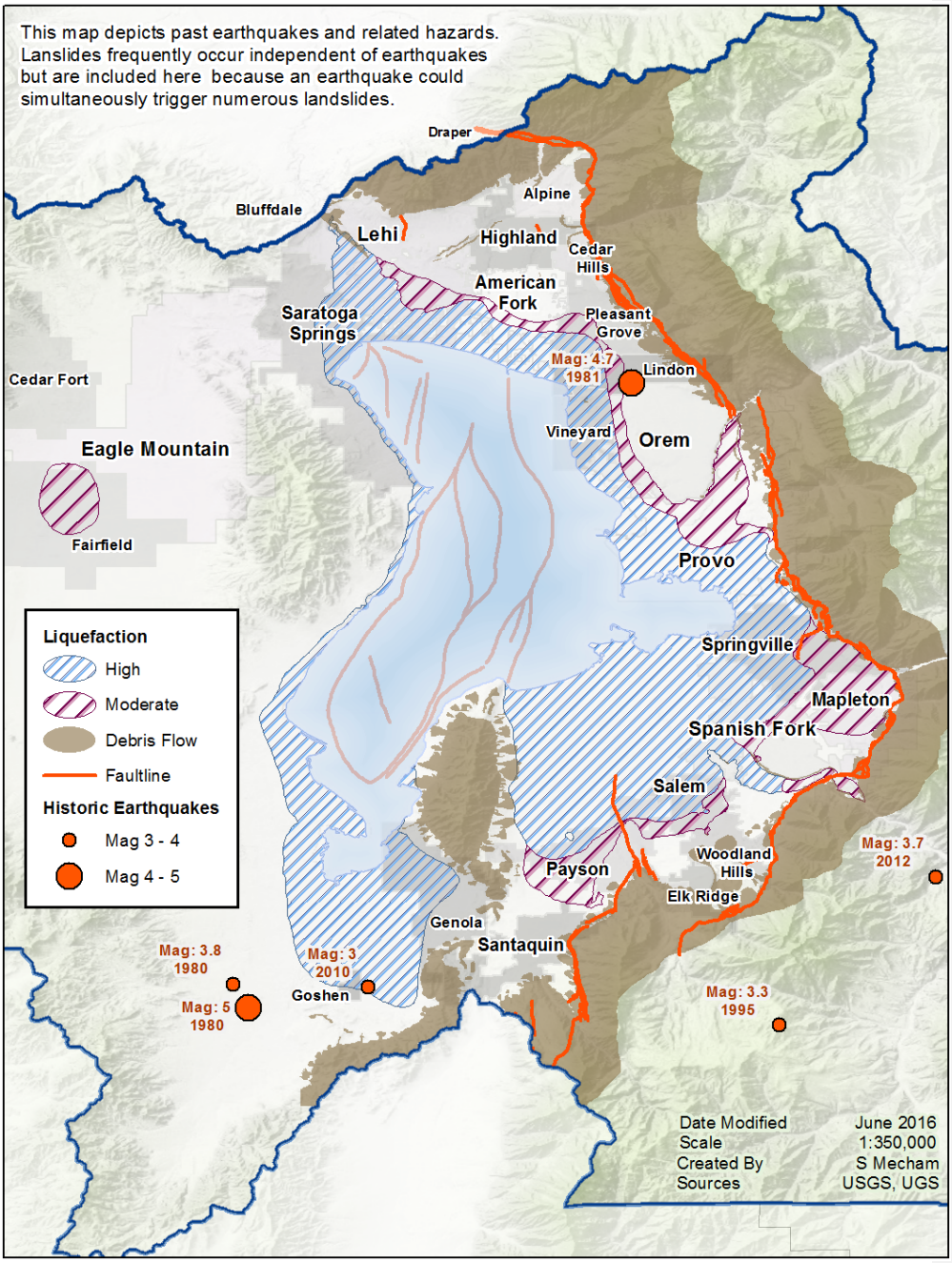
As development occurs in Utah County, more buildings and people will be in danger from earthquakes. However, newer buildings will be built to better standards, which will actually decrease the risk of damage. It is interesting to note that when most residential structures are engineered, out the three categories of design criteria; seismic zone, wind shear and snow load; the design criteria for wind shear over-rules the other criteria.

History

Earthquakes

Location	Magnitude	Date
Santaquin/Goshen	VI-VII	2-Oct-00
Elberta, Utah County	3.8	4/6/1980
Elberta, Utah County	5	5/24/1980
Lindon, Utah County	4.7	2/20/1981
Diamond Fork Campground, Utah County	3.2	5/6/1994
Payson Lakes Campground, Utah County	3.3	7/6/1995
Near Strawberry Reservoir, Utah County	3	1/5/1998
Goshen, Utah County	3	1/23/2010
Rocky Ridge, Juab/Utah County	3.2	7/5/2011
Rocky Ridge, Juab/Utah County	3.6	7/22/2011
Thistle, Utah County	3.7	2/4/2012

*United States Geologic Survey: earthquake.usgs.gov/earthquakes/search


This map depicts past earthquakes and related hazards.
Lanslides frequently occur independent of earthquakes
but are included here because an earthquake could
simultaneously trigger numerous landslides.
Draper
Alpine
Bluffdale
Lehi
Highland
Cedar Hills
American Fork
Saratoga Springs
Pleasant Grove
Mag: 4.7
1981
Lindon
Cedar Fort
Vineyard
Orem
Eagle Mountain
Fairfield
Provo
Springville
Mapleton
Spanish Fork
Salem
Liquefaction
High
Moderate
Debris Flow
Faultline
Historic Earthquakes
Mag 3 - 4
Mag 4 - 5
Mag: 3.7
2012
Woodland Hills
Payson
Elk Ridge
Genola
Santaquin
Mag: 3.8
1980
Mag: 3
2010
Goshen
Mag: 5
1980
Mag: 3.3
1995
Date Modified
June 2016
Scale
1:350,000
Created By
S Mecham
Sources
USGS, UGS

Landslide

Overview

Due to the topography of Utah County, landslides are an issue. The foothills and alluvial fans on the bench areas are desirable for home locations. Landslides and debris flows often occur after a wildfire event. The following table illustrates the vulnerability assessment for landslides in Utah County.

Profile

Frequency	Movement occurs nearly every year.
Severity	Moderate several structures have been condemned.
Location	Along most benches and hillsides.
Seasonal Pattern	Spring when ground saturation is at its peak.
Duration	Minutes to years.
Speed of Onset	Seconds to days.
Probability of Future Occurrences	Moderate: 0.2

Development Trends

Development along the foothills and bench areas is very desirable as more development occurs, more homes will be at risk for landslide damage. As more of the county land is developed, more marginal areas with problems soils will be developed. Increased analysis and geotechnical reports should become an integral part of the development and building process. Careful consideration should be given to ensure cutting and filling for any project is minimized.

History

Landslide/Debris Flow

Location	Date	Damages	Source	Details
Utah	12/27/1964	$500	SHELDUS	
Utah	1/1/1983	$200,000,000	SHELDUS	Record precipitation triggered many

Utah	1/1/1983	$8,603,666.52	SHELDUS	landslides, including Thistle
Utah	1/1/1984	$1,471,256.97	SHELDUS	
Santaquin	9/12/2002	$500,000	Utah Geologic Survey	The Mollie fire in 2001 and days of light rain created the conditions for the debris flow by exposing bare soil and saturating ground.
Provo	9/10/2003	$0	SHELDUS	Debris-Flow, Fire related. Damages prevented by diversion works.
Spring Lake, Santaquin	7/26/2004	$500,000	SHELDUS, the Geological Society of America	Debris-Flow, Fire related
Sage Vista Lane, Cedar Hills	4/28/2005	$1,000,000	FEMA Disaster Declaration & Utah Geological Survey	Above-average precipitation reactivated historic landslide, exacerbated by development at the base of the hill.
Provo	5/12/2005	One guest house damaged	SHELDUS, Utah Geological Survey	A 13-ton rock rolled down Y mountain over a mile after a spring storm, coming to a stop in a guest house.
Sherwood Hills, Provo	6/28/2005	Multiple homes condemned	SHELDUS	High groundwater tables after a wet winter triggered slow slide
Utah County	9/7/2013	$200,000	NOAA	Summer storms combined with fire scars resulted in several landslides this year.
Utah County	8/22/2013	$15,000	NOAA	
Utah County	7/16/2013	$10,000	NOAA	

Case Studies

Thistle Slide

In 1983 the town of Thistle, Utah, known to many highway travelers as the small community where both the Spanish Fork River and nearby U.S. highways branch, was eliminated by the costliest landslide on record in the United States.

Thistle was located at the triple junction of transportation systems leading south to Sanpete County, east to the coal counties of Carbon and Emery and points beyond, and northwest to the Wasatch Front and Salt Lake City. Two major highways converged at Thistle (U.S. Highways 89 and 6). Until the landslide, two rail lines also converged at Thistle--the main line of the Denver and Rio Grande Western Railroad (D&RGW) joining Denver and Salt Lake City, and a branch line to Marysvale.

Storms heralding the 1982 to 1986 wet cycle kicked off the wettest month ever recorded at the Salt Lake City International Airport in September 1982, and saturated the ground before the winter snows. The winter was neither exceptionally wet nor cold. However, snows and cold nights continued late into April and May 1983, and resulted in an unusually late and sudden snowmelt when temperatures did warm up. May snowpacks of northern Utah averaged two to three times their normal. Utah's landslide problems correlate with precipitation and snowmelt. Two large landslides in the early spring alerted geologic experts to the situation. The National Weather Service briefed local and national officials about the unusual conditions. Yet even with the geologic and climatic indicators, the events of April, May, and June caught the state by surprise.

Starting in January, the D&RGW watched the Thistle area as well as several other landslide-prone areas near Soldier Summit. Their geotechnical experts visited the area on April 12. Days later, when the Thistle landslide began to move visibly, no one recognized it as a major hazard. The railroad tracks went out of alignment on Wednesday, 13 April. The highway became bumpy, fractured, and became impassible on Friday, 15 April. The streambed and deposits on the canyon floor rose approximately one foot an hour as a huge tongue of earth piled up against the bedrock buttress of Billies Mountain, filled the canyon, and dammed the river. The waters of the Spanish Fork River rapidly created Thistle Lake upstream of the landslide dam.

The railroad company and the Utah Department of Transportation (UDOT) initially tried to keep the railroad tracks, highway, and river open. Sunday, 17 April the landslide defeated efforts to cut down through the rising toe of the landslide and allow passage of the river water. Efforts to siphon waters rising behind the landslide dam also failed. Rising lake waters drowned the community of Thistle. That very day, the president of the D&RGW announced at Thistle that the railroad would tunnel a new railroad course through Billies Mountain. To be successful, the tunnel had to be above Thistle Lake's eventual highest water line. Railroad experts in consultation with the state decided to form the landslide into a dam and to construct an overflow spillway tunnel to control the uppermost rise of the lake. Having calculated how fast an overflow tunnel could be constructed, and how fast the lake would rise, they began drilling. The state took charge of public safety priorities. Armies of workers and heavy equipment shaped the landslide dam while it moved by transferring 500,000 cubic yards of earth from

the middle area of the landslide onto its toe. This also provided a platform from which to construct the tunnels. The state constructed a third tunnel to drain the impounded water. UDOT decided to relocate the highway over Billies Mountain. The Army Corps of Engineers constructed a pumping system to keep Thistle Lake from rising to dangerously high levels.

The impounded water rose at approximately the rate predicted and the D&RGW contractors completed the overflow tunnel system with two days to spare. Trains passed through the new tunnel on 4 July, eighty-one days after the initiation of the project and eleven days before the contracted completion date. The new tunnel provided a permanent bypass for the Spanish Fork River around the landslide. The relocated highway encountered difficult geotechnical problems. The highway opened at the end of the year but was often closed due to major rockfalls and slope stability problems.

The town of Thistle was destroyed. The Marysvale branch line of the railroad was never reopened, leaving a large area of central Utah without rail service. Thistle resulted in Utah's first presidential disaster declaration and became the most costly landslide the United States had experienced. The Utah Business and Economic and Research Bureau reported the following dramatic impacts of the landslide. The D&RGW and Utah Railway embargoed all shipment that normally went through Thistle. The rerouting surcharge of $10 per ton virtually stopped coal shipments. Two trucking companies laid off workers, cancelled contracts, and even suspended operations. Most of the area's coal mines laid off miners, cancelled contracts, and experienced shut downs. Some miners' commutes suddenly exceeded 100 miles. Some coal haulage commutes trebled. Due to market conditions and the Thistle landslide, coal production dropped nearly 30 percent in 1983. Uranium producers paid substantially more for supplies in an already soft market. At least one oil company became non-competitive due to increased travel costs. Tourism in the area, particularly in-state tourism, sagged in response to negative publicity and difficult access. To the south, the blockage of route 89 and the Marysvale line hurt coal companies, turkey and feed operations, and gypsum, cement, and clay shipments.

The Thistle landslide caused total estimated capital losses of $48 million and revenue losses of $87 million, plus associated losses in tax revenues. Direct costs of Thistle tally over $200 million, including relocating the railroad at a cost of $45 million, relocating the highway at a cost of $75 million, and lost revenue to the railroad of $1 million per day (which totaled $80 million, including $19 million in charges that the D&RGW paid the Union Pacific to use their rail lines).

See: O.B. Sumsion, Thistle . . . Focus on Disaster (1983).

Buckley Draw- Springville Fire

The Springville fire started on June 30, 2002 at 7:19 p.m. The fire burned a total of 2,207 acres above dozens of homes. The immediate post fire impacts for Provo City were: loose surface rock, silty and sandy soils, and blackened steep (40% grade) hillsides. Steep terrain and impervious soils cause rapid run off with rocks. Post fire conditions increased sediment expectations to 13 tons per acre. Brian McInerney of the NWS stated our risk level was the highest in the state.

Recommendations for mitigation offered to Provo City included the Uinta National Forest rehabilitating the burn area with vegetation (seed and mulch) and installing wire fences in the upper channel. The Natural Resource Conservation Service (NRCS) and the Emergency Watershed Program (EWP) implemented temporary measures to reduce the transport of sediment. Additionally, a Rain Activated Weather Station (RAWS) unit was relocated to the Buckley Draw area (elevation of 9,143 feet) to monitor site conditions on Sunday, July 13, 2002.

Provo City held public meetings on Sunday, July 13, and Monday, July 14, 2002 to present information and resources for the residents. National Flood Insurance Program (NFIP) information distributed. Sandbags and sand drops were scheduled and delivered.

On July 15, 2002, information was distributed to the Neighborhood regarding the increase in risk of post fire debris flow, with information about the NFIP program. Communication links to relay current hazard information to the residents were established. The evacuation plan was updated.

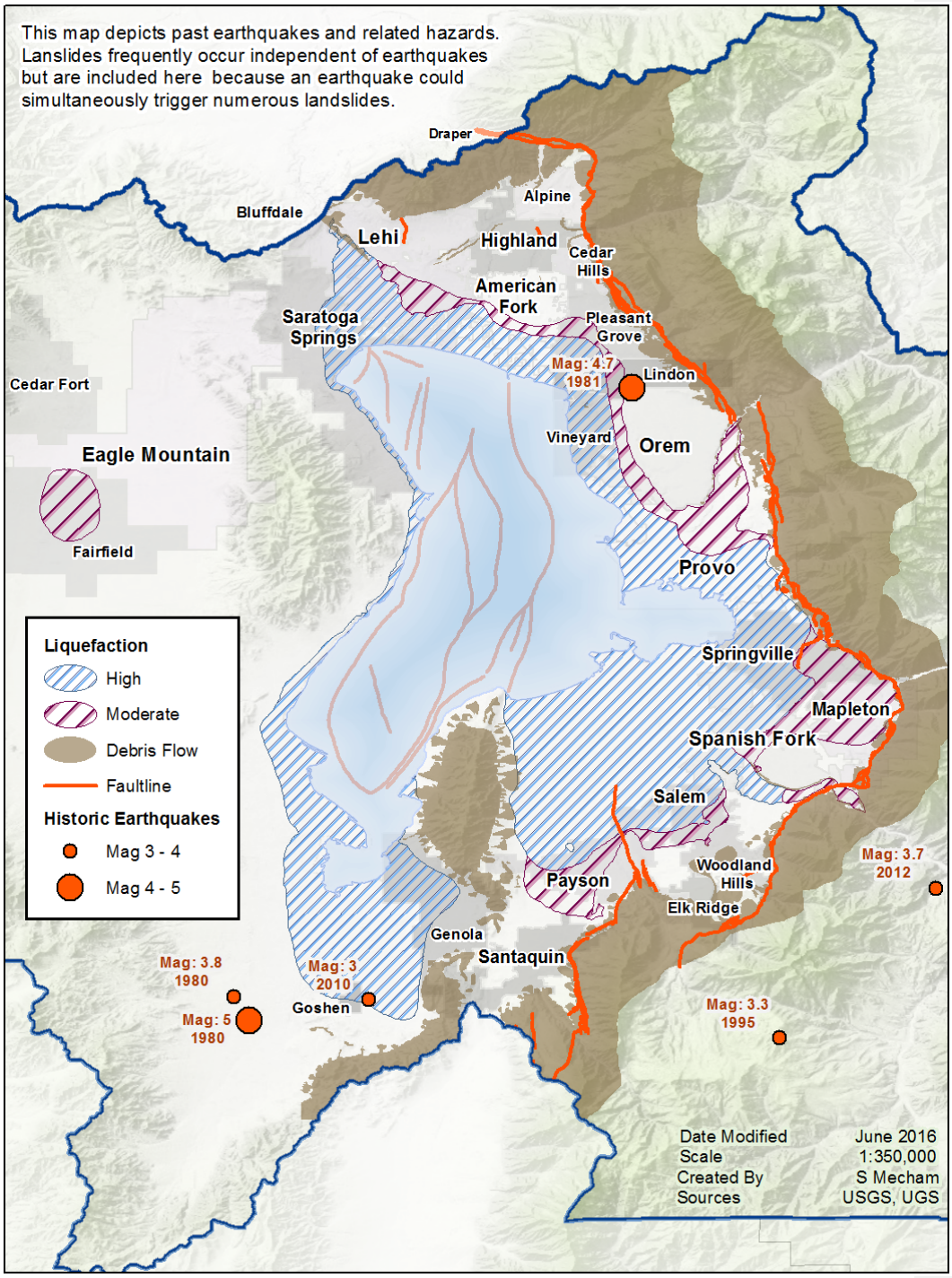
On July 16, 2002 a helicopter overview of the burn area was taken. Provo Public Safety responders had a Post Fire Debris Flow Risks in Utah class on July 31, 2002. NRCS and the EWP engineered of a trench to redirect potential debris flow. Provo City obtained the necessary property agreements. Two debris flow events just to the north and just to the south of Provo in September, 2002 provided motivation to secure agreements and build the trench.

A SNOTEL was installed above the Little Rock Canyon drainage to monitor soil moisture and snow pack conditions on 22 October, 2002.

At the April 29, 2003 neighborhood meeting, the debris flow in Santaquin was contrasted with the conditions at the Buckley Draw. Plans for trench construction were discussed. A flag notification system and evacuation plan for the residents for the risk level was proposed and accepted. A web link with updated hazard information, a phone 'hot line' with an updated message, and a notification procedure alerting the Neighborhood Chair of any changes in the hazard level were implemented. A practice evacuation drill was held on Saturday, May 10, 2003.

The 1500 feet long trench was essentially complete on July 28, 2003. Weather conditions continued to be monitored on a daily basis.

At approximately 3:00 a.m. on September 10, 2003, four separate debris flows were triggered. The second largest flow came down the newly finished trench. There was little or no warning. This flow would have been life threatening and would have caused significant property damage without the debris trench in place. The spreader fences in the debris field distributed the runoff materials and completely contained this debris flow.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Pleasant Grove
Mag: 4.7 1981
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Cedar Fort
Vineyard
Orem
Eagle Mountain
Fairfield
Provo
Springville
Mapleton
Spanish Fork
Salem
Mag: 3.7 2012
Woodland Hills
Payson
Elk Ridge
Genola
Santaquin
Mag: 3.8 1980
Mag: 3 2010
Goshen
Mag: 5 1980
Mag: 3.3 1995
Liquefaction
High
Moderate
Debris Flow
Faultline
Historic Earthquakes
Mag 3 - 4
Mag 4 - 5
Date Modified June 2016
Scale 1:350,000
Created By S Mecham
Sources USGS, UGS

Severe Weather

Overview

Utah County's mountainous terrain makes it particularly susceptible to Severe Weather, especially Winter Weather. Add to the topography those who seek snowy slopes for recreation and disaster can ensue, as seen in the table below. Avalanches, typically a voluntary risk, have caused the most deaths in Utah County. Winter weather has caused the most injuries. Wind is responsible for the most monetary damages of any type of severe weather. These numbers will only increase as the population grows, though crop damages should decrease as agricultural land is developed.

Profile

Frequency	Frequent Multiple events happen each year.
Severity	Moderate
Location	Region wide with some locations more frequent due to geography.
Seasonal Pattern	All year depending upon the type of event.
Duration	Seconds to Days
Speed of Onset	Immediate
Probability of Future Occurrences	Highly probable. Winter Weather and Hail have the highest probability of occurrence of all weather hazards facing Utah County.

History

NOAA Extreme Weather Events Summary

Countywide	Deaths			Injuries			Property Damage			Crop Damage		
	1950-1999	2000-2009	2010-2015	1950-1999	2000-2009	2010-2015	1950-1999	2000-2009	2010-2015	1950-1999	2000-2009	2010-2015
Avalanche	4	16	6	6	7	0	$50,000	$20,000	0	0	0	0

Winter Weather	10	4	0	39	20	0	$622,500	$918,000	$90,000	$400	$10,000	0
Dense Fog	-	4	-	-	5	-	-	$520,000	-	-	0	-
Hail	0	0	0	8	0	0	$327,000	$2,000	0	$101,200	0	0
Heavy Rain	0	-	-	0	-	-	$308,000	-	-	$17,000	0	0
Wind	1	3	1	22	2	26	$50,913,700	$7,744,500	$792,000	$16,800	$113,000	0
Lightning	0	0	-	1	2	-	$160,000	$6,500	-	0	0	-

*Numbers from the National Oceanic and Atmospheric Administration. See http://www.ncdc.noaa.gov/stormevents for more information

**Winter Weather includes Winter Weather, Blizzard, and Snow Storm, Cold/Wind Chill/Extreme Cold. Wind includes High Wind, Thunderstorm Wind, Strong Wind

Damage Assessment and Mitigation

Overview

Each jurisdiction represented by this plan has participated in the creation of its contents and given local input into their individual mitigation goals and priorities. Listed below are the damage assessments for each of the participating jurisdiction followed by an update of the community's mitigation strategies from the 2010 plan, after which are the strategies the community wishes to pursue in the course of this plan.

Damage assessments were calculated using the methodologies mentioned in the Methods section. Strategies were developed by each community with assistance from MAG as requested. The subsequent county and city strategies reflect the advancement of local and regional goals and continue the community's vision for the security and prosperity of the region. These goals include:

- Reducing the impact of natural hazards on life, property, and preserving the environment
- Minimizing damage to infrastructure and services and protecting their ability to respond
- Preventing potential hazards from affecting area or mitigating its effects
- Increasing public awareness, capabilities and experience
- Ensuring the safety of citizens and visitors
- Enabling cooperation between citizens and emergency and public services
- Maintaining cooperation with, and adherence to, FEMA guidelines
- Developing zoning and other plans that decrease development in hazardous areas

Utah County/Unincorporated	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	403	$59,305,624	
500 Year Flood	444	$65,463,124	5711.4
Dam Failure (Deer Creek)	135	$25,050,624	732.1
Dam Failure (Local Dams)	149	$22,221,560	1320.0
Fire (High and Moderate Risk)	1028	$246,108,258	20451.8
Landslide	96	$15,042,200	2475.8
Debris Flow	179	$35,505,109	3689.4
Liquefaction	1629	$259,915,180	15916.0

Statement of Vulnerabilities: One of Utah County's biggest priorities is terrorism, as it relates to our infrastructure. We have key components in Utah County that we need to protect, such as waterways (Provo Canyon), airports, and such. We will be placing emphasis on our natural resource protection from terrorism. Another priority is emergency notification. We are in the process of implementing our Emergency Notification system throughout Utah County. This will be used to notify citizens of evacuations in the event of a natural disaster, such as a wildfire or flood. The system will also be used to notify first responders in the event of a natural disaster. Lots of our resources will be directed at our Emergency Notification system.

Addressing the Floodplain: Land Use Ordinances Chap 3 part 2 "FLOOD PROTECTION" states "In all zones other than the Flood Plain Overlay Zone, the following regulations shall apply: A. No dwelling or other building used for human habitation shall be constructed within one hundred (100) feet from the banks of a stream, gully, or other flood channel. Exception: A permit may be issued by the Zoning Administrator within the 100-foot limit, upon a favorable review of the County Engineer based on existing engineering reports or his own on-site investigations, when it is determined: 1. That the structure will be above water during normal spring runoff and the water levels of a base flood; and 2. The design of the building and any appurtenant residential accessory structures, grading work, driveways, and landscaping features will be sufficient to protect both the building and other property from damage due to flooding. However, if the Zoning Administrator, with the assistance of the County Engineer, cannot determine that the above criteria are met based on the available information, an engineering study and report by a Professional Engineer licensed to practice in the State of Utah may be obtained by the applicant and submitted for approval by the Zoning Administrator, after favorable review of the County Engineer. B. No use or structure (except flood control works or irrigation diversion dams) shall be permitted in any flood channel if such use or structure will adversely affect normal flow, will increase flooding of land above or below the property, will increase erosion within or adjoining the flood channel, will cause diversion of flood waters in a manner more likely to create damage than does flow in a normal course, will increase peak flows or velocities in a manner likely to add to property damage or hazards to life, or will increase amounts of damaging materials (including those likely to be injurious to health) which might be carried downstream in floods."

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Canyon Debris Basins	High	Ongoing	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	In Progress	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	Yes	

Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Yes, same principles not FIREWISE	
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS	No	

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	In Progress	
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Ongoing	
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	Ongoing	
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Coordination efforts fell through

Protecting Current Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Wildfire	Fuel Mitigation plan with AF canyon	High	1 year	Minimal	Local Cash	Local Government

Flooding/ Drought	Highline Canal Retrofit	High	3 years	TBD	Local Cash, Water Conservancy District	Local Government, Water Conservancy District
Flooding	Canal assessment with Provo City	High	2 years	TBD	Local Cash	Local government, Provo City
Terrorism	Natural Resource Protection	High	Ongoing	TBD	Local Cash, grants	Local government
All Hazards	Implement Early Notification System	High	1 year	TBD	Local Cash	Local Government
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Earthquake	Promote earthquake awareness and preparation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, UGS, USGS
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	Ongoing	Minimal	Local Cash, Grants	Local Government
All Hazards	Implement Early Notification System	High	1 year	TBD	Local Cash	Local Government

Alpine	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	98	$31,986,500	86.6
500 Year Flood	109	$35,614,400	106.1
Dam Failure (Deer Creek)	0	$0	0.0
Dam Failure (Local Dams)	0	$0	0.0
Fire (High and Moderate Risk)	971	$367,019,400	1079.5
Landslide	89	$33,932,000	308.2
Debris Flow	183	$84,921,500	400.6
Liquefaction	0	0	0.0

Statement of Vulnerabilities: Alpine has two water tanks that are located near a fault line. Alpine City is located at the base of the mountains. Because of this, we have areas that are prone to debris flows, potential landslides, rockfall hazards and alluvial fan flooding. Due to our proximity to the mountains, we have areas that are prone to wildfires. There are some homes that currently have only one wildfire evacuation route.

Addressing the Floodplain: Development Code 3.4.1 “Environmentally Sensitive Areas” and 3.12.8 “Flood Damage Prevention Overlay” address floodplains. See Section X Policy and Program Capability of this document for an example of the comprehensive “Flood Damage Prevention Overlay” code.

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Ongoing	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No	Staffing not identified
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Ongoing	
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Med	1 year	TBD	Local Cash, Grants	Local Government, UGS	Yes	

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	Ongoing	
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes	

Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	Ongoing	
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Coordination fell through

Protecting Current Residents and Structures (Alpine)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	Ongoing	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS

Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	Ongoing	1 year	Minimal	Local Cash, Grants	Local Government
Drought	Identify drought assessment criteria. Notify residents of drought conditions.	Medium	2 years	TBD	Local Cash	Local Government

American Fork	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	71	$11,861,800	44.9
500 Year Flood	259	$38,444,100	112.7
Dam Failure (Deer Creek)	0	$0	0.0
Dam Failure (Local Dams)	5107	$1,064,310,300	2135.5
Fire (High and Moderate Risk)	786	$311,950,500	584.6
Landslide	5	$1,357,300	2.4
Debris Flow	5	$1,357,300	2.4
Liquefaction (Moderate to High)	2385	$571,855,800	1244.7

Statement of Vulnerabilities: The main vulnerability identified by American Fork is the cross section of the American Fork River. Through the core of American Fork, the river goes through a series of culverts, many of which may be sized too small. This poses a flooding risk to many surrounding homes and businesses. This is something that we as a city would like to study and analyze more in depth.

Addressing the Floodplain: City Code Chapter 15.16 comprehensively addresses floodplain management. See Section X Policy and Program Capabilities of this document for an example.

Protecting Current Residents and Structures: Analysis of 2010 Goals

Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	
Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No	Lack of funding
Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS	Yes	

Protecting Future Residents and Structures: Analysis of 2010 Goals

Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party		
Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	
Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Lack of funding
Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Efforts fell through

Protecting Current Residents and Structures

Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS
Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government

Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS

Protecting Future Residents and Structures

Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS
Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS
Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS

Cedar Fort	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	0	$0	0.0
500 Year Flood	0	$0	0.0
Dam Failure (Deer Creek)	0	$0	0.0
Dam Failure (Local Dams)	0	$0	0.0
Fire (High and Moderate Risk)	54	$9,011,300	312.0
Landslide	0	$0	0.0
Debris Flow	0	$0	0.0

Liquefaction	0	0	0.0

Statement of Vulnerabilities: Past fires near Cedar Fort have presented a significant risk and future fire could reach the town itself, affecting community assets like the fire station and school building. Increased efforts to clear brush on the hillsides have proven difficult.

Addressing the Floodplain: There is no floodplain in Cedar Fort boundaries.

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	Minimal	Local Cash, Grants	Local Government	All of the critical structures are seismically sound except the Town Hall which is a 100 year old converted school house	Town Hall has only 2 meetings per month – no employees
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	We distribute information and brochures. Properties on the wildland interface are encouraged to eliminate fire fuel.	
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Med	1 year	Minimal	Local Cash, Grants	Local Government , UGS	This is a minimal situation with no current structures affected. Most steep terrain is heavily vegetated and unimproved.	

Protecting Future Residents and structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government , UGS, USGS	CERT and other awareness classes have been presented and future ones are planned	
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	DNR and BLM have done fuel thinning projects to reduce fuel in interface areas.	At risk areas are not developed
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government , UGS, USGS	Updated UGS maps showing landslide potential have been produced. No building is allowed in steep areas	

Protecting Current Residents and Structures (Cedar Fort)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Earthquake	Provide CERT classes	High	1 year	Minimal	Local Cash	Fire Department, Local Government
Wildfire	Fuel Thinning	High	2 years	Minimal	BLM, DNR, SITLA	BLM, DNR, SITLA
Wildfire	Education (Pamphlets at 24 July Celebration, notices in Water Bill)	High	Yearly	Minimal	Local Cash, Forest Service	Local Government, Forest Service

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Earthquake	Provide CERT classes	High	1 year	Minimal	Local Cash	Fire Department, Local Government
Wildfire	Fuel Thinning	High	2 years	Minimal	BLM, DNR, SITLA	BLM, DNR, SITLA
Wildfire	Education (Pamphlets at 24 July Celebration, notices in Water Bill)	High	Yearly	Minimal	Local Cash, Forest Service	Local Government, Forest Service

Cedar Hills	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	0	$0	0.0
500 Year Flood	0	$0	0.0
Dam Failure (Deer Creek)	0	$0	0.0
Dam Failure (Local Dams)	0	$0	0.0
Fire (High and Moderate Risk)	1303	$322,886,318	416.4
Landslide	316	$69,918,500	88.2
Debris Flow	472	$97,371,300	104.8
Liquefaction	0	0	0.0

Statement of Vulnerabilities: Cedar Hills City lies on the Wasatch Front and within close proximity to the Wasatch fault line. The fault line runs north-south along the foothill interface. While no homes or development are immediately on the fault line, major culinary and irrigation water transmission lines do cross a known fault zone. Due to the potential hazard, the city has installed earthquake valving at the upper supply tanks. Also, the piping through the fault zone has been modified to include an upgraded supply line with locked joint pipe. The eastern city limit line of Cedar Hills includes an open space interface. Much of the area is contiguous to Forest Service land and is primarily inaccessible. Cedar Hills maintains an access road which also includes a pressurized irrigation transmission line.

Addressing the Floodplain: Codes and Ordinances 11-7-10 "Improvement Requirements-Environmental Hazards" states:
"Environmental hazards must be eliminated as required by the planning commission as follows:
A. No cut or fill slopes shall be constructed in a location or in such a manner that produces a slope face exceeding the critical angle of repose unless, in the opinion of the planning commission, adequate measures will be taken to prevent the soil from moving under force of gravity until such slope is stabilized. All cut and fill slopes shall be covered with topsoil and reseeded to the same extent as the prior existing natural conditions unless, in the opinion of the planning commission, alternative or additional treatment of the slope is necessary to avoid the creation of a significant soil erosion, flood or other environmental hazard.
B. Location of streets and buildings on unstable soil shall be avoided.
C. Surface water produced from the subdivision development shall be properly disposed within the subdivision or shall be drained into natural channels in a manner that will reduce the exposure to flood hazard and will prevent the soil within and outside of the subdivision from eroding, and will not produce an undue flood hazard to adjacent properties.
D. The subdivision layout shall make adequate provision for natural drainage channels and floodways.
E. All water, sewer and other utility systems and facilities located in flood hazard areas shall be designed to minimize infiltration of floodwater into the system, or discharge of the system into the floodwaters.
F. Other environmental hazards must also be eliminated or adequately handled as directed by the planning commission. (Ord. 4-11-79A, 4-24-1979)"

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed ?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Ongoing	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No	Staffing not identified

Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Ongoing	
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Med	1 year	TBD	Local Cash, Grants	Local Government, UGS	Yes	

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed ?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	Ongoing	
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes	
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	Ongoing	
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Unable to coordinate

Protecting Current Residents and Structures (Cedar Hills)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding	Storm Water/ Ditch System Cleaning	Medium	2 years	TBD	Local Cash	Local Government
Earthquake	Participate in Great Shakeout	High	1 Year	N/A	Local Cash	Local Government

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk	Medium	1 year	Minimal	Local Cash, Grants	Local Government
Landslide	Update landslide mapping with UGS and USGS.	Medium	2 years	TBD	Local Cash, Grant	Local Government, USGS, UGS
Drought	Identify drought assessment criteria. Notify residents of drought conditions.	Medium	2 years	TBD	Local Cash	Local Government

Eagle Mountain	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	43	$7,919,500	59.6
500 Year Flood	57	$9,855,600	70.2
Dam Failure (Deer Creek)	0	$0	0.0
Dam Failure (Local Dams)	0	$0	0.0
Fire (High and Moderate Risk)	3972	$630,849,566	2770.6
Landslide	0	$0	0.0
Debris Flow	0	$0	0.0
Liquefaction (Low to Moderate)	42	$6,399,600	6.2

Statement of Vulnerabilities: It would be difficult to evacuate the subdivision (Kiowa Valley) due to single lane roads leaving the subdivisions and in the near future city evacuation. Thoroughfares (SR 73, SR 68 and Porter's Crossing) going out of the city will not be feasible to handle a mass evacuation of the city.

Addressing the Floodplain: Title 15 Chap 15.105 Flood Damage Prevention, has comprehensive floodplain management objectives and building requirements within 100 yr floodplain, also designates the Floodplain Administrator. See Section X Policy and Program Capabilities of this document for an example.

Protecting Current Residents and Structures: 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding	Join NFIP community/participation.	Med	1 year	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No	Most facilities are newer
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Yes, but not FIREWISE specific	
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Med	1 year	TBD	Local Cash, Grants	Local Government, UGS	No	Not a priority

Protecting Future Residents and Structures: 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party		
Flooding	Join NFIP community/participation.	Med	1 year	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	No staff assigned

Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	Yes, but not FIREWISE specific	
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Efforts fell through

Protecting Current Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding	Join NFIP community/participation.	Medium	1 year	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding	Join NFIP community/participation.	Medium	1 year	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas	High	1 year	Minimal	Local Cash, Grants	Local Government

	at risk.					
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS

Elk Ridge	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	0	$0	0.0
500 Year Flood	0	$0	0.0
Dam Failure (Deer Creek)	0	$0	0.0
Dam Failure (Local Dams)	0	$0	0.0
Fire (High and Moderate Risk)	675	$138,558,700	354.9
Landslide	99	$27,625,000	61.2
Debris Flow	123	$32,441,300	81.8
Liquefaction	0	0	0.0

Statement of Vulnerabilities: Because of location and growth in Elk Ridge the current infrastructure is inadequate to handle a natural disaster, which Elk Ridge considers to be its greatest vulnerability. The current goals will be to educate the community and to develop proper infrastructure that will provide safety to Elk ridge.

Addressing the Floodplain: Though there is no FEMA floodplain within city boundaries, there is some mention in Article B "Critical Environmental Zones" that "Development setbacks from sensitive areas shall be delineated when required detailed work is done at the development stage."

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes/Ongoing	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	Yes, rebuilt public works building.	
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	No	No resources allocated
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Med	1 year	TBD	Local Cash, Grants	Local Government, UGS	No	No resources allocated

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	Yes/Ongoing	
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	No resources allocated
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	Yes/Partial	Local ordinances not FIREWISE

								specific
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Too difficult to coordinate.

Protecting Current Residents and Structures: 2017 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Promote NFIP participation. Promote educating our current residents on flooding risks. upgrade infrastructure	High	Ongoing	TBD	Local Cash, Grants	Local Government, FEMA, UDHS
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government
Wildfire	Educate homeowners on FIREWISE practices. seek assistance for upgraded fire suppressing equipment	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA
Landslide	Create infrastructure that will eliminate/prevent future erosion of the dugway.	Extremely high	1 year	TBD	Local Cash, Grants	Local Government, UGS, FEMA

Protecting Future Residents and Structures: 2017 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Update Flood mapping and provide to future residents and promote NFIP participation. Promote educating our current residents on flooding risks. upgrade infrastructure	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS

Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government

Fairfield	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	0	$0	0.0
500 Year Flood	0	$0	0.0
Dam Failure (Deer Creek)	0	$0	0.0
Dam Failure (Local Dams)	0	$0	0.0
Fire (High and Moderate Risk)	8	$1,009,400	830.0
Landslide	0	$0	0.0
Debris Flow	0	$0	0.0
Liquefaction (Moderate Risk)	39	$7,943,400	1845.0

Statement of Vulnerabilities: Earthquake and hazmat incidents on SR-73 would be biggest problems for Fairfield, but its situation is relatively safe from fire and flood, liquefaction potential is only moderate, there are 4 possible evacuation routes and few residents to worry about. There is an emergency notification through email and Fairfield is working on implementing emergency text notification as well.

Addressing the Floodplain: There is no floodplain within Fairfield's boundaries.

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	No	Does not apply
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No	In process, should be done by the end of 2016
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Yes	

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party		
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	No	Does not apply
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	In process, should be done by the end of this year
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	Yes	

Protecting Current Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government
All Hazards	Add texting to Emergency Notification System	Med	1 year	Minimal	Local Cash	Local Government

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS
All Hazards	Add texting to Emergency Notification System	Med	1 year	Minimal	Local Cash	Local Government

Genola	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	1	$100,300	6.4
500 Year Flood	16	$1,875,500	187.7
Dam Failure (Deer Creek)	0	$0	0.0
Dam Failure (Local Dams)	1	$115,200	0.3
Fire (High and Moderate Risk)	37	$4,876,633	300.0

Landslide	2	$151,100	10.5
Debris Flow	28	$4,253,500	106.0
Liquefaction (Moderate to High)	82	$13,548,318	467.9

Statement of Vulnerabilities: Strawberry Highline Canal could cause flooding, though it has been altered recently to lessen that likelihood. Santaquin sometimes sends extra floodwater downstream, to Genola. Genola has added pipes to redirect water should this occur, but there would be problems if the pipes broke. A mountain on the Northeast side of town often washed debris onto the road during high rainfall events.

Addressing the Floodplain: The only floodplain is the lake bed, and no structures are in the floodplain, or potential to build in the lake.

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Partly-	Santaquin Irrigation dam rebuilt, established storm drain for flood water for $5,000.
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No	Fire Dept. recently built, other critical facilities being remodeled.

Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	No	Fire Dept. recently built
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS	No	Not applicable to Genola's topography

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	Partly. New General Plan made	
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes, through CERT	
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	No	Fire Dept. recently built
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Coordination efforts fell through

Protecting Current Residents and Structures (Genola)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Earthquake	Upgrade City Office Building	High	4 years	TBD	Local Cash, Grants	Local Government
Landslide	Educate homes in Landslide/ Debris Flow areas on risk	Med	Ongoing	Minimal	Local Cash	Local Government
Flood	Adopt new FEMA flood plains, participate in NFIP	Med	3 years	Minimal	Local Cash, FEMA	Local Government, FEMA

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk	Medium	3 years	Minimal	Local Cash, Grants	Local Government
Flood	Adopt new FEMA flood plains, participate in NFIP	Med	3 years	Minimal	Local Cash, FEMA	Local Government, FEMA

Goshen	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	0	$0	0.0
500 Year Flood	0	$0	0.0
Dam Failure (Deer Creek)	0	$0	0.0
Dam Failure (Mona Dam)	67	$6,493,095	69.2

Fire (High and Moderate Risk)	66	$7,333,352	37.4
Landslide	0	$0	0.0
Debris Flow	0	$0	0.0
Liquefaction	162	$13,326,984	121.5

Statement of Vulnerabilities: Our large elderly demographic would be difficult to contact and relocate in the event of an emergency.

Addressing the Floodplain: No 100/500 year floodplain within town boundaries.

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	No	No SFHA
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No	No resources allocated
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	No	No resources allocated

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	No	No SFHA

Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	No resources allocated
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	No	No resources allocated

Protecting Current Residents and Structures (Goshen)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Promote NFIP participation.	High	3 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	Minimal	Local Cash, Grants	Local Government
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	2 years	Minimal	Local Cash, Grants	Local Government

Highland	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	29	$11,288,800	32.8
500 Year Flood	57	$20,573,700	45.7
Dam Failure (Deer Creek)	0	$0	0.0
Dam Failure (Silver Lake, Tibble Fork, American Fork Debris)	185	$72,594,500	124.8
Fire (High and Moderate Risk)	2894	$875,492,900	1927.7
Landslide	25	$10,021,600	30.5
Debris Flow	25	$10,021,600	30.5
Liquefaction	0	0	0.0

Statement of Vulnerabilities: Highland City is located against the Wasatch Mountains on both the north and east border. This geography, while beautiful leads to potential vulnerabilities. Two floodplains exist throughout the city, one stemming from Dry Creek and the other from the American Fork River. In addition, there are a few small areas that have the potential for debris flow or landslide due to their high slopes. Further, a fault line has been identified on the east border of the community along the American Fork Canyon. The potential hazard that impacts the largest area from a geographic perspective is in the area north of Dry Creek. That area is comprised of steep slopes and clay-like soils which has the potential to lead to critical runoff and erosion.

Addressing the Floodplain: Code of Ordinances Chapter 13.52 comprehensively addresses floodplain issues. See Section X Policy and Program Capability of this document for an example.

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Highland Glen Park Bridge Replacement (Culvert Expansion)	High	1 year	$370,000	Local Cash, HMGP and FMA Grants	Local Government	No	Lack of funds.
Flooding/ Dam Failure	Pheasant Hollow Bridge Replacement (Culvert Expansion)	High	1 year	$360,000	Local Cash, HMGP and FMA Grants	Local Government	No	Bridge is still in good shape.
Flooding/ Dam Failure	Hidden Oaks Bridge Replacement (Culvert Expansion)	High	1 year	$525,000	Local Cash, HMGP and FMA Grants	Local Government	Yes	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No	All but one City structure has been built recently and as such is up to current seismic standards
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Yes	
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS	No	Small number of residents in susceptible area.

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	No	Lack of funding and staffing
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes	
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	No	City employees take precautions in susceptible areas, but nothing has been codified.
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Lack of funding and staffing

Protecting Current Residents and Structures (Highland)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government
Wildfire	Create maintenance plan to cut native grasses in fire hazard areas of City owned property by July of each year.	High	1 year	Minimal	Local Cash	Local Government

Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Med	Ongoing	Minimal	Local Cash, Grants	Local Government, UGS
Earthquake	Promote earthquake awareness and preparation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, UGS, USGS
Drought	Educate Residents on water conservation practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government
Extreme Temperatures	Educate property owners about freezing pipes.	Med	Ongoing	Minimal	Local Cash	Local Government
Severe Winter Weather	Educate residents on winter weather preparedness.	Med	Ongoing	Minimal	Local Cash, Grants	Local Government
Multiple Hazards	Update Emergency Operations Plan	High	2 years	Minimal	Local Cash, Grants	Local Government, Public Safety District

Protecting Future Residents and Structures (Highland)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	3 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS
Flooding/ Dam Failure	Maintain drainage ways.	Med	Ongoing	TBD	Local Cash	Local Government
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	TBD	Local Cash, Grants	Local Government, UGS, USGS
Landslide	Review Development standards for issues with hillside development.	Med	2 years	Minimal	Local Cash	Local Government

Lehi	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	1199	$205,498,110	448.4
500 Year Flood	1802	$303,171,455	757.5
Dam Failure (Deer Creek)	0	$0	0.0
Dam Failure (Dry Creek and Silver Lake)	3443	$599,089,314	1352.6
Fire (High and Moderate Risk)			
Landslide	254	$64,870,900	441.8
Debris Flow	382	$92,897,100	464.4
Liquefaction	6832	$1,246,309,425	3539.6

Statement of Vulnerabilities: Continued growth of high intensity uses in the area, and population growth including increases in special populations (elderly, handicapped, etc.) increase potential impacts from natural and man-caused disasters to both people and property.

Addressing the Floodplain: Policies set forth in the Lehi City Development Code 12.060 "Infrastructure Provision and Environmental Criteria":

- Supporting comprehensive management of activities in sensitive and hazard areas to avoid risks or actual damage to life and property.
- Using a variety of techniques to manage activities affecting water and the land to prevent degradation and minimize risks to life and property.
- Requiring developers to provide site-specific environmental information to identify possible on and off site methods for mitigating impacts.
- Working with city residents, businesses, builders, and the development community to promote low impact development to minimize surface water runoff.
- Minimize the construction of impervious surfaces.
- Specific tools to implement strategies for flood mitigation include those outlined in the City's Critical Areas Regulations.

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?

Flooding/ Dam Failure	Promote NFIP participation/Clean dam drainage and remove debris from water ways	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	
Earthquake	Promote earthquake awareness and preparation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Yes	
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Yes	
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS	Yes	

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes	
Wildfire	Implement a power line inspection and maintenance program in the wild land areas.	High	1 year	Minimal	Local Cash, Grants	Local Government	Yes	
Landslide	Create a vegetation placement and management plan	High	1 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes	

Protecting Current Residents and Structures (Lehi)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Winter Weather	Winter preparedness bulletins	Med	Ongoing	Minimal	Local Government	Fire Department, Local Government
Drought	Repair water distribution systems to control leakage and pressure problems	High	Ongoing	Moderate	Local Government	Local Government
Drought	Reduce water consumption, offer rebate programs for fixtures and equipment	Med	Ongoing	Minimal	Local Government, Water Conservation Program	Water Conservation Program
Drought	Retrofit showers and toilets, increase mete efficiency and maintenance, promote leak detection and repair programs	Med	4 years	Moderate	Local Government	Local Government
Earthquake	Seismic Building Retrofitting Program	High	4 years	TBD	FEMA's Project Impact	FEMA, Local Government
Flood	Manage activities affecting water and the land to prevent degradation and minimize risks to life and property	Med	Ongoing	Minimal	Local Government	Local Government

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flood	Requiring developers to provide site-specific environmental information to identify possible on and off site methods for mitigating impacts	High	Ongoing	Minimal	Developers	Developers
Flood	Implement strategies for flood mitigation outlined in the City's Critical Areas Regulations	Med	Ongoing	TBD	Local Government	Local Government
Landslide	Control development in sensitive areas through Hillside and Grading ordinance	High	Ongoing	Minimal	Local Government	Local Government
Landslide	Encourage maintenance of existing vegetation and retain natural drainage	Med	Ongoing	Minimal	Local Government	Local Government

Snow Storms	Bury power lines to prevent damage	High	4 years	Moderate	Local Government	Local Government
Winter Weather & Fire	Provide inspections and maintenance operations to prune trees throughout the city to prevent damage to homes, power, TV and telephone lines	Med	Ongoing	TBD	Local Government	Local Government

Lindon	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	161	$41,124,700	98.1
500 Year Flood	176	$44,723,600	102.2
Dam Failure (Deer Creek)	0	$0	0.0
Dam Failure (Lindon Irrigation, Lindon Squaw Hollow, Battle Creek, Grove Creek, and Silver Lake Flat)	1382	$417,301,134	1162.7
Fire (High and Moderate Risk)	494	$191,230,082	468.3
Landslide	371	$101,494,400	160.9
Debris Flow	485	$133,556,500	201.0
Liquefaction	725	$298,554,682	820.9

Statement of Vulnerabilities: Many of Lindon's residents, structures, utilities, roads and other improvements are vulnerable to the identified hazards due to our location along the Wasatch Mountains. In a hazard event, the city recognizes that the city's eastern portion may be greatly impacted. The city will continue to look for and identify hazards to present and future residents and structures.

Addressing the Floodplain: City Code chapter 17.62 "Flood Damage Prevention" comprehensively addresses floodplain issues. See Section X Policy and Program Capability of this document for an example.

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why?
Flooding/ Dam Failure	Promote NFIP participation. Ditch improvements. Annual dam inspections (Dry Canyon, Squaw Hollow)	High	Ongoing	Moderate	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	
Earthquake	Follow and apply current building codes adopted by City.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Ongoing	
Wildfire	Educate homeowners on FIREWISE practices. Fire suppression required in homes on steep slopes.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Yes	
Debris Flow	Construct / Install debris flow basins in inventoried hazard areas.	Medium	5 years	High	Local Cash, Grants	Local Government, UGS	Yes, at Bald Mtn Subdivision	

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why?

Flooding/ Dam Failure	Restrict development in hazard areas, maintain storm drainage facilities, update ordinances.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	
Earthquake	Promote earthquake awareness and preparation. Avoid hazard areas (faults), Canberra tank fault study.	High	3 years	Moderate	Local Cash, Grants	Local Government, UGS, USGS	Yes, Hillside Protection District	
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	2 years	Minimal	Local Cash, Grants	Local Government	Pending	Lack of funding
Debris Flow	Maintain debris flow basins. Monitor wildfire and landslide areas.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes, limited development	

Protecting Current Residents and Structures (Lindon)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Promote NFIP participation. Ditch improvements. Annual dam inspections (Dry Canyon, Squaw Hollow)	High	Ongoing	Moderate	Local Cash, Grants	Local Government, FEMA, UDHS
Earthquake	Follow and apply current building codes adopted by City.	High	Ongoing	Minimal	Local Cash, Grants	Local Government
Wildfire	Educate homeowners on FIREWISE practices. Fire suppression required in homes on steep slopes.	High	Ongoing	Minimal	Local Cash, Grants	Local Government
Debris Flow	Construct / Install debris flow basins in inventoried hazard areas.	Medium	5 years	High	Local Cash, Grants	Local Government, UGS

Protecting Future Residents and Structures (Lindon)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party

Flooding/ Dam Failure	Restrict development in hazard areas, maintain storm drainage facilities, update ordinances.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS
Earthquake	Promote earthquake awareness and preparation. Avoid hazard areas (faults), Canberra tank fault study.	High	3 years	Moderate	Local Cash, Grants	Local Government, UGS, USGS
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	2 years	Minimal	Local Cash, Grants	Local Government
Debris Flow	Maintain debris flow basins. Monitor wildfire and landslide areas.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, UGS, USGS

Mapleton	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	122	$32,326,700	192.2
500 Year Flood	149	$39,029,700	246.1
Dam Failure (Deer Creek)	0	$0	0.0
Dam Failure (Hobble Creek)	3	$727,200	18.5
Fire (High and Moderate Risk)	38	$10,367,500	193.0
Landslide	11	$2,765,200	70.0
Debris Flow	37	$16,775,500	160.2
Liquefaction (Moderate)	2492	$543,732,235	2636.2

Statement of Vulnerabilities: Lack of a city-wide storm water system and reliance on detention ponds and storm water storage vaults beneath streets mean areas of city are prone to flooding during high water accumulation events.

Addressing the Floodplain: City Code 15.44 comprehensively addresses floodplain issues. See Section X Policy and Program Capability of this document for an example.

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Ongoing	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No	Funding shortfalls
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Ongoing	
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS	Ongoing. City has implemented a tiered water rate structure for Pressurized Irrigation	City is growing and new residents move in all the time

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?

Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	Mapping is consistent withfema.govmapping. Ordinances and General Plan are ongoing.	
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Ongoing	
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	Ongoing	Other ordinance priorities superseded this priority
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Ongoing	

Protecting Current Residents and Structures (Mapleton)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS

Protecting Future Residents and Structures (Mapleton)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS

Orem	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	26	$17,864,000	132.4
500 Year Flood	191	$48,439,200	172.0
Dam Failure (Deer Creek)	257	$108,893,500	282.4
Dam Failure (Lindon City Dry Canyon Debris Basin, and Rock Canyon)	1226	$209,895,600	323.3
Fire (High and Moderate Risk)	726	$224,204,700	700.5

Landslide	284	$86,763,900	254.0
Debris Flow	321	$94,823,800	266.0
Liquefaction (Moderate and High)	2646	$696,327,300	1404.3

Statement of Vulnerabilities: Orem's highest priority natural disaster is severe winter weather storm (freezing conditions : snow, blizzard, ice, etc.) because it affects the largest area most frequently. Earthquake is also high priority because activity along the Wasatch Fault is inevitable, but impossible to predict with accuracy. Structure/Wild fire is also a high priority.

Addressing the Floodplain: City Code Chapter 10 "Flood Damage Prevention" comprehensively addresses floodplain issues. See Section X Policy and Program Capability of this document for an example.

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	Yes, partially: Most critical facilities owned and operated by the City of Orem have been seismically studied and identified.	Need a comprehensive list of critical infrastructure with seismic vulnerabilities.
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Partially complete: Educational materials/resources are available to all Orem residents.	

Landslide	Public education on correct watering practices and retaining measures in susceptible areas.	Med	1 year	TBD	Local Cash, Grants	Local Government, UGS	No	Lack of available resources

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	Yes, ongoing effort.	
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes: CERT, "Putting Down Roots in Earthquake Country", website, city-wide drill.	
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	No	Difficulty passing legislation with requirements on homeowners.
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	In-process of re-evaluating current hillside ordinance and producing maps that identify sensitive slope areas as well and poor soil areas	

Protecting Current Residents and Structures (Orem)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government
Landslide	Public education on correct watering practices and retaining measures in susceptible areas.	Med	1 year	TBD	Local Cash, Grants	Local Government, UGS

Protecting Future Residents and Structures (Orem)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances	High	2 years	TBS	Local Cash, Grants	Local Government
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS
Wildfire	Promote FIREWISE landscaping to resident's living in vulnerable areas of the city	High	1 year	Minimal	Local Cash, Grants	Local Government
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS

Payson	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	977	$123,861,800	477.1
500 Year Flood	1046	$141,017,400	549.0
Dam Failure (Deer Creek)	0	$0	0.0
Dam Failure (Big East, Box Lake, Dry Lake, Maple Lake, McClellan Lake, Red Lake, Winward)	1033	$120,395,000	347.0
Fire (High and Moderate Risk)	1566	$246,094,200	740.9
Landslide	22	$2,633,400	106.3
Debris Flow	55	$8,317,500	121.8
Liquefaction	2345	$347,283,200	2349.0

Statement of Vulnerabilities: Payson City currently has two areas of the City that have been designated as flood plains by FEMA. When a new home or structure is requested to be constructed in one of the flood plain areas we require that the applicant meet certain requirements to be able to construct a building in the flood plain. FEMA is currently in the process of updating the flood plain and Payson City will adjust our requirements as needed to address these changes. These are a concern because some homes and structures were built before today's current standards existed and Payson City does all that it can in a large rainfall event to protect these structures from getting flooded. Payson City also has a few subdivisions that have only one evacuation route and due to the hillside development that they were constructed on this is a concern that we deal with if there ever is a need to evacuate. We also have one development that has an earthquake fault line running through it, with one existing home sitting directly on the fault line. This has been addressed with the home owner but is a concern in a large earthquake.

Addressing the Floodplain: Payson has a floodplain overlay zone and requires anyone currently living in or building on the land to purchase insurance accordingly. Payson updates maps and incorporates them into city plans and ordinances as available. There are some areas where an

insufficient storm drain system results in flooding after heavy downpours, but it is not damaging enough to justify upgrading the system just yet. Title 21, "Sensitive Lands ordinance", includes some provisions for development not exacerbating flood, providing notice to homes located in flood-prone areas, indication of flood prevention for new basements.

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes, Ongoing	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	In Progress	Cost
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Yes, Ongoing	
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Med	1 year	TBD	Local Cash, Grants	Local Government, UGS	Yes, Ongoing	

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	

Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes, Ongoing	
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	Yes, Ongoing	

Protecting Current Residents and Structures (Payson)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS

Pleasant Grove	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	290	$61,163,200	32.2
500 Year Flood	290	$61,163,200	32.2

Dam Failure (Deer Creek)	0	$0	0.0
Dam Failure (Silver Lake Flat, Tibble Fork, American Fork Debris and Battle Creek, Grove Creek)	5634	$1,011,169,976	1813.0
Fire (High and Moderate Risk)	1710	$379,002,466	794.4
Landslide (High and Moderate)	968	$171,562,200	337.5
Debris Flow	1433	$245,528,900	487.7
Liquefaction (High and Moderate)	3180	$646,612,176	993.4

Statement of Vulnerabilities: Pleasant Grove has multiple critical facilities, including the old police station, Battle Creek and Grove Creek dams that need to be retrofit for earthquake safety.

Addressing the Floodplain: Though HAZUS software predicts some areas of flooding within city limits, there is no official NFIP 100 or 500-year floodplain within Pleasant Grove city limits.

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	N/A	No special flood hazard area

Flooding/ Dam Failure	Pipe water from flood basin 200 S. and 500 N. to canal. Approx. 8000 ft. high pressure pipe	High	Ongoing	2 million	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	Yes	
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	No	Few homes at risk
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Med	1 year	TBD	Local Cash, Grants	Local Government, UGS	No	Public education not applicable with city ordinances

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	No	No SFHA
	Pipe water from flood basin 200 S. and 500 N. to canal. Approx. 8000 ft. high pressure pipe	High	Ongoing	2 million	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Ongoing	

Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	No	Few homes in danger
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Coordination fell through.

Protecting Current Residents and Structures (Pleasant Grove)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Earthquake	Study on vulnerabilities of Critical Facilities	High	3 years	$20,000	FEMA, Local Government	Local Government
Fire	Install emergency generator to pump water for fire prevention.	High	5 years	1 million	FEMA, Local Government	Local Government
Dam Failure	Upgrade Battle Creek and Grove Creek dams to conform to seismic standards	High	2 years	TBD	North Utah County Water Conservancy District	North Utah County Water Conservancy District
Drought	Public education on correct watering practices	High	Ongoing	Minimal	Local Government	Local Government
Earthquake	Promote earthquake awareness and preparation	High	Ongoing	Minimal	Local Government	Local Government

Protecting Future Residents and Structures (Pleasant Grove)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Landslide	Require geotechnical reports for proposed structures in landslide-prone areas, conform to Hillside ordinance	High	3 years	Minimal	Local Government	Local Government

Flooding	Update storm water master plans to reduce flooding in developing areas	High	3 years	Minimal	Local Government	Local Government
Earthquake	Promote earthquake awareness and preparation	High	Ongoing	Minimal	Local Government	Local Government

Provo	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	1160	$493,454,778	930.3
500 Year Flood	2120	$669,148,102	1161.4
Dam Failure (Deer Creek)	14713	$3,878,874,280	5076.8
Dam Failure (Rock Canyon and Slate Canyon Dams)	4459	$1,439,046,416	1760.0
Fire (High and Moderate Risk)	759	$285,905,900	960.6
Landslide	1549	$402,340,500	972.0
Debris Flow	2226	$513,693,300	1145.8
Liquefaction (High and Moderate)	18864	$4,616,610,780	6224.0

Statement of Vulnerabilities: Provo has experienced large growth over the past decade and while efforts have been taken to enhance water storage capacity, a long term drought could create water shortages in the community. Provo water distribution division utilizes dozens of local springs to supplement wells for distribution. Several of the springs in Provo Canyon are used to supply water to the treatment facility. Some of the old lines lie below the Provo River Bed and current policy does not allow construction on the river to move and replace these lines for access. The position of the city between Utah Lake and the Wasatch Mountain range create an evacuation challenge. Utah Lake is Provo's West border while the Wasatch Mountain Range is Provo's East border. Provo City is dissected by Provo River running from the mouth of Provo Canyon to

Utah Lake, as well as the Union Pacific Rail Line and Interstate 15. These barriers and restrictions constrict large scale movement of motorists.
The Wasatch Fault is located under Provo's east bench. There are currently slow moving landslides occurring in neighborhoods that are impacting residents and infrastructure. These slides are being monitored by the Utah Geological Survey and area considerations for planning.
Provo residents and businesses located on the west side of Interstate 15 have limited routes for evacuation. There are 2 exits with underpasses as well as 3 other underpasses to east side access. During evacuation, each of these will create a bottleneck.
Provo Airport is a Part 139 FAA Certified airport. It is growing and in the coming years will have significantly increased traffic. The increase in traffic increases the potential for emergency response.

Addressing the Floodplain: City Code Chapter 14.33 “Flood Plain Zone” includes portions of the comprehensive version example found in Section X Policy and Program Capability of this document, such as, Purpose and Objectives, Flood Study and Map, Use in Combination, Permitted Uses, Building and Development Permit, Administration, Use of Other Base Flood Data, Records, Certificate by Engineer or Architect, Development Standards, and Definitions.

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Ongoing	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	Ongoing	
Wildfire	Educate homeowners on “Ready Set Go” practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Ongoing	
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Med	1 year	TBD	Local Cash, Grants	Local Government, UGS	Ongoing	

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Ongoing	
Wildfire	Incorporate "Ready Set Go" landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	Ongoing	
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes	

Protecting Current Residents and Structures (Provo)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS
Flooding/ Dam Failure	Review existing ordinances related to flood plain hazards to identify needed revisions, if any.	High	1 – 2 years	Minimal	Local Cash, Grants	Local Government
Flooding/ Dam Failure	Participate in the Provo River Levee Analysis and Mapping Process (LAMP) to identify potential improvements to levee system.	High	3 years	TBD	Local Cash, Grants	Local Government, FEMA, Others?
Flooding/ Dam Failure	Replace vulnerable areas of large diameter pipe.	High	5 years	CIP	Local Cash	Local Government

Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government
Wildfire	Educate homeowners on Ready Set Go practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS
Landslide	Review existing ordinances related to slide area hazards to identify needed revisions, if any.	High	1 2 years	Minimal	Local Cash, Grants	Local Government

Protecting Future Residents and Structures (Provo)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Participate in the Provo River Levee Analysis and Mapping Process (LAMP) to identify potential improvements to levee system.	High	3 years	TBD	Local Cash, Grants	Local Government, FEMA
Flooding/ Dam Failure	Replace vulnerable areas of large diameter pipe.	High	5 years	Identified in CIP	Local	Local Government
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS
Wildfire	Incorporate Ready Set Go landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government
Wildfire	Restrict use of fireworks at highly vulnerable areas.	High	1 year	Minimal	Local Cash	Local Government
Landslide	Review existing ordinances related to slide area hazards to identify needed revisions, if any.	High	1-2 years	Minimal	Local Cash, Grants	Local Government
Drought	Promote water saving programs.	High	1 year	Minimal	Local Cash, Grants	Local Government

Salem	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	21	$2,392,300	76.1
500 Year Flood	44	$5,978,400	100.6
Dam Failure (Deer Creek)	0	$0	0.0
Dam Failure (Local Dams)	0	$0	0.0
Fire (High and Moderate Risk)	734	$149,218,820	1454.5
Landslide	4	$709,100	1.8
Debris Flow	426	$96,255,200	1125.9
Liquefaction (Moderate to High)	491	$82,628,596	812.1

Statement of Vulnerabilities: Salem City is aware of the different vulnerabilities within and around our city. Salem City has two canals that run through our city limits. We are concerned about breaches and the issues associated with that. We are also aware of the area and the risk of earthquakes, as we are on a major fault line. To the east of our city is the mountain range, knowing issues with fire's and mudslides. Most of the situations are discussed among the city leaders and directors of departments.

Addressing the Floodplain: Title 13-3-120 "Storms, Sewers - Drainage" states: All subdivision proposals shall be consistent with the need to minimize flood damage. The subdivision layout shall make adequate provision for natural drainage channels and floodways. All water, sewer, and other utility systems and facilities located in designated flood areas shall be designed and constructed to minimize flood damage, including the infiltration of flood water into the system, or the discharge of the system into the flood waters. Base flood data shall be provided by the developer as part of the preliminary plat.

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Ongoing	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	Yes	
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Ongoing	
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Med	1 year	TBD	Local Cash, Grants	Local Government, UGS	Yes	

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	Ongoing	
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes	
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	Yes	
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Ongoing	

Protecting Current Residents and Structures (Salem)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS
Flooding/ Canal Breach	Coordinate efforts with Salem Canal, Strawberry Highline Canal and bureau of reclamation	High	Ongoing	TBD	State and Federal	BOR, Salem Canal Highline Canal, local government
Earthquake	Inventory current critical facilities for seismic standards.	High	Ongoing	TBD	Local Cash, Grants	Local Government
Wildfire	Educate homeowners on FIREWISE practices.	Med	Ongoing	Minimal	Local Cash, Grants	Local Government
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Med	Ongoing	TBD	Local Cash, Grants	Local Government, UGS

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS
Flooding/Canal Breach	Coordinate efforts with Salem Canal, Strawberry Highline Canal and bureau of reclamation	High	Ongoing	TBD	State and Federal	BOR, Salem Canal Highline Canal, local government
Earthquake	Promote earthquake awareness and preparation.	High	Ongoing	TBD	Local Cash, Grants	Local Government
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	Med	Ongoing	Minimal	Local Cash, Grants	Local Government

Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	Med	Ongoing	TBD	Local Cash, Grants	Local Government, UGS

Santaquin	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	4	$739,500	1.0
500 Year Flood	6	$965,000	1.4
Dam Failure (Deer Creek)	0	$0	0.0
Dam Failure (Santaquin Debris Dam)	1490	$195,014,797	718.3
Fire (High and Moderate Risk)	1565	$226,765,000	835.8
Landslide	10	$1,552,900	103.2
Debris Flow	318	$49,987,600	218.7
Liquefaction (Moderate to High) (All bldgs low-very low)	0	0	0.0

Statement of Vulnerabilities: Santaquin faces several vulnerabilities due to local geology, proximity to wildlands, and past development policies. These vulnerabilities include homes which have been built along the eastern border of the town (US Forest Service boundary) which are at risk for wildfires, landslides, and debris flow impacts. These same homes are also built in close proximity to a fault line. Santaquin recently adopted hillside development standards to address future development in these areas. There are currently over 500 homes in the southwest area of Santaquin, which are accessed via one rail separated bridge. Santaquin is working to establish two additional emergency access routes to nearby highways and through the hilly terrain.

Addressing the Floodplain: City Code Chapter 11-6-21 "Floodplain Areas" to 11-6-22 "Alteration of Natural Waterways" states that “A. Any subdivision in or adjacent to a floodplain identified by the federal emergency management agency (FEMA) shall be required to comply with the provisions of this section. B. The design and development of the subdivision shall provide each lot with a buildable area that will permit the lowest floor elevation, including the basement, to be constructed one foot (1') above the 100-year flood elevation. The developer shall be required to obtain an elevation certificate prior to issuance of building permits. C. The design of the subdivision shall minimize the effects of flooding and facilitate the flow of surface water runoff. D. The following base flood elevation data shall be submitted with the application for preliminary plat approval: 1. The elevation of the 100-year floodplain in relation to mean sea level, as noted in FEMA data and maps; and 2. The elevation of the lowest floor level, including basements, for all proposed dwelling lots. An elevation certificate will be required for all dwellings in areas adjacent to a floodplain. E. The developer and/or subdivider shall deliver a copy of all information required in this section to the Santaquin City community development department. F. The subdivider may be required to install or replace, when required by the city, all sewer and water systems within an identified floodplain in such a manner as to eliminate or minimize possible damage to such systems, discharge from such systems into floodwater, infiltration of floodwaters into such systems, or the contamination of ground water. G. To assure compliance with all applicable regulations, the developer and/or subdivider shall obtain the approval of the Santaquin City public utilities department and/or engineer of all new storm drain and water systems. (Ord. 05-01-2003, 5-7-2003, eff. 5-8-2003) 11-6-22: ALTERATION OR RELOCATION OF NATURAL WATERWAYS: A. Prior to approval of a preliminary plat by the city, the developer/subdivider shall complete any alteration or relocation of any natural waterway, which the army corps of engineers and/or the Utah County flood control department, or its successor, require in connection with the subdivision. B. Any request for alteration or relocation of a natural waterway on a subdivision plat shall be accompanied by the appropriate approval of the city engineer to ensure: 1. That the proposed alteration or relocation will not decrease the flow capacity or increase the velocity of the waterway, or otherwise result in any condition that could reasonably be anticipated to cause an increased danger to the safety of persons or property; 2. That the soil conditions in the proposed location will not increase flooding potential; and 3. That the proposed waterway can be adequately maintained. (Ord. 05-01-2003, 5-7-2003, eff. 5-8-2003)”

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Ongoing	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	Ongoing	Santaquin is continually updating through survey and GPS work our city's GIS and facility plans
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Ongoing	A Fire Chief was hired by the City who is conducting citizen education outreach opportunities and providing materials
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS	Ongoing	Santaquin implemented a Hillside Overlay zone that provides standards for hillside protection and grading practices for current and future residents.

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	Ongoing	Santaquin has been working with state and federal agencies to identify greatest flood hazard potential and constructing

								infrastructure to protect future residents. City ordinances have been adopted to address protection of sensitive areas and protection standards.
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes	City ordinance now requires mapping of geologic sensitive areas and limiting development areas and noticing based on study results.
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	Yes	
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Ongoing	

Protecting Current Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Med	1 year	TBD	Local Cash, Grants	Local Government, UGS

Flooding/ Dam Failure	Continue to work with Summit Creek Management Group to construct runoff capture and recharge areas	High	Ongoing	$1,500,000	Local, Private, Grants	Private Irrigation Company

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS

Saratoga Springs	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	215	$30,520,800	388.1
500 Year Flood	245	$34,703,800	391.6
Dam Failure (Deer Creek)	0	$0	0.0
Dam Failure (Local Dams)	236	$35,909,700	58.0
Fire (High and Moderate Risk)	4412	$868,343,400	2063.7
Landslide	0	$0	0.0

Debris Flow	0	$0	0.0
Liquefaction	1633	$332,900,100	732.3

Statement of Vulnerabilities: Ten of the 59 licensed explosive manufacturers and handlers in the whole state are licensed in Saratoga Springs. The proximity to the plants is certainly a vulnerability, as is the proximity to the NSA and Camp Williams. Redwood Road is only one main access road to the north for most of the city. Most neighborhoods are vulnerable to wildfire due to the wildland/urban interface and consequent flooding from lost vegetation, especially where there is hillside development built in or near drainages from Lake Mountain i.e. Lake Mountain Estates, Jacobs Ranch, Saratoga Hills, Stillwater, and Fox Hollow. There is also potential for fire in the phragmites along the lake. Proximity to Utah Lake brings liquefaction concerns during seismic events.

Addressing the Floodplain: City Code Title 18.02 "Flood Damage Prevention" comprehensively addresses floodplain issues. See Section X Policy and Program Capability of this document for an example.

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No	Mostly new buildings
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Yes	
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS	Yes	

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	Partial: 1.5 of 3 detention basins built	
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Partial: Info on website & social media, starting CERT	
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	Yes	
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Partial; some hillside stabilized through construction efforts.	

Protecting Current Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Continue phases of building 2nd Detention basin above Jacobs Ranch development. Further education and participation in NFIP.	High	3 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS

Earthquake	Continue to promote awareness and provide self-reliance training, CERT training. NIMS – ICS for city staff.	High	Ongoing	TBD	Local Cash, Grants	Local Government, FEMA, DHS
Wildfire	Continue Fire-Wise concepts and compliance with the Utah Wildland Urban Interface city adopted ordinance.	High	Ongoing	Minimal	Local Cash, and Fire Wise Resources	Local Government
Acts of Terror	Full risk analysis of critical infrastructure. NIMS – ICS Training for city staff and local stakeholders.	Medium	3 year	Minimal	Local Cash	Local Government, DHS

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Develop and incorporate building zones to reduce risk and exposure to potential flooding.	High	3 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS
Earthquake	Incorporate awareness with all community events. Continue compliance with NIMS – ICS training and exercising.	High	3 years	TBD	Local Cash, Grants	Local Government, USGS, UGS
Wildfire	Insure compliance with UWUI city ordinance and defensive spaces with and around proper fuel types.	High	3 years	Minimal	Local Cash, Grants	Local Government
Acts of Terror	Continuation of risk analysis of existing and to be built critical infrastructure. Compliance with NIMS – ICS training maintained and exercised with city staff and local stakeholders.	Medium	3 years	Minimal	Local Cash, Grants	Local Government, FEMA, DHS
Landslides	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS

Spanish Fork	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	627	$107,845,833	425.3
500 Year Flood	733	$124,168,033	475.8
Dam Failure (Deer Creek)	0	$0	0.0
Dam Failure (Local Dams)	0	$0	0.0
Fire (High and Moderate Risk)	835	$201,167,417	1004.0
Landslide	190	$36,106,100	83.8
Debris Flow	190	$36,106,100	83.8
Liquefaction (High and Moderate)	5136	$892,004,169	3017.7

Statement of Vulnerabilities: Streets often flood due to old railroad infrastructure. The railroad company is reluctant to replace infrastructure and is difficult to coordinate with.

Addressing the Floodplain: City Code 15.4.20 comprehensively addresses floodplain issues. See Section X Policy and Program Capability of this document for an example. There are additional specifications for the Spanish Fork River.

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Replace Millrace Diversion Structure	High	2 years	$3 Million	Local Cash, HMGP	Local Government FEMA	Yes (2015)	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No	Scheduled 2019
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Yes (2012)	
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Med	1 year	TBD	Local Cash, Grants	Local Government UGS	Pending	Only occurs after fire, heavy rain.

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government FEMA UDHS	Yes (2011)	
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government UGS, USGS	Ongoing	

Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	Yes (2015)	
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government UGS, USGS	No	Unable to coordinate.

Protecting Current Residents and Structures (Spanish Fork)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding	Remove debris from riverine areas	High	Ongoing	Minimal	Local Government	Local Government
Fire	Yearly Inspections from Fire Marshall, FIREWISE education	High	Yearly	Minimal	Local Government	Local Government
HAZMAT	Fire dept. HAZMAT certified	High	1 Year	Minimal	Local Government	Local Government
Landslide	Public education on correct watering practices and retaining measures	Med	Ongoing	Minimal	Local Government	Local Government

Protecting Future Residents and Structures (Spanish Fork)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Earthquake	Promote earthquake awareness and preparation through CERT, ShakeOut	Med	Ongoing	Minimal	Local Government	Local Government
Landslide	Public education on correct watering practices and retaining measures	Med	Ongoing	Minimal	Local Government	Local Government
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	Med	2 years	Minimal	Local Government	Local Government

Springville	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	2002	$388,160,065	904.8
500 Year Flood	2131	$411,159,765	1091.8
Dam Failure (Deer Creek)	46	$75,280,100	394.6
Dam Failure (Hobble Creek)	3341	$497,984,034	1128.9
Fire (High and Moderate Risk)	352	$99,796,102	290.3
Landslide	156	$37,150,102	105.0
Debris Flow	651	$119,458,502	259.8
Liquefaction (High and Moderate)	8080	$1,423,133,172	3728.3

Statement of Vulnerabilities: Springville City is aware of several “vulnerabilities” that could cause issues should a certain type of disaster and/or events occur within our city. The city is working to better safeguard these areas or are working on contingency plans on how to deal with them should the event occur. A few of these “vulnerabilities” are listed below:

· The UPRR railroad bridges crossing Hobble Creek at 400 W and 1500 W are deep girder bridges and sit very low to the annual average water elevation of Hobble Creek. During high water events debris continually collects at these locations and can/has caused flooding.

· The city has 2 water tanks located at the top of 400 S (approx. 400S and 2000 E) that are within 30-70 feet of a known and mapped fault line.

· There are several major water trunk lines/supply lines running from our water tanks that cross over known and mapped fault lines.

· The entire west side of our town (west of 400 west) is designated as a high liquefaction potential area. This is disclosed to all developers and home builders and is presently where most of our growth is occurring.

Addressing the Floodplain: City Code Chapter 5 Article 1 11-5 “Floodplain Overlay Regulations” addresses floodplain issues, including Objectives, Permitted uses, Development Standards and Conditions, Specific Requirements in FPO Subzone, Information to be Obtained and Maintained, and Administration.

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No	It did not get funded in budget and no grants were obtained.
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Yes	
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS	No	Program was never developed for this due to lack of resources.

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	No	FEMA was doing an update of the NIFP 100-year flood maps. New legislation was passed that effected the NFIP mapping and FEMA began the process over again. FEMA expects to have new maps available in 2 years.
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes	
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	No	FIREWISE landscaping requirements were not added to the municipal code.
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	At the time we were developing our GIS system and due to lack of communication with the USGS/UGS.

Protecting Current Residents and Structures (Springville)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	2 years	TBD	Local Cash, Grants	Local Government, UGS

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Update NFIP 100-Year Flood Plain and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS
Wildfire	Recommend FIREWISE landscaping practices to developments or homes within areas at risk. Educate new home owners of these practices.	High	1 year	Minimal	Local Cash, Grants	Local Government
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS

Vineyard	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	0	$0	0.0
500 Year Flood	0	$0	0.0
Dam Failure (Deer Creek)	0	$0	0.0
Dam Failure (Battle Creek and Grove Creek)	1	Pacificorp Power Plant	20.0
Fire (High and Moderate Risk)	75	$23,452,600	336.8
Landslide	0	$0	0.0
Debris Flow	0	$0	0.0
Liquefaction (High and Moderate)	397	$112,524,200	780.2

Statement of Vulnerabilities: Liquefaction would affect most of the town, potentially destabilizing the four sections of road that allow access across the railroad. Residents on the west side of town, where development is ongoing, would be difficult to evacuate if those access points were damaged. Additionally, Vineyard is comprised of many young families who are prone to move as employment changes, first-time homebuyers who are less familiar with the ins and outs of homeownership, and renters that are less involved with or aware of town issues.

Addressing the Floodplain: Vineyard has only a small section of NFIP floodplain along its north most border. That area is zoned Open Space, does not have any structures, and contains a trail mostly used by the adjoining city, Lindon. Water release along that waterway is controlled and any flooding would be minimal. Vineyard does not participate in the NFIP.

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	No	No homes in floodplain
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	Yes	

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	No	No NFIP floodplain
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Recent population boom, previously no staff.

Protecting Current Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Earthquake	Build overpasses to be usable after earthquake. Overpasses are the main access across railroad.	High	5-10 years	$10 million	Local Government, FEMA grants, MAG	Local Government, MAG

Earthquake	Develop evacuation plan	High	1-3 years	$50,000	Local Government	Local Government
All Hazards	Share disaster planning via city Social Media platforms	Med	Ongoing	Minimal	Local Government	Local Government
All Hazards	Maintain fund for timely replacement and updates of infrastructure via utility bill	High	Ongoing	$4/household per month	Utility fees	Individual/ Local Government
All Hazards	Interactive parcel map including hazard information	Med	1 year	Minimal	Local Government	Local Government

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Earthquake	Build overpasses to be usable after earthquake. Overpasses are the main access across railroad.	High	5-10 years	$10 million	Local Government, FEMA grants, MAG	Local Government, MAG
Liquefaction	Geotechnical study in town center area for potential tall buildings and frontrunner station	High	1-3 years	$200,000	Local Government, FEMA grants, developers	Local Government
Earthquake/ Liquefaction	All building permits require geotechnical study including site visit to be in accordance with earthquake standards	High	Ongoing	$2,000 per lot	Builder/ Individual	Builder/ Individual
Earthquake	Develop evacuation plan	High	1-3 years	$50,000	Local Government	Local Government
All Hazards	Share disaster planning via city Social Media platforms	Med	Ongoing	Minimal	Local Government	Local Government
All Hazards	Maintain fund for timely replacement and updates of infrastructure via utility bill	High	Ongoing	$4/household per month	Utility fees	Individual/ Local Government
All Hazards	Interactive parcel map including hazard information	Med	1 year	Minimal	Local Government	Local Government

Woodland Hills	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	0	$0	0.0
500 Year Flood	0	$0	0.0
Dam Failure (Deer Creek)	0	$0	0.0
Dam Failure (Local Dams)	0	$0	0.0
Fire (High and Moderate Risk)	376	$105,726,000	661.7
Landslide	0	$0	0.0
Debris Flow	222	$63,236,600	308.3
Liquefaction	0	0	0.0

Statement of Vulnerabilities: Woodland Hills is a bedroom community with little funding and few employees. This makes costly mitigation efforts and quick response difficult for most hazards. Due to its small size, the city is unlikely to receive priority attention and/or funding in the event of a regional disaster. With that said, it has a strong CERT program, several residents who actively prep for disasters and excellent volunteers.

Fire: Woodland Hill's greatest threat is fire, since any fire started downhill could quickly make its way up to the city, endangering lives. Many of the homes are within the Wildland Urban Interface and need to work diligently to decrease the fuel load. To mitigate the potential disaster, Woodland Hills has an ongoing fire prevention and awareness campaign including a "chipper" day for dead wood, familiarizing children with firemen, drills every 2-3 months, an active CERT program and zoning inspections by the Fire Chief. Their volunteer fire department has a 3-6 min response time and the city's monthly newsletter always contains a note from the Fire Chief.

Earthquake: Woodland Hills also sits on a fault. Earthquake activity would break the water lines, the majority of which are old, ductile iron installed around 1965. A breakage near the water tank could drain the entire tank in less than a minute, leaving the city with some flooding and without water until it could be trucked up its steep roads.

Mass movement: Avalanches and debris flows have done some damage on the periphery of the city. Berms and buried infrastructure mitigated some of the effects of mass movement in the past, but the relative unpredictability of these occurrences makes them difficult to plan for.

Addressing the Floodplain: There is no NFIP floodplain within Woodland Hills' boundaries.

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No	No resources allocated
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Yes, but not FIREWISE specific	
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Med	1 year	TBD	Local Cash, Grants	Local Government, UGS	No	No resources allocated

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes	

Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	Yes, but not FIREWISE specific	
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Coordination efforts fell through

Protecting Current Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Med	1 year	TBD	Local Cash, Grants	Local Government, UGS

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS

Other City Participation

The following jurisdictions participated in meetings discussing the Hazard Mitigation Plan. Every city was contacted by phone and email on multiple occasions and given a packet describing the purpose of the plan, future probability of events countywide, county history of disaster, and buildings at risk per city. Fairfield, Cedar Fort, and Genola also had separate meetings with MAG.

Hazard Mitigation Plan Update
March 15, 2016 Orem, Utah
Facilitated by Mountainland Association of Governments
Aaron Cloward and Shauna Mecham

Name	City	Phone	Email
DAVID STROUD	OREM	801-229-7095	dstroud@orem.org
JoAnna Larsen	Orem	801-229-7146	Jalarsen@orem.org
Peter Quittner	Utah Co.	801-404-6050	peterq@utahcounty.gov
Chris Blinzinger	Provo City	801-904-6368	cblinzinger@provo.org
ROBERT MILLS	PROVO CITY	801-852-6407	rmills@provo.org
Brandon Snyder	Lindon	801-785-7687	bsnyder@lindoncity.org
DON DERRON	Vineyard	385.215.4060	dono@vineyardtown.com
~~Dave Anderson~~	~~Spanish Fork~~	~~801.804.4586~~	~~daanderson@spanishfork.org~~
BRIAN TUCKER	MAPLETON	801-860-9108	btucker@mapleton.org
Jeff Anderson	Springville	801-491-2719	janderson@springville.org

Hazard Mitigation Plan Update

March 1, 2016 Lehi, Utah

Facilitated by Mountainland Association of Governments

Aaron Cloward and Shauna Mecham

Name	City	Phone	Email
Howard Anderson	Cedar Fort	801-318-0184	jhowardanderson22@yahoo.com
SHANE SORENSEN	Alpine	801-420-2962	ssorensen@alpinecity.org
Erin Wells	Highland	801-772-4566	erin@highlandcity.org
Spencer Kyle	Saratoga	801 7669793	skyler@saratogaspringscity.com
Jess Campbell	Saratoga	801-766-6505 Ext 218	JohnnyBell@saratogaspringscity.com
Christie Hutchings	Lehi	385-201-2515	chutchings@lehi-ut.gov
David Bunker	Cedar Hills	801 785-9668 x101	dbunker@cedarhills.org
Ben Bailey	Cedar Hills	801 420 2529	bbailey@cedarhills.org
Trent Andrus	American Fork	801-763-3060	tandrus@afcity.net

Southern Cities meeting March 29, 2016

Goshen	Josh Cummings	801-420-4019	joshcummings75@gmail.com
Salem	Brad James	801-423-2312	bjames@salemcity.org
Salem	Jeff Nielsen	801-423-2770	jeffn@salemcity.org
Payson	Jill Spencer	801-465-5233	jills@payson.org
Santaquin	Dennis	801-420-3725	dmarker@santaquin.org
Elk Ridge Commissioner	Stacey Petersen	801-423-2300, 318-4293	stacey@elkridgecity.org

Other Participation

Eagle Mountain	Spoke with Ikani on the phone multiple times in June and July to discuss vulnerabilities and strategies.
Pleasant Grove	Met with Pleasant Grove Planners, Police, Fire and others on 07 June. Worked through all the background and decided on new strategies then.
Woodland Hills	Met with Corbett in Woodland Hills in Feb 2017. Discussed hazards and outlined strategies then.

Part VIII
Wasatch County
Profiles and Mitigation

Background

Area: 1,191 square miles; *county seat*: Heber City; *origin of county name*: from the Wasatch Mountains; *economy:* hay, livestock, recreation; *points of interest*: Strawberry, Deer Creek, and Jordanelle reservoirs, Wasatch Mountain State Park, Wasatch LDS Tabernacle in Heber City, Heber Creeper, historic homes in Midway.

Heber Valley, one of several back valleys in the Wasatch Mountains, is often called Utah's Switzerland because of the rugged beauty of Mount Timpanogos located to the west, its climate, and a large population of Swiss that settled in Midway. The county's highest peaks top 10,000 feet, and over half of the land is 7,500 feet above sea level. The climate zone, classified as undifferentiated highlands, offers cool summers and very cold winters. The average annual precipitation is about sixteen inches.

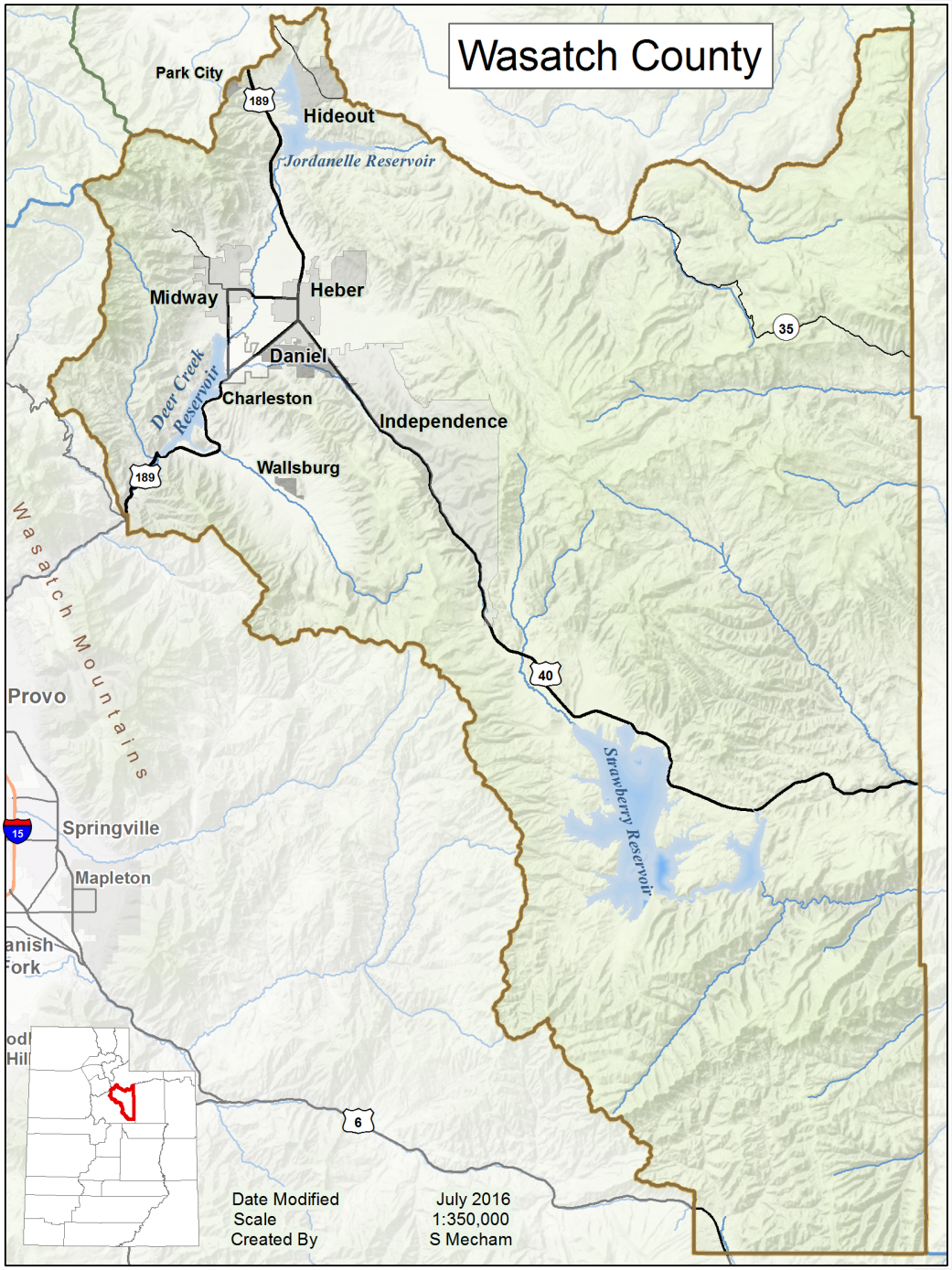
The county is divided into two watersheds--the Colorado and the Great Basin drainage systems. Because of its annual precipitation and its location between the Uinta and Wasatch mountains, Heber Valley is well endowed with water. Flowing from the east are Daniels, Lake, and Center creeks. From the north and northeast is the Provo River. From the west Snake Creek drains a central portion of the Wasatch Mountains. Two additional sources of water are man-made: the Ontario Drain Tunnel west of Keetley drains many of the Park City mines, and the Weber/Provo diversion canal diverts water from the Weber across the Kamas prairie in Summit County to the Provo River in Wasatch County.

Prior to the 1850s, Heber Valley was an important summer hunting ground for the Timpanogos Utes living around Utah Lake. The first white men to visit the county were members of the Dominguez-Escalante expedition in 1776. They skirted Heber Valley, traveling down Diamond Fork to Spanish Fork Canyon and then into Utah Valley. Fifty years later fur trappers entered the county. In 1824 and 1825 Etienne Provost from Taos, New Mexico, trapped beaver in the Uinta and Wasatch mountains. About the same time, William Henry Ashley and members of his fur company from St. Louis also hunted and trapped for beaver in the county.

The first settlers came into Wasatch County from Utah Valley in the spring of 1859 and located a short distance north of present Heber City at the London or John McDonald Spring. That same year, Midway and Charleston were also settled. In 1862 the territorial legislature created Wasatch County, which then included all of the Uinta Basin. Wasatch in Ute means "mountain pass" or "low pass over high range." Heber City, named for Mormon Apostle Heber C. Kimball, was selected as the county seat.

The county produces hay, dairy products, sheep and cattle. During the early 1900s, after the Denver and Rio Grande Railroad completed a line into the county from Provo, Heber City became an important shipping terminal for wool and sheep. In 1922 the Union Pacific Railroad constructed a spur from Park City to the mines west of Keetley. Lead, zinc, and silver ore were shipped from these mines on this railroad spur. Today neither railroad line is in full operation, and other economic activities are more important to the county than transportation and mining.

Strawberry Reservoir (completed in the 1910s), Deer Creek Reservoir (completed in the 1940s), and Jordanelle Reservoir (completed in the 1990s), together with sparkling streams and beautiful mountain scenery, have made Wasatch a popular recreation area. (Source: Utah Historical Encyclopedia. Craig Fuller, Author)


Wasatch County
Park City
189
Hideout
Jordanelle Reservoir
Midway
Heber
35
Daniel
Deer Creek Reservoir
Charleston
Independence
189
Wallsburg
Wasatch Mountains
40
Provo
Strawberry Reservoir
15
Springville
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Population

The following table shows historic and future projections for population:

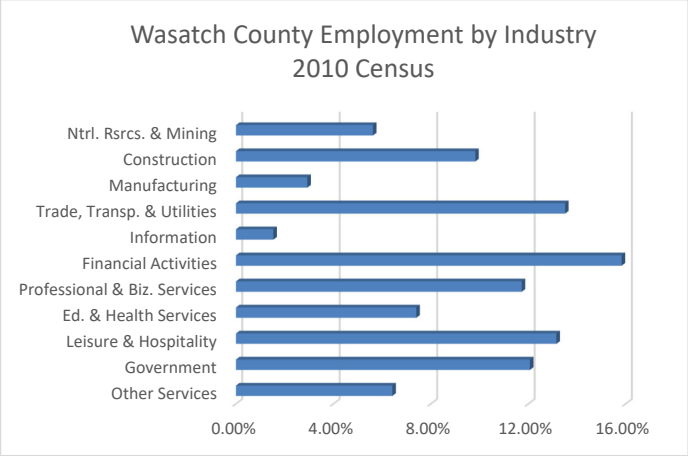
Mountainland Region Population 1990-2060

	Census			Short Range Projection			Long Range Projection	
	1990	2000	2010	2020	2030	2040	2050	2060
Mountainland Region	291,606	417,321	579,448	746,796	934,540	1,150,420	1,381,418	1,602,441
Summit County	15,693	30,034	36,473	45,491	56,890	71,433	88,334	107,671
Utah County	265,764	371,873	519,307	668,564	833,101	1,019,828	1,216,695	1,398,074
Wasatch County	10,149	15,414	23,668	32,741	44,549	59,159	76,389	96,696

2012 Baseline Projections, Governor's Office of Planning and Budget. Produced using results from the 2010 Census as the base. See http://gomb.utah.gov/

Economy

Wasatch County, though still largely rural in nature, has seen its economy show greater signs of life than ever before. Heber City and Midway, the two largest cities in the county, have both seen a number of new developments add some vitality and tax base to their communities. New economic development and housing plans currently being completed will no doubt add to Wasatch County's ability to focus and channel resources into the most beneficial sectors and activities.



Economic Overview	2010	2011	2012	2013	2014	2015
Employment:	10,405	10,591	10,991	11,656	12,268	12,779
Labor Force	11,360	11,400	11,674	12,228	12,750	13,229
Unemployment Insurance Compensation	6,879	4,540	3,286	2,407	1,640	
Unemployment Rate	8.40%	7.00%	5.80%	4.70%	3.80%	3.40%
Income:						
Per capita personal income ($)	30,891	34,576	36,362	37,745	38,624	N/A
Sales and Use Tax						
Gross taxable sales ($ thousands)	1,189,659	1,324,336	1,360,925	1,469,760	1,570,920	N/A
Construction (permit-authorized):						
New dwelling unit permits	424	209	146	353	435	465
Miscellaneous:						
Payment in Lieu of Taxes Act ($ thousands)	$1,047	$1,061	$1,089	$1,125	$1,412	$1,167

Population Characteristics

Social Characteristics	Estimate	Percent	U.S.
Average household size	3.28	(X)	2.58
Average family size	3.72	(X)	3.14
Population 25 years and over	14,992		
High school graduate or higher	13,562	90.5%	86.30%
Bachelor's degree or higher	5,153	34.4%	29.30%
Disability status (population 5 years and over)	1,886	7.3%	12.3%
Foreign born	2,667	10.4%	13.10%
Speak a language other than English at home	3,309	14.2%	20.9%

(population 5 years and over)			
Household population	25,393		(X)
Economic Characteristics	**Estimate**	**Percent**	**U.S.**
In labor force (population 16 years and over)	12,201	68.1%	63.90%
Mean travel time to work in minutes (workers 16 years and over)	25.2	(X)	25.7
Median household income	65,582	(X)	53,482
Median family income	70,812	(X)	86,963
Per capita income (in 2007 inflation-adjusted dollars)	26,145	(X)	28,555
Individuals below poverty level	(X)	7.1%	14.80%
Housing Characteristics	**Estimate**	**Percent**	**U.S.**
Total housing units	11,058		
Occupied housing units	7,752	70.10%	88.60%
Owner-occupied housing units	5,761	74.30%	65.1%
Renter-occupied housing units	1,991	25.70%	34.90%
Vacant Housing Units	3,306	29.90%	11.40%
Median value of Owner-occupied (dollars)	304,300	(X)	175,700
Median of selected monthly owner costs			
With a mortgage (dollars)	1,791	(X)	1,522
Without a mortgage (dollars)	409	(X)	457
Demographic Characteristics			
Male	11,962	50.8	49.20%
Female	11,568	49.2	50.80%
Median age (years)	31.6	(X)	37.2

Under 5 years	2,334	9.9	6.50%
18 years and over	15,550	66.1	76.00%
65 years and over	2,017	8.6	13.00%
One race	23,204	98.6	97.1%
White	21,275	90.4	72.4%
Black or African American	79	0.3	12.60%
American Indian and Alaska Native	127	0.5	0.90%
Asian	181	0.8	4.80%
Native Hawaiian and Other Pacific Islander	29	0.1	0.20%
Some other race	1,513	6.4	6.20%
Hispanic or Latino (of any race)	3,184	13.5	16.30%

Source: 2010 American Community Survey 5-year estimates

Source: U.S. Census Bureau, 2005-2007 American Community Survey

Hazards Compared

Hazard Matrix

Probability	Negligible	Limited	Critical	Catastrophic
Highly Likely	Hail	Winter Weather, Avalanche		
Likely		Drought, Lightning, Wind		
Possible		Flood, Landslide		
Unlikely		Tornado	Earthquake, Dam Failure	

Severity

Probability Calculations for Wasatch County

Hazard	Number of Events	Years in Record	Recurrence Interval (years)	Hazard Frequency and Probability/Year	Source
Avalanche	36	19	0.56	1.89	NOAA
Drought (Moderate, PDSI<-2)	23	120	5.20	0.19	Utah State Water Plan
Earthquakes 3.0 and greater	12	52	4.42	0.23	University of Utah Dept of Seismology
Floods	6	65	11.00	0.09	Various
Hail	9	60	6.78	0.15	NOAA
Landslides causing damage	3	51	17.33	0.06	SHELDUS
Lightning (fatalities)	3	19	6.67	0.16	NOAA
Wildfires (over 300 acres)	9	54	6.11	0.17	Utah Division of Forestry Fire and State Lands and BLM
Wildfires (over 50 acres)	18	54	3.06	0.33	
Urban Interface Fires	Unknown	Unknown	Unknown		
Wind	16	60	3.81	0.27	NOAA (High Wind and Thunderstorm Wind with bodily harm or $ damages)
Winter Weather	38	19	0.53	2.00	NOAA (Blizzards/Snow/Winter Weather/Cold/Wind Chill with bodily harm or $ damages)
Tornadoes (all)	0	65		0.00	NOAA
Volcanoes	700	5,000,000	7142.86	Negligible	

**The Palmer Drought Severity Index (PSDI) is a standardized measurement of relative dryness using precipitation and temperature data ranging from -10 (dry) to 10 (wet)

Flooding/Dam Failure

Overview

Although Utah is considered a dry desert state, flooding does occur. Ranging from Most floods have occurred either from snow melt or severe thunderstorms. Often times flooding is increased by soils that are more impervious due to either wildfire or drying out. Floods occur on a regular basis in Wasatch County.

Profile

Frequency	Some flooding happens within Wasatch County on a regular basis.
Severity	Moderate
Location	Primarily along streams, rivers and along the shores of Deer Creek and Jordanelle Reservoirs.
Seasonal Pattern	Spring time due to snow melt. Isolated events throughout the year due to severe weather (microburst).
Duration	A few hours to a few weeks depending upon conditions
Speed of Onset	Sudden to 12 hours
Probability of Future Occurrences	High - for delineated floodplains there is a 1% chance of flooding in any given year.

Development Trends

As development occurs on the bench areas of Heber Valley, along the shore of Deer Creek and Jordanelle Reservoirs, or along river and stream corridors more homes will be in danger of floods. Communities need to make developers and homeowners aware of the danger as well as contribute to mitigation actions. Cities should review every development that it is in compliance with NFIP guidelines.

The following table identifies the communities in Utah County with their NFIP Status.

Communities Participating in NFIP

CID	Community Name	Current Effective Map Date	Actions taken
490165#	Charleston	03/15/12(M)	Current, maps available online.

490033#	Daniel	03/15/12(M)	Current, maps available online.
490166#	Heber City	3/15/2012	Current, maps available online.
490167#	Midway	3/15/2012	Current, maps available online.
490164#	Wasatch County	3/15/2012	Current, maps available online.
490139#	Park City	(NSFHA)	No special flood hazard area

Communities NOT in NFIP

CID	Community Name	Current Effective Map Date	Reasons for non-participation
495518#	Hideout	3/15/2012	Not yet participating. Town incorporated in 2008.
490263#	Independence	3/15/2012	Recently adopted FEMA recommended floodplain ordinance. Town incorporated in 2008.
490168#	Wallsburg	3/15/2012	In process of participating- waiting for new FEMA flood plain maps.

**Adapted from FEMA's National Flood Insurance Program Community Handbook*

The primary goal of those non participating communities is to join the NFIP.

Assessing Vulnerability: Addressing Repetitive Loss Properties

There are no repetitive loss properties in Wasatch County (FEMA, 2008).

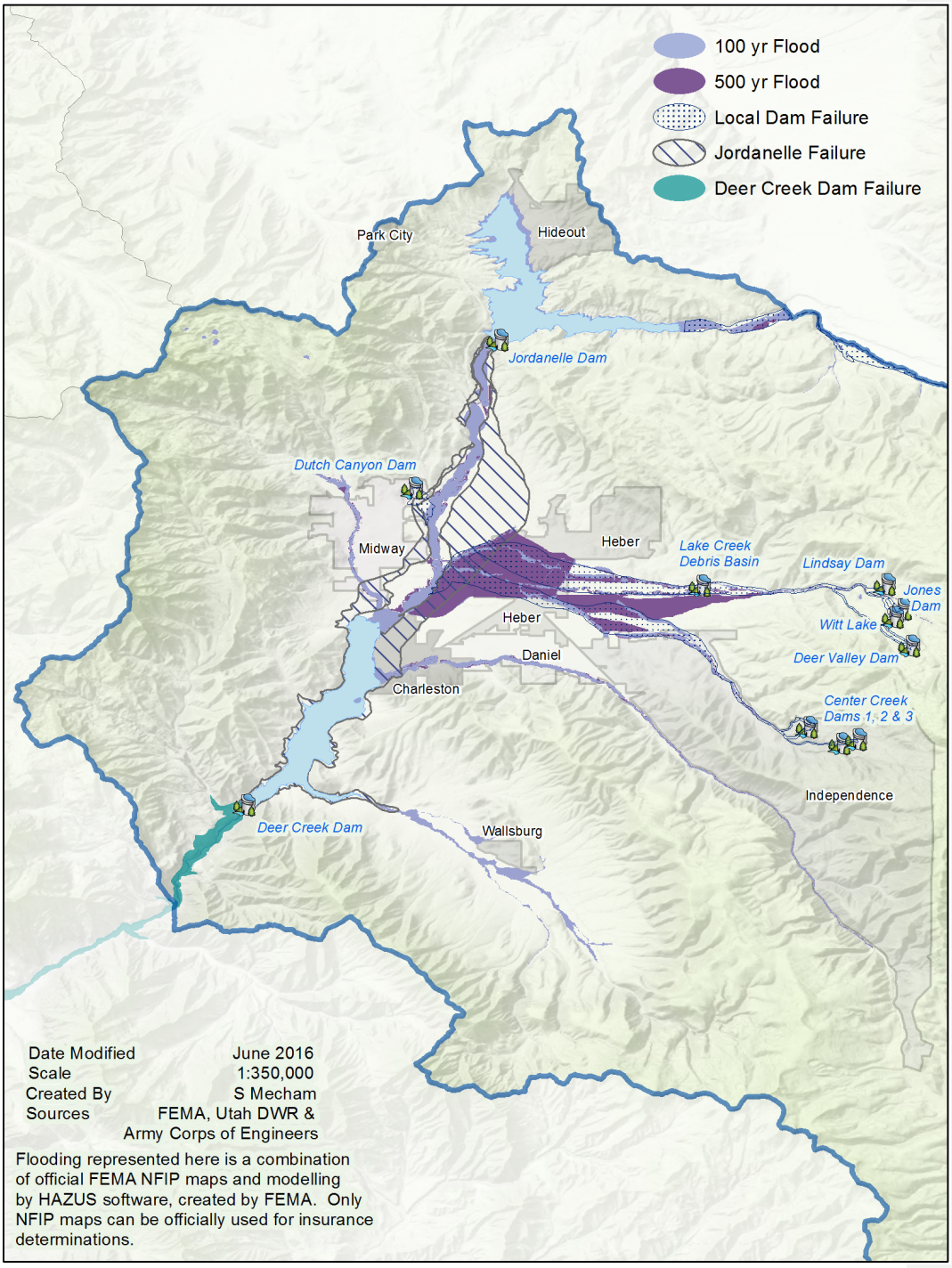
Utah County Flood and Dam Failure History

Flooding

Location/Extent	*Date*	*Fatalities*	*Damages*	*Source*	*Details*
Strawberry, upper Price, upper San Rafeal, Ogden, Weber, Provo, and Jordan Rivers; Blacksmith Fork, and Spanish Fork; upper Muddy and Chalk Creeks.	04/28/1952-06/11/1952	2	$8.4 million	National Water Summary 1988-89--Hydrologic Events and Floods and Droughts: U.S. Geological Survey Water-Supply Paper	Melting of snowpack having maximum-of-record water content for Apr. 1. Disaster declared.
Heber City	Feb-62	0	Thousands	Wasatch Emergency Manager & Wasatch Newspaper	Warm weather and rain cause snowmelt, flooding on Heber Main St
Northern Utah, Deer Creek Dam	01/29/1963-02/02/1963	0		Richardson, Peck and Green, "Heavy Precipitation Storm In Northern Utah January 29 to February 2, 1963" U.S. Weather Bureau	Record-breaking precipitation and runoff, damage in Heber valley and Daniels Canyon, RR tracks washed out S of Midway
Lower Duchesne and Jordan Rivers and tributaries (including Spanish Fork); upper Price, Bear, Sevier, and San Pitch Rivers; Chalk, East Canyon, Trout, and George Creeks; Great Salt Lake and tributaries between Ogden and Salt Lake City.	04/10/1983-06/25/1983	0	$621 million	National Water Summary 1988-89--Hydrologic Events and Floods and Droughts: U.S. Geological Survey Water-Supply Paper	Rapid melting of snowpack having maximum-of-record water content for June 1. Disaster declared by President.

White, upper Price, and Fremont Rivers; lower Bear and Sevier Rivers and tributaries; Beaver River; Red Butte Creek; Spanish Fork; Jordan River.	04/17/1984-06/20/1984	1	$41 million	National Water Summary 1988-89--Hydrologic Events and Floods and Droughts: U.S. Geological Survey Water-Supply Paper	Runoff from greater than average snowpack for Apr. 1 and spring precipitation.
Wasatch County	2/12/1986	0.9	$74,866	Spatial Hazard Event and Losses Database	Heavy rains and snow (SHELDUS divides the damages and fatalities by the number of counties involved, hence the 0.9 deaths)
Wasatch County	8/1/2005		$1,993,482.00		FEMA Disaster Declaration 1598

*FEMA has paid Heber, Midway, and Wasatch County a total of $39,288.90 for 9 Flood Insurance claims since 1978


100 yr Flood
500 yr Flood
Local Dam Failure
Jordanelle Failure
Deer Creek Dam Failure
Park City
Hideout
Jordanelle Dam
Dutch Canyon Dam
Midway
Heber
Lake Creek
Debris Basin
Lindsay Dam
Jones
Dam
Witt Lake
Deer Valley Dam
Heber
Daniel
Charleston
Center Creek
Dams 1, 2 & 3
Independence
Deer Creek Dam
Wallsburg
Date Modified June 2016
Scale 1:350,000
Created By S Mecham
Sources FEMA, Utah DWR &
Army Corps of Engineers
Flooding represented here is a combination of official FEMA NFIP maps and modelling by HAZUS software, created by FEMA. Only NFIP maps can be officially used for insurance determinations.

Wildland Fire

Overview

Wildland fire is a big concern in the Wasatch County area. On August 24, 1990, the most devastating urban wildland interface wildfire to have occurred in Utah began just west of the Heber Valley and lasted for six days, burning nearly 3,000 acres until it was officially contained. The Wasatch Mountain Fire, as it is referred to now, killed two firefighters, destroyed 18 homes and cost the state approximately $1.42 million in fire suppression. The overall loses were estimated to be about $2 million. Following this wildfire, precautions were taken in Midway for flash flooding and the NRCS Emergency Watershed Protection Program (EWP) was implemented with emergency flash flood mitigation measures.

Due to this fire a grant was received to implement a Children's Wildfire Mitigation Awareness Program. In the summer of 2003, a second wildfire, also started by the Forest Service, this time in the Cascade Springs area of Utah County, got out of control and burned into Wasatch County. The original "Prescribed" Burn was to be about 600 acres. The wildfire consumed more than 8,000 acres and threatened homes in the Midway area. Mudflows from the burned areas may have a negative effect on water quality in the Deer Creek Reservoir. There was considerable concern on the part of Wasatch County Officials that Forest Service Officials would not let the County aid in fighting the fire.

Profile

Frequency	Multiple wildland fires occur in Wasatch County Every year.
Severity	Moderate
Location	Hillsides and mountainous areas, open grass and range lands.
Seasonal Pattern	Summer and fall depending on weather conditions.
Duration	A few hours to a few weeks depending upon conditions
Speed of Onset	1 to 48 hours
Probability of Future Occurrences	High Major Fires: 0.17 (300 acres and larger) All Fires: 0.33 (50 acres and larger)

Development Trends

As development occurs on the bench areas of Wasatch County more homes will be in danger of wildfire. Communities need to make developers and homeowners aware of the danger. Cities should also require firebreaks and access roads along urban/wildland interfaces. Although development brings homes closer to areas of potential wildfire, it also brings water and access for firefighters closer to the urban fringe. Firewise community development principles, such as not storing firewood near homes, installing fire resistant roofing and cleaning debris from rain gutters will reduce potential loses.

History

Fires

Fire Name	Start Date	Total Acres
Cascade2	9/23/2003	7828
Wasatch Mountain Fire	8/30/1990	3000
South Hollow	8/17/2001	2121
East Vivian	7/29/2000	1753
Mill Hollow	6/23/2008	694
Wheeler Fire	09/04/2015	640
Fox Bay	08/18/2012	535
Whiskey Fire	08/19/2012	500
Daniels Canyon	8/13/1996	483
Deer Creek	7/29/1960	415
Vivian Park	8/11/1996	350
Piuta	7/28/1980	325
Total Fires > 300 acres:	10	18644
Iron Mine Lake	7/19/2000	200
Broadhead Meadows	5/14/1905	200
Daniel's Creek	9/4/1964	195
Wallsburg	10/16/1964	180
Center Canyon	10/3/1993	160
UTAH	7/24/1981	100
Wallsburg	7/26/2000	99.82
Deer Creek Dam	10/9/2000	90

Bear Canyon	7/20/1961	80
Total Fires 50-299 acres:	9	1304.82

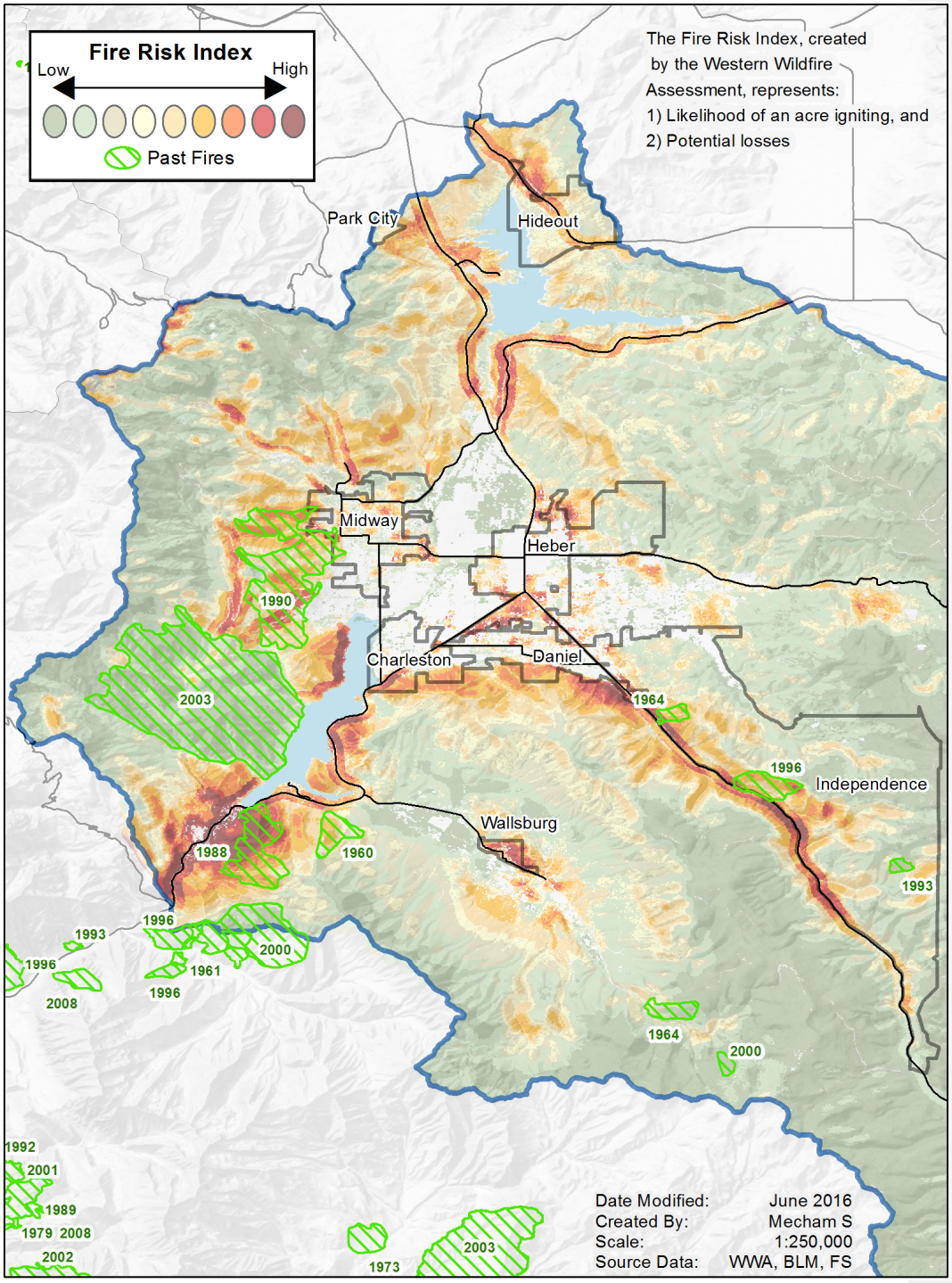
**Sources: Forest Service, BLM, Wasatch County Fire Service District*

Mitigation

The FFSL has helped communities develop Community Fire Plans. According to the FFSL, the purpose of community fire planning is to:

- Empower communities to organize, plan, and take action on issues impacting community safety
- Enhance levels of fire resistance and protection to the community
- Identify the risks of wildland/urban interface fires in the area
- Identify strategies to reduce the risks to homes and businesses in the community during a wildfire

Community Name	*County*	*Date Signed*
Brighton Estates POA, Inc. (Near Park City)	Wasatch	Aug 2010
Bryant's Fork (Strawberry Reservoir)	Wasatch	Jul 2006
Deer Crest (Near Park City)	Wasatch	Aug 2011
Diamond Hills (Near Kamas)	Wasatch	Nov 2006
Interlaken	Wasatch	Jul 2011
Lake Creek (Near Timber Lakes)	Wasatch	Unfinished
Oak Haven (Midway)	Wasatch	Aug 2011
Timberlakes	Wasatch	Jul 2011
Wolf Creek Ranch HOA (Near Heber City)	Wasatch	Jul 2010


Fire Risk Index
Low
High
Past Fires
The Fire Risk Index, created by the Western Wildfire Assessment, represents:
1) Likelihood of an acre igniting, and
2) Potential losses
Park City
Hideout
Midway
Heber
Charleston
Daniel
Wallsburg
Independence
1990
2003
1964
1996
1988
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1989
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2002
1973
2003
Date Modified: June 2016
Created By: Mecham S
Scale: 1:250,000
Source Data: WWA, BLM, FS

Earthquake

Overview

Due to Wasatch Counties populated areas being mostly outside of the Wasatch Fault zone the severity of a potential earthquake is thought to be lower. Recent development trends have been to build on steeper slopes and benches which can lessen the potential for liquefaction but increase susceptibility to earthquake triggered landslides. Ultimately, new construction in the area equals more structures that are susceptible to earthquakes. Each construction project should be thoroughly reviewed for resistance to ground shaking and other earthquake related hazards.

Profile

Frequency	Low -Events above 3.0 on the Richter scale are rare. Minor events (below 3.0) occur every month, but generally aren't felt.
Severity	High (up to 5.0)
Location	Multiple faults throughout the county particularly around Wallsburg.
Seasonal Pattern	None
Duration	1 to 6 minutes excluding aftershocks.
Speed of Onset	Seconds
Probability of Future Occurrences	93% probability that an earthquake Magnitude 5 or higher will occur somewhere along the Wasatch Front in the next 50 years, though effects would be diminished in Wasatch County.

Development Trends

As development occurs in Wasatch County, more buildings and people will be in danger from earthquakes. However, newer buildings will be built to better standards, which will actually decrease the risk of damage. It is interesting to note that when most residential structures are engineered, out the three categories of design criteria; seismic zone, wind shear and snow load; the design criteria for wind shear over-rules the other criteria.

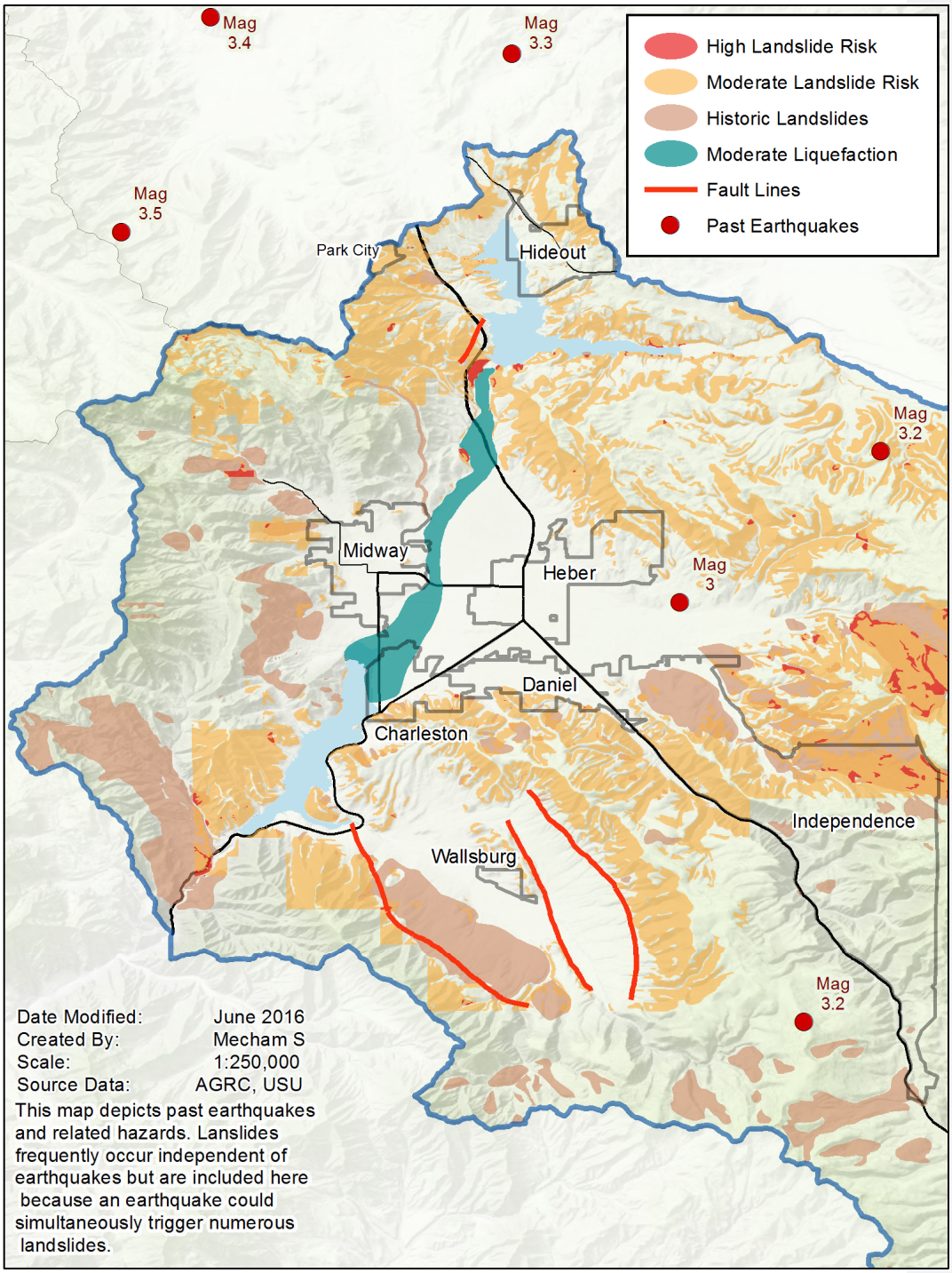
History

Recorded Earthquakes magnitude 3.0 or greater since 1950: Wasatch County

Earthquakes

Location	Magnitude	Date
12 miles northeast of Strawberry Reservoir	3.9	8/17/1963
Near Heber	3.8	10/1/1972
Near Heber	3.2	10/2/1972
Near Heber	3	12/24/1972
Deer Creek Reservoir	3.4	8/5/1973
South of Heber	3.4	8/19/1973
W of Hanna, Wasatch County	3.2	4/9/1988
SE of Wallsburg, Wasatch County	3.2	7/19/1999
E of Heber, Wasatch County	3	12/10/2000
Near Currant Creek Peak, Wasatch County	3	11/17/2003
Near Strawberry Reservoir, Wasatch County	3.5	6/11/2006
5km S of Francis, Wasatch County	3.2	3/14/2014

**United States Geologic Survey Earthquake Archives*


Mag 3.4
Mag 3.3
Mag 3.5
Park City
Hideout
Mag 3.2
Midway
Heber
Mag 3
Daniel
Charleston
Independence
Wallsburg
Mag 3.2
High Landslide Risk
Moderate Landslide Risk
Historic Landslides
Moderate Liquefaction
Fault Lines
Past Earthquakes
Date Modified: June 2016
Created By: Mecham S
Scale: 1:250,000
Source Data: AGRC, USU
This map depicts past earthquakes and related hazards. Lanslides frequently occur independent of earthquakes but are included here because an earthquake could simultaneously trigger numerous landslides.

Landslide

Overview

The Utah Interagency Technical Team (IAT) has worked with Wasatch County in 1999 due to extensive landslide complexes identified by the Utah Geological Survey in the Timber Lakes area and also in several mountain communities on the west side of the Heber Valley. In one such area of Timber Lakes, more than 200 homes are in a Landslide Study Area of the UGS. Thus, the UGS has completed, and is still conducting, "Landslide Investigation of Timber Lakes Estates, Wasatch County, Utah: Landslide Inventory and Preliminary Geotechnical-Engineering Slope Stability Analysis." These reports can be obtained from the UGS.

Profile

Frequency	Movement occurs nearly every year.
Severity	Moderate several structures have been condemned.
Location	Along most benches and hillsides.
Seasonal Pattern	Spring when ground saturation is at its peak.
Duration	Minutes to years.
Speed of Onset	Seconds to days.
Probability of Future Occurrences	Specific data is unavailable. However, terrain and topography make the probability of future occurrences relatively high.

Development Trends

As development continues on the foothills of the Heber Valley, more houses may be in danger of landslides. Increased analysis and geotechnical reports should become an integral part of the development and building process. An emphasis should also be put on ensuring proper drainage is developed. Reseeding wildfire areas, cuts and fills must also be a priority.

History

Landslide/Debris Flow

Location	Date	Damages	Source
Wasatch	12/27/1964	$500	SHELDUS database
Wasatch	1/1/1983	$8,603,666.52	SHELDUS database
Wasatch	1/1/1984	$1,471,256.97	SHELDUS database

**Spatial Hazard Event and Losses Database*

Severe Weather

Overview

Wasatch County's mountainous terrain makes it particularly susceptible to Winter Weather. Add to the topography those who seek snowy slopes for recreation and disaster can ensue, as seen in the table below. Avalanches, typically a voluntary risk, have caused the most deaths in Wasatch County. Winter Weather has caused the most injuries and property damage while Wind is responsible for the most crop damages of any type of severe weather. Summit County government actively emphasizes household accountability and preparation as individuals from less rural settings move into the area.

Profile

Frequency	Frequent Multiple events happen each year.
Severity	Moderate
Location	Region wide with some locations more frequent due to geography.
Seasonal Pattern	All year depending upon the type of event.
Duration	Seconds to Days
Speed of Onset	Immediate
Probability of Future Occurrences	Highly probable. Winter Weather and Avalanche have the highest probability of occurrence of all weather hazards facing Utah County.

History

NOAA Extreme Weather Events Summary

Countywide	Deaths			Injuries			Property Damage			Crop Damage		
	1950-1999	2000-2009	2010-2015	1950-1999	2000-2009	2010-2015	1950-1999	2000-2009	2010- 2015	1950-1999	2000-2009	2010-2015
Avalanche	2	24	10	6	9	1	$50,000	$20,000	$0	$0	$0	$0
Winter Weather	10	1	0	50	4	0	$604,500	$368,250	$50,000	$8,600	$10,000	$0
Cold, Wind Chill	0	-	-	0	-	-	$0	-	-	$0	-	-
Hail	0	0	0	0	0	0	$0	$0	$0	$0	$0	$0
Wind	0	1	0	6	3	1	$212,000	$243,800	$30,000	$0	$22,000	$0
Lightning	-	1	-	-	0	-	-	$15,000	-	-	$0	-

**Numbers from the National Oceanic and Atmospheric Administration. See http://www.ncdc.noaa.gov/stormevents for more information*

***Winter Weather includes Winter Weather, Blizzard, and Snow Storm, Cold/Wind Chill/Extreme Cold. Wind includes High Wind, Thunderstorm Wind, Strong Wind*

Damage Assessment and Mitigation

Overview

Listed below are the damage assessments for each of the participating jurisdiction followed by an update of the community's mitigation strategies from the 2010 plan, after which are the strategies the community wishes to pursue in the course of this plan. Damage assessments were calculated using the methodologies mentioned in the Methods section. Strategies were developed by each community with assistance from MAG as requested. The subsequent county and city strategies reflect the advancement of local and regional goals and continue the community's vision for the security and prosperity of the region. These goals include:

- Reducing the impact of natural hazards on life, property, and preserving the environment
- Minimizing damage to infrastructure and services and protecting their ability to respond
- Preventing potential hazards from affecting area or mitigating its effects
- Increasing public awareness, capabilities and experience
- Ensuring the safety of citizens and visitors
- Enabling cooperation between citizens and emergency and public services
- Maintaining cooperation with, and adherence to, FEMA guidelines
- Developing zoning and other plans that decrease development in hazardous areas

Wasatch County/Unincorporated	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	105	$21,043,154	933.2
500 Year Flood	466	$118,614,054	2038.14
Dam Failure-Non Federal	466	$102,573,177	1762.4

Dam Failure-Jordanelle	194	$38,837,460	1278.1
Fire-High to Moderate Risk	1768	$590,733,414	4892.57
Debris Flow	179	$56,667,917	179
Landslide-Moderate to High	1212	$333,235,705	3887.77
Liquefaction-Moderate	53	$15,764,169	329.94

Statement of Vulnerabilities: Fire is of concern to Wasatch County as there have been several that threatened homes in the past years and the mountainous terrain makes firefighting difficult.

Addressing the Floodplain: County Code Chapter 16.28.08 comprehensively addresses the floodplain. See Section X Policy and Program Capability in this document for an example.

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS		
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government		
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government		
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Med	1 year	TBD	Local Cash, Grants	Local Government, UGS		

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS		
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS		
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government		
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS		

Protecting Current Residents and Structures (Wasatch County)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Reinforce stream and canal banks & remove debris to prevent flooding	High	2 years	TBD	Local Cash, Grants	Local Government
Earthquake, Flood, Fire, Severe Weather	Education	Med	Ongoing	Minimal	Local Cash	Local Government
Flood	Encourage NFIP Participation	High	Ongoing	Minimal	Local Cash	Local Government

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk	Medium	1 year	Minimal	Local Cash, Grants	Local Government

Floods	Prohibit building in the floodplain or manipulating floodplain without consent	High	Ongoing	Minimal	Local Cash	Local Government

Charleston	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	29	$5,578,865	37.2
500 Year Flood	32	$5,825,763	43.04
Dam Failure-Jordanelle (Worst Case)	131	$32,361,112	245.41
Fire-High and Moderate Risk	187	$47,833,138	432.76
Debris Flow	3	$548,811	4.74
Liquefaction-Moderate	123	$30,672,065	248.1

Statement of Vulnerabilities: Specific bridges and culverts often worsen flooding. Charleston is working with landholders (mostly upstream) and looking for sources of flooding to correct the structures.

Addressing the Floodplain: The Land Use Ordinance states a building permit may be denied if, "The proposed use would create or pose a nuisance, conflict or hazard relating to noise, vibration, light, electrical or electronic interference, traffic, odor, fumes, dust, explosion, flooding, contamination or other negative effect to the adjoining properties or the community in general."

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government		
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government		
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Med	1 year	TBD	Local Cash, Grants	Local Government, UGS		

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS		
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS		
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government		
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Coordination efforts fell through

Protecting Current Residents and Structures (Charleston)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Remove vegetation around Daniels Creek Bridge	High	2 years	TBD	Local Cash, UTA	Local Government, UTA
Flooding/ Dam Failure	Work with Gravel quarry to divert floods from quarry and property	High	2 years	TBD	Local Cash, Gravel Quarry	Local Government, Gravel Quarry, Daniel Creek Tributary

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Remove vegetation around Daniels Creek Bridge	High	2 years	TBD	Local Cash, UTA	Local Government, UTA
Flooding/ Dam Failure	Work with Gravel quarry to divert floods from quarry and property	High	2 years	TBD	Local Cash, Gravel Quarry	Local Government, Gravel Quarry, Daniel Creek Tributary

Daniel	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	12	$2,335,718	55.32
500 Year Flood	19	$3,092,928	59.41
Dam Failure	0	0	0
Fire-High to Moderate Risk	116	$14,980,536	394.03

Debris Flow	7	$1,952,439	16.74
Landslide-Moderate	1	$493,016	4.93
Liquefaction	0	0	0

Statement of Vulnerabilities: Daniel is susceptible to flood, fire, and severe weather, but some if its strategies qualify as mitigation rather than response. Daniel recognizes how the occurrence of one hazard can worsen the effects of another, especially when it comes to landslides.

Addressing the Floodplain: The "FEMA Flood Protection Ordinance" comprehensively addresses the floodplain. See Section X Policy and Program Capability in this document for an example. Also, Town Code Section 8.27.23 "Physical Constraints Restrictions" prevents development in 100 yr stream flood hazard. Section 8.28.04 "Stream corridor/Wetland Development Standards" Puts additional constraints on floodplain development.

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS		
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government		
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government		
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Med	1 year	TBD	Local Cash, Grants	Local Government, UGS		

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/	Update Flood and Inundation	High	2 years	TBD	Local Cash,	Local Government,		

Dam Failure	mapping and incorporate them into general plans and ordinances.				Grants	FEMA, UDHS		
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS		
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government		
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Coordination efforts fell through

Protecting Current Residents and Structures (Daniel)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Fire/Landslide	Work with CUWCD to expand water tank, plant vegetation to prevent erosion on nearby slopes	High	2 years	TBD	Local Cash	Local Government, CUWCD
Flooding/ Dam Failure	Expand culverts and implement erosion control along Daniel Creek	High	2 years	TBD	Local Cash, Grants	Local Government
Severe Weather, Landslides	Move instrumentation inside and underground	Med	4 years	TBD	Local Cash	Local Government
Flooding	Rebuild bridge at Big Hollow Rd	High	4 years	$33,000	Local Cash	Local Government
Flooding	Maintain/Reinforce Canals	High	Ongoing	TBD	Local Cash	Local Government

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Severe Weather, Landslides	Move instrumentation inside and underground	Med	4 years	TBD	Local Cash	Local Government

Flooding/ Dam Failure	Expand culverts and implement erosion control along Daniel Creek	High	2 years	TBD	Local Cash, Grants	Local Government
Fire/Landslide	Work with CUWCD to expand water tank, plant vegetation to prevent erosion on nearby slopes	High	2 years	TBD	Local Cash	Local Government, CUWCD

Heber City	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	129	$21,060,255	45.04
500 Year Flood	2697	$398,007,939	899.68
Dam Failure-Witt Lake, Deer Valley, Jones, Linsday Lower, Lake Creek	1913	$278,556,963	632.65
Dam Failure-Jordanelle Worst Case Failure	163	$21,928,369	37.62
Fire-High and Moderate Risk	947	$181,081,723	537.25
Debris Flow	171	$35,677,978	63.04
Landslide-Moderate	4	$868,513	1.52
Liquefaction	0	0	0

Statement of Vulnerabilities: Main Street has experienced flooding multiple times with damages and is a main corridor for the transportation of hazardous materials.

Addressing the Floodplain: Municipal Code 18.109 "Flood Damage Prevention" comprehensively addresses the floodplain. See Section X Policy and Program Capability in this document for an example.

Protecting Current Residents and Structures: Analysis of 2010 Goals (Heber City)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No	Budget
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	No	Budget
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS	No	Budget

Protecting Future Residents and Structures: Analysis of 2010 Goals (Heber City)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes	
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	No	Budget

Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Budget

Protecting Current Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS
Flooding/ Dam Failure	Improve and construct drainage and flood control infrastructure.	High	Ongoing	TBD	Local Cash, Grants	CUP, Local Government
Earthquake	Inventory and upgrade public buildings and critical facilities for seismic standards.	High	3 years	TBD	Grants	FEMA
Wildfire	Educate homeowners on FIREWISE practices.	Medium	Ongoing	Minimal	Local Cash, Grants	Local Government
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS
All	Promote the Community Emergency Response Team (CERT)	High	Ongoing	Minimal	Local Cash, Grants	Local Government

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS
Flooding/ Dam Failure	Improve and construct drainage and flood control infrastructure.	Medium	Ongoing	TBD	Local Cash, Grants	CUP, Local Government
Earthquake	Promote earthquake awareness and preparation.	Medium	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS

Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	Medium	1 year	Minimal	Local Cash, Grants	Local Government
Landslide	Adopt ordinances that avoid development of areas prone to landslides.	Medium	Ongoing	Minimal	Local Cash, Grants	Local Government, UGS, USGS
All	Promote Community Emergency Response Team (CERT)	High	Ongoing	Minimal	Local Cash, Grants	Local Government

Hideout	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	0	0	0
500 Year Flood	0	0	0
Dam Failure	0	0	0
Fire-High and Moderate Risk	109	$22,840,175	169.84
Landslide-High Risk	0	0	0
Landslide-Moderate	2	$897,313	0.19
Liquefaction	0	0	0

Statement of Vulnerabilities: Hideout's biggest challenge is its lack of personnel available to dedicate to hazard activities. Town was established in 2008 and is still developing resources and personnel. (Also zero significant structures in floodplain, which borders Deer Creek Reservoir).

Addressing the Floodplain: Only NFIP floodplain is Deer Creek reservoir which, as a recreation area, has zero significant structures.

Protecting Current Residents and Structures: Analysis of 2010 Goals (Hideout)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why?
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No	Town established in 2008, still developing resources and personnel
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	No	Town established in 2008, still developing resources and personnel
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS	No	Town established in 2008, still developing resources and personnel

Protecting Future Residents and Structures: Analysis of 2010 Goals (Hideout)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Town established in 2008, still developing resources and personnel
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	No	Town established in 2008, still developing resources and personnel
Landslide	Coordinate and update landslide mapping	High	3 years	Minimal	Local Cash, Grants	Local Government,	No	Project too big to coordinate.

	within the area with UGS and USGS.					UGS, USGS		

Protecting Current Residents and Structures (Hideout)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Earthquake	Inventory current critical facilities for seismic standards.	High	2 years	TBD	Local Cash, Grants	Local Government
Wildfire	Educate homeowners on FIREWISE practices.	Medium	Ongoing	Minimal	Local Cash, Grants	Local Government
Landslide	Completing an inventory of locations where critical facilities, other buildings, and infrastructure are vulnerable to landslides and determine any action required.	Med	2 years	TBD	Local Cash, Grants	Local Government, UGS

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Earthquake	Evaluate necessity to implement additional building codes for Promote earthquake awareness and preparation.	High	2 years	Minimal	Local Cash, Grants	Fire Department, UGS, USGS
Wildfire	Implement Wildfire Urban Construction ordinance.	High	1 year	Minimal	Local Cash, Grants	Local Government
Landslide	Determine if current vulnerable areas dictate a need to implement additional town ordinances or building codes based on planned buildings or facilities.	Med	3 years	Minimal	Local Cash, Grants	Local Government

Independence	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	0	0	0
500 Year Flood	3	$512,682	3.02
Dam Failure-Center Creek Dams	16	$1,973,045	16.72
Fire-High to Moderate Risk	12	$956,558	109.39
Debris Flow	2	$633,812	7.09
Landslide	0	0	0
Liquefaction	0	0	0

Statement of Vulnerabilities: Fire is the biggest threat to Independence, as well as homes along Center Creek. Independence wants to communicate more with those responsible for Center Creek Dam to prevent damages.

Addressing the Floodplain: Town Ordinance 20, "Flood Damage Prevention Ordinance", comprehensively addresses the floodplain. See Section X Policy and Program Capability in this document for an example.

Protecting Current Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government		
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Yes	
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS		

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Implemented?	If not, why not?
Flooding/Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS		

Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	In progress	
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Coordination efforts fell through

Protecting Current Residents and Structures (Independence)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Fire	Partner with youth organizations to establish zones for fire safety	High	1 year	Minimal	Local Government	Local Government
Fire	Tree trimming/clearing project	High	1 year	Minimal	Local Government	Local Government

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding	Encourage NFIP participation, follow FEMA recommended floodplain ordinance	High	1 year	Minimal	Local Government	Local Government
Fire	Adopt Wildland Fire Urban Interface Code	Med	1 year	Minimal	Local Government	Local Government

Interlaken	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	0	0	0
500 Year Flood	0	0	0
Dam Failure	0	0	0
Fire-High and Moderate Risk	164	$23,316,455	117.14
Landslide-Moderate	26	$4,076,696	20.74
Liquefaction	0	0	0

Statement of Vulnerabilities: Interlaken's strategies reflect its biggest threat, which is a wildfire that could trigger secondary hazards such as landslide. Additionally, Interlaken is a small community but there is only one paved road in and out of town.

Addressing the Floodplain: No floodplain within Interlaken's boundaries.

Protecting Current Residents and Structures (Interlaken)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Wildfire	Develop an emergency response plan for wildfires	High	1 year	Minimal	Local Cash	Local Government, residents

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Wildfire	Incorporate FIREWISE landscaping recommendations into local ordinances in applicable areas	Medium	1 year	Minimal	Local Cash	Local Government
Landslide	Require slope stability analyses for susceptible areas in local land use codes	Medium	1 year	Minimal	Local Cash	Local Government

Midway	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	29	$6,414,599	49.04
500 Year Flood	44	$10,451,694	59.9
Dam Failure-Dutch Canyon	67	$29,407,086	34.51
Dam Failure-Jordanelle Worst Case Failure	295	$54,824,078	122.27
Fire-High and Moderate Risk	670	$135,826,851	561.39
Debris Flow	114	$36,736,698	56.41
Liquefaction	0	$0	0

Statement of Vulnerabilities: Wildfire is Midway's biggest vulnerability. Cabins have burned down multiple times, and the State Park is deciding on where to build a firebreak. Also, there is flooding down the canyons not identified in the NFIP floodplain and Midway is still trying to remedy problems caused by previous flooding. The older subdivision only has one access route.

Addressing the Floodplain: City Code Chapter 5.05 "Flood Damage Prevention" comprehensively addresses the floodplain. See Section X Policy and Program Capability in this document for an example.

Protecting Current Residents and Structures: Analysis of 2010 Goals (Midway)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes	
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No	Funding
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, County Fire	No	No resources allocated
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Med	1 year	TBD	Local Cash, Grants	Local Government, UGS	No	No resources allocated

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	In Progress	
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	No resources allocated
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	Yes	

Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Coordination fell through

Protecting Current Residents and Structures (Midway)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, County Fire
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Med	1 year	TBD	Local Cash, Grants	Local Government, UGS

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government

Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS

Wallsburg	Buildings at Risk	Monetary Loss	Acreage
100 Year Flood	3	$376,998	1.29
500 Year Flood	3	$376,998	1.29
Dam Failure	0	0	0
Fire-High to Moderate Risk	58	$6,189,195	81.51
Debris Flow /Historic Alluvial Fan	74	$8,310,722	64.15
Landslide-Moderate	1	$227,542	1.59
Liquefaction	0	0	0

Statement of Vulnerability: Proximity to fault line, landslides/historic alluvial fan, and older buildings are vulnerabilities Wallsburg to address with inspections and greater public education.

Addressing the Floodplain: Development Code Chapter 5.6 "Sensitive Lands Overlay Zone" requires a special permit for development on sensitive lands, which includes FEMA 100 yr floodplain. Chapter 5.6.7 "Development Standards for Floodplain Corridor Lands" prohibits excess fill in floodplain corridor, requires culverting or bridging a waterway design from an engineer, at least 1 ft above base flood elevation for any new structures, prohibits habitable basements in floodplain corridor, permits non-habitable basements if they are flood-proofed, prohibits storage of hazardous chemicals and fences that could collect debris during a flood. Chapter 6 states the Planning commission can deny development on unsuitable land, including that where flooding cannot be properly mitigated. Chapter 6.15.4 "flood plain areas should be preserved from any and all destruction or damage resulting from clearing, grading, or dumping of earth... except at the discretion of the Planning Commission."

Protecting Current Residents and Structures: Analysis of 2010 Goals (Wallsburg)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	No	Lack of information
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No	Talked about, in progress
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	No	Lack of information
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS	No	Limited staff

Protecting Future Residents and Structures: Analysis of 2010 Goals

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	No	Maps updated, need to be incorporated
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Need more information
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	No	No longer desirable
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Attempted, coordination beyond capabilities

Protecting Current Residents and Structures (Wallsburg)

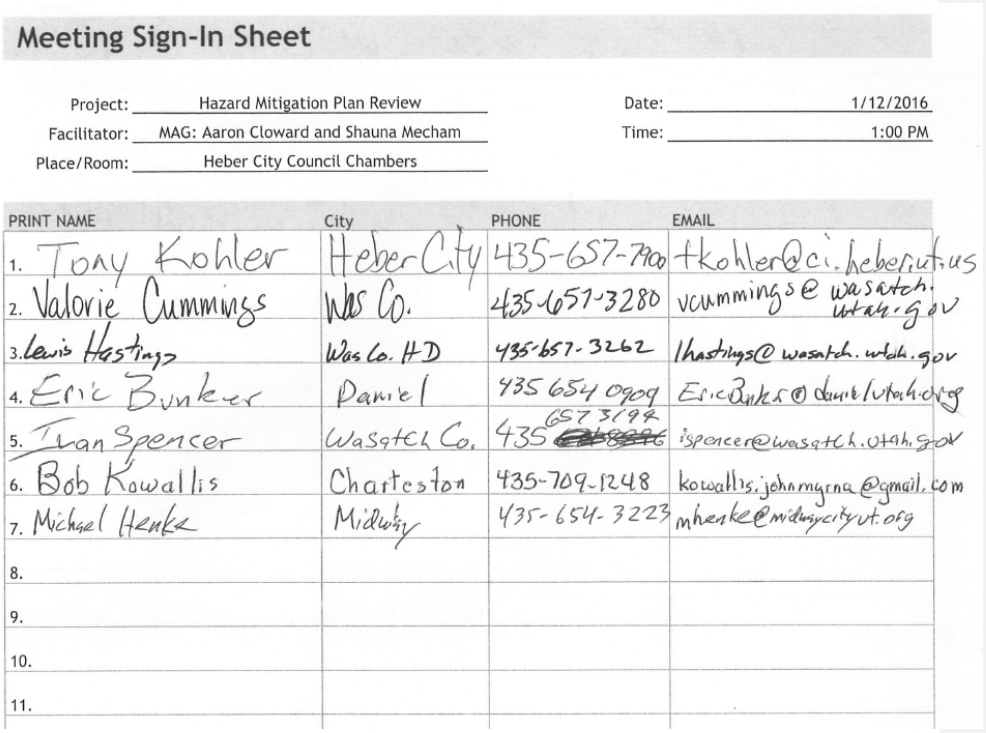
Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Promote NFIP participation.	High	1 year	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	No	Lack of information
Earthquake	Inventory current critical facilities, esp. City Hall, for seismic standards.	High	2 years	TBD	Local Cash, Grants	Local Government	No	Talked about, in progress
Wildfire	Educate homeowners on FIREWISE practices by passing out information on 24 July.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	No	Lack of information
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Low	Ongoing	TBD	Local Cash, Grants	Local Government, UGS	No	Limited staff

Protecting Future Residents and Structures

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?	If not, why not?
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	High	2 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	No	Maps updated, need to be incorporated
Earthquake	Promote earthquake awareness and preparation by providing information at 24 July activities.	Med	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No	Need more information

Other City Participation

The following jurisdictions were present at the first physical meeting with Wasatch County. All cities were contacted by email and phone on multiple occasions. Wallsburg had a separate meeting on May 10, 2016.



Meeting Sign-In Sheet

Project: Hazard Mitigation Plan Review
Facilitator: MAG: Aaron Cloward and Shauna Mecham
Place/Room: Heber City Council Chambers

Date: 1/12/2016
Time: 1:00 PM

	PRINT NAME	City	PHONE	EMAIL
1.	Tony Kohler	Heber City	435-657-7100	tkohler@ci.heber.ut.us
2.	Valorie Cummings	Was Co.	435-657-3280	vcummings@wasatch.utah.gov
3.	Lewis Hastings	Was Co. HD	435-657-3262	lhastings@wasatch.utah.gov
4.	Eric Bunker	Daniel	435 654 0909	EricBunker@daniel.utah.org
5.	Ivan Spencer	Wasatch Co.	435 657 3199	ispencer@wasatch.utah.gov
6.	Bob Kowallis	Charleston	435-709-1248	kowallis.johnmyrna@gmail.com
7.	Michael Henke	Midway	435-654-3223	mhenke@midwaycityut.org
8.				
9.				
10.				
11.				

Other Participation

Hideout	Spoke with Hideout clerks several times, exchanged multiple emails regarding possible strategies and reason for plan.
Independence	Spoke with and exchanged emails with Jodi Hoffman throughout the beginning of 2017.
Interlaken	Spoke with Bart on the phone to discuss hazards and develop strategies.

Part IX
Plan Maintenance

Plan Maintenance

Monitoring, Evaluating and Updating the Plan

Periodic monitoring and reporting of the Plan is required to ensure that the goals and objectives for the Mountainland Region are kept current and that local mitigation efforts are being carried out. The Plan has therefore been designed to be user-friendly in terms of monitoring implementation and preparing regular progress reports.

Annual Reporting Procedures

The Plan shall be reviewed annually, as required by the Executive Council, or as situations dictate such as following a disaster declaration. Each year the MAG Community Development Department Staff will review the plan and ensure the following:

1. The Executive Director and the Executive Council will receive an annual report and/or presentation on the implementation status of the Plan at the January Executive Council Meeting.

2. The report will include an evaluation of the effectiveness and appropriateness of the mitigation actions proposed in the Plan.

3. The report will recommend, as appropriate, any required changes or amendments to the Plan.

If the MAG Executive Council determines that a modification of the Plan is warranted, the Council may initiate a Plan amendment.

Revisions and Updates

Periodic revisions and updates of the Plan are required to ensure that the goals and objectives for the Mountainland Region are kept current. More importantly, revisions may be necessary to ensure the Plan is in full compliance with Federal regulations and State statutes. This portion of the Plan outlines the procedures for completing such revisions and updates.

Five (5) Year Plan Review

The entire plan including any background studies and analysis should be reviewed every five (5) years to determine if there have been any significant changes in the Mountainland Region 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.

The Pre-Disaster Hazard Mitigation Plan Ad-Hoc Committee, with a potential membership representing every jurisdiction in the MAG area, will be reconstituted for the five (5) year review/update process. Typically, the same process that was used to create the original plan will be used to prepare the update.

Further, following a disaster declaration, the Plan will need to be revised to reflect on lessons learned or to address specific circumstances arising out of the disaster.

The results of this five (5) year review should become summarized in the annual report prepared for this Plan under the direction of the Community Development Director. The annual report will include an evaluation of the effectiveness and appropriateness of the Plan, and will recommend, as appropriate, any required changes or amendments to the Plan.

If the Executive Council determines that the recommendations warrant modification to the Plan, the Council may either initiate a Plan amendment as described below, or, if conditions justify, may direct the MAG Community Development Department to undertake a complete update of the Plan.

Plan Amendments

An amendment to the Plan should be initiated only by the Executive Council, either at its own initiative or upon the recommendation of the Executive Director, Community Development Director, Mayor of an affected community or the State Department of Emergency Services and Homeland Security.

Upon initiation of an amendment to the Plan, Mountainland will forward information on the proposed amendment to all interested parties including, but not limited to, all affected city or county departments, residents and businesses. Depending on the magnitude of the amendment, the full Ad-Hoc committee may be reconstituted or the MAG Regional Growth Committee may review the amendment. At a minimum, the information will be made available through public notice in a newspaper of general circulation and on the Mountainland Website at www.mountainland.org. Information will also be forwarded to the Utah Department of Public Safety, Division of Emergency Management. This information will be sent out in order to seek input on the proposed Plan amendment for not less than a forty-five (45) day review and comment period.

At the end of the comment period, the proposed amendment and all review comments will be forwarded to the Executive Director (or his/her designee) for consideration. If no comments are received from the reviewing parties within the specified review period, such will be noted accordingly. The Executive Director (or his/her designee) will review the proposed amendment along with comments received from other parties and submit a recommendation to the Executive Council within sixty (60) 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.

Upon receiving the recommendation of the Executive Director or his/her designee, the Executive Council will hold a public hearing. The Executive Council will review the recommendation (including the factors listed above) and any oral or written comments received at the public hearing. Following that review, the Executive Council will take one of the following actions:

1. Adopt the proposed amendment as presented.

2. Adopt the proposed amendment with modifications.

3. Refer the amendment request back to the Executive Director for further consideration.

4. Defer the amendment request for further consideration and/or hearing.

5. Reject the amendment request.

Implementation through Existing Programs

Process

The Mountainland Association of Governments Pre-Disaster Hazard Mitigation Plan will be implemented through the General Plans and Capital Improvement Plans (CIP) of each local jurisdiction. It will be the responsibility of Mayor/Council/Commissioner(s) of each jurisdiction, as he/she/they see 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).

Prioritization

Each city or county within the jurisdiction of Mountainland Association of Governments were invited to attend an Plan orientation and strategy meeting geared toward the recognition and analysis of local and regional hazards and the development of strategies to mitigate threats. Each received a packet including: an analysis of hazards threatening their area, historical hazards, critical facilities, and other regional information. Each participating municipality identified “problem areas” and needed projects based on hazard likelihood, cost/benefit, available resources, and other factors; and independently, or in conjunction with Mountainland, directed mitigation strategies to improve those areas.

Administrative

Project administration is purely a function of project size and complexity, for given jurisdictions within the planning area. Jurisdictions have self-funded or received state and federal funding for numerous projects in the past. The larger the project the more administration resources are needed. Local jurisdictions with current staff could administer small projects or request county or state assistance. Larger projects would most likely still by managed “in-house” but would require additional staff be hired and may request state technical assistance.

Funding Sources

Although all mitigation techniques will likely save money by avoiding losses, many projects are costly to implement. The Mountainland jurisdictions will continue to seek outside funding assistance for mitigation projects in both the pre- and post-disaster environment. This portion of the Plan identifies the primary Federal and State grant programs for Mountainland jurisdictions to consider, and also briefly discusses local and non-governmental funding sources.

Federal

The following federal grant programs have been identified as funding sources which specifically target hazard mitigation projects:

Title: Pre-Disaster Mitigation Program

Agency: Federal Emergency Management Agency

Through the Disaster Mitigation Act of 2000, Congress approved the creation of a national program to provide a funding mechanism that is not dependent on a Presidential Disaster Declaration. The Pre-Disaster Mitigation (PDM) program provides funding to states and communities for cost-effective hazard mitigation activities that complement a comprehensive mitigation program and reduce injuries, loss of life, and damage and destruction of property.

The funding is based upon a 75% Federal share and 25% non-Federal share. The non-Federal match can be fully in-kind or cash, or a combination. Special accommodations will be made for "small and impoverished communities", who will be eligible for 90% Federal share/10% non-Federal.

FEMA provides PDM grants to states that, in turn, can provide sub-grants to local governments for accomplishing the following eligible mitigation activities:

- State and local hazard mitigation planning
- Technical assistance (e.g. risk assessments, project development)
- Mitigation Projects

- Acquisition or relocation of vulnerable properties
- Hazard retrofits
- Minor structural hazard control or protection projects
- Community outreach and education (up to 10% of State allocation)

Title: Flood Mitigation Assistance Program

Agency: Federal Emergency Management Agency

FEMA's Flood Mitigation Assistance program (FMA) provides funding to assist states and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes and other structures insurable under the National Flood Insurance Program (NFIP). FMA was created as part of the National Flood Insurance Reform Act of 1994 (42 USC 4101) with the goal of reducing or eliminating claims under the NFIP.

FMA is a pre-disaster grant program, and is available to states on an annual basis. This funding is available for mitigation planning and implementation of mitigation measures only, and is based upon a 75% Federal share/25% non-Federal share. States administer the FMA program and are responsible for selecting projects for funding from the applications submitted by all communities within the state. The state then forwards selected applications to FEMA for an eligibility determination. Although individuals cannot apply directly for FMA funds, their local government may submit an application on their behalf.

Title: Hazard Mitigation Grant Program

Agency: Federal Emergency Management Agency

The Hazard Mitigation Grant Program (HMGP) was created in November 1988 through Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistant Act. The HMGP assists states and local communities in implementing long-term mitigation measures following a Presidential disaster declaration.

To meet these objectives, FEMA can fund up to 75% of the eligible costs of each project. The state or local cost-share match does not need to be cash; in-kind services or materials may also be used. With the passage of the Hazard Mitigation and Relocation Assistance Act of 1993, federal funding under the HMGP is now based on 15% of the federal funds spent on the Public and Individual Assistance programs (minus administrative expenses) for each disaster.

The HMGP can be used to fund projects to protect either public or private property, so long as the projects in question fit within the state and local governments overall mitigation strategy for the disaster area, and comply with program guidelines. Examples of projects that may be funded include the acquisition or relocation of structures from hazard-prone areas, the retrofitting of existing structures to protect them from future damages; and the development of state or local standards designed to protect buildings from future damages.

Eligibility for funding under the HMGP is limited to state and local governments, certain private nonprofit organizations or institutions that serve a public function, Indian tribes and authorized tribal organizations. These organizations must apply for HMPG project funding on behalf of their citizens. In turn, applicants must work through their state, since the state is responsible for setting priorities for funding and administering the program.

Title: Public Assistance (Infrastructure) Program, Section 406

Agency: Federal Emergency Management Agency

FEMA's Public Assistance Program, through Section 406 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, provides funding to local governments following a Presidential Disaster Declaration for mitigation measures in conjunction with the repair of damaged public facilities and infrastructure. The mitigation measures must be related to eligible disaster related damages and must directly reduce the potential for future, similar disaster damages to the eligible facility. These opportunities usually present themselves during the repair/replacement efforts.

Proposed projects must be approved by FEMA prior to funding. They will be evaluated for cost effectiveness, technical feasibility and compliance with statutory, regulatory and executive order requirements. In addition, the evaluation must ensure that the mitigation measures do not negatively impact a facility's operation or risk from another hazard.

Public facilities are operated by state and local governments, Indian tribes or authorized tribal organizations and include:

- Roads, bridges & culverts
- Draining & irrigation channels
- Schools, city halls & other buildings
- Water, power & sanitary systems
- Airports & parks

Private nonprofit organizations are groups that own or operate facilities that provide services otherwise performed by a government agency and include, but are not limited to the following:

- Universities and other schools
- Hospitals & clinics
- Volunteer fire & ambulance
- Power cooperatives & other utilities
- Custodial care & retirement facilities
- Museums & community centers

Title: SBA Disaster Assistance Program

Agency: US Small Business Administration

The SBA Disaster Assistance Program provides low-interest loans to businesses following a Presidential disaster declaration. The loans target businesses to repair or replace uninsured disaster damages to property owned by the business, including real estate, machinery and equipment, inventory and supplies. Businesses of any size are eligible, along with non-profit organizations.

SBA loans can be utilized by their recipients to incorporate mitigation techniques into the repair and restoration of their business.

Title: Community Development Block Grants

Agency: US Department of Housing and Urban Development

The community Development Block Grant (CDBG) program provides grants to local governments for community and economic development projects that primarily benefit low- and moderate-income people. The CDBG program also provides grants fro post-disaster hazard mitigation and recovery following a Presidential disaster declaration. Funds can be used for activities such as acquisition, rehabilitation or reconstruction of damaged properties and facilities and for the redevelopment of disaster areas.

STATE PROGRAMS

See the Capabilities Assessment Annex of this document for a full description of the State Programs available.

LOCAL

Local governments depend upon local property taxes as their primary source of revenue. These taxes are typically used to finance services that must be available and delivered on a routine and regular basis to the general public. If local budgets allow, these funds are used to match Federal or State grant programs when required for large-scale projects.

NON-GOVERNMENTAL

Another potential source of revenue for implementing local mitigation projects are monetary contributions from non-governmental organizations, such as private sector companies, churches, charities, community relief funds, the Red Cross, hospitals, Land Trusts and other non-profit organizations.

Paramount to having a plan deemed to be valid is its implementation. There is currently no new fiscal note attached to the implementation of this Plan.

Continued Public Involvement

Throughout the planning process, public involvement has been and will be critical to the development of the Plan and its updates. On a yearly basis the plan will be profiled at Mountainland's Annual Open Houses, which are held in the fall of every year. There are typically 400 to 500 local citizens who attend

the Open Houses. The plan will also be available on the MAG website to provide additional opportunities for public participation and comment.

Mountainland Association of Governments staff has been designated by its Executive Council as the lead agency in preparing and submitting the Mountainland Pre-Disaster Hazard Mitigation Plan, which includes coverage for all incorporated cities and counties within the three county region, i.e. Summit, Utah and Wasatch Counties. The strategy of the Association of Governments in preparing the plan is to use available resources and manpower in the most efficient and cost effective manner to allow our cities and counties continued access to data, technical planning assistance and FEMA eligibility. In addition, the AOG will reach out to non-profits, public agencies, special needs organizations, groups and individuals in allowing them input and access to the plan. With limited resources, however, it becomes difficult to both identify and to individually contact the broad range of potential clients that may stand to benefit from the plan. This being the case, we have established the following course of action:

STEP 1. The AOG will publicly advertise all hearings, requests for input and meetings directly related to the Pre-Disaster Hazard Mitigation Plan process. Executive Council meetings where plan items are discussed and where actions are taken will not receive special notifications as they are already advertised according to set standards. All interested parties are welcome and invited to attend such meetings and hearings as they are public and open to all. Advertisement will be done according to the pattern set in previous years, i.e. the AOG will advertise each hearing and request for input at least seven days (7) in advance of the activity and will publish notices of the event in the Provo Herald, the Wasatch Wave and the Summit County Bee. The notices will advertise both the hearing and the means of providing input outside the hearing if an interested person is unable to attend.

STEP 2. The AOG has established a mailing list of many local agencies and individuals that may have an interest in the Pre-Disaster Hazard Mitigation Plan. Each identified agency or person will be mailed a notice of the hearings and open houses.

STEP 3. Comments, both oral and written, will be solicited and accepted from any interested party. Comments, as far as possible, will be included in the final draft of the Hazard Mitigation Plan; however, the AOG reserves the right to limit comments that are excessively long due to the size of the Plan.

STEP 4. Specific to risk assessment and hazard mitigation, needs analysis, and capital investment strategies, the AOG will make initial contact and solicitation for input from each incorporated

jurisdiction within the region. All input is voluntary. Staff time and resources do not allow personal contact with other agencies or groups, however, comments and strategies are welcomed as input to the planning process from any party via regular mail, FAX, e-mail, phone call, etc. In addition, every public jurisdiction advertises and conducts public hearings on their planning, budget, etc. where most of these mitigation projects are initiated. Input can be received from these prime sources by the region as well.

STEP 5. The final draft of the Hazard Mitigation Plan will be presented to the Mountainland Executive Council at its regularly scheduled monthly meeting for adoption and approval. Executive Council policies on adoption or approval of items will be in force and adhered to. This document is intended to be flexible and in constant change so comments can be taken at any time of the year for consideration and inclusion in the next update. Additionally, after FEMA approval of the Plan, the Plan will be promulgated for each local jurisdiction for adoption by resolution.

STEP 6. The following policies will guide AOG staff in making access and input to the Hazard Mitigation Plan as open and convenient as possible:

A. Participation: All citizens of the region are encouraged to participate in the planning process, especially those who may reside within identified hazard areas. The AOG will take whatever actions possible to accommodate special needs of individuals including the impaired, non-English speaking, persons of limited mobility, etc.

B. Access to Meetings: Adequate and timely notification to all area residents will be given as outlined above to all hearings, forums, and meetings.

C. Access to Information: Citizens, public jurisdictions, agencies and other interested parties will have the opportunity to receive information and submit comments on any aspect of the Hazard Mitigation Plan, and/or any other documents prepared for distribution by the Association of Governments that may be adopted as part of the plan by reference. The AOG may charge a nominal fee for printing of documents that are longer than three pages.

D. Technical Assistance: Residents as well as local jurisdictions may request assistance in accessing the program and interpretation of mitigation projects. AOG staff will assist to the extent

practical, however, limited staff time and resources may prohibit staff from giving all the assistance requested. The AOG will be the sole determiner of the amount of assistance given all requests.

E. Public Hearings: The AOG will plan and hold public hearings according to the following priorities: 1- Hearings will be conveniently timed for people who might benefit most from Mitigation programs, 2- Hearings will be accessible to people with disabilities (accommodations must be requested in advance according to previously established policy), and 3- Hearings will be adequately publicized. Hearings may be held for a number of purposes or functions including to: a-identify and profile hazards, b-develop mitigation strategies, and c-review plan goals, performance, and future plans.

F. Comment Period: The AOG will sponsor a 30-day public comment period prior to final plan adoption. The comment period will begin with a public hearing to open the 30-day solicitation of input. Comments may be made orally, or in writing, and as far as possible, will be included in the final Pre-Disaster Hazard Mitigation Plan according to the outlined participation rules.

Part X
Additional State Requirements Capability Assessment

INTRODUCTION

What follows is a description of the organizational, technical and political capacity of the Mountainland Region to implement hazard mitigation strategies and goals. The best plan will do nothing to improve hazard mitigation efforts in the region without sufficient implementation capacity and capability; particularly local level capacity (town, city and county government). The purpose of this section is to analyze gaps and potential capability weaknesses for local level jurisdictions in the region.

LOCAL ORGANIZATIONAL AND TECHNICAL CAPABILITY

Not all of communities in the Mountainland region have full time professional staff. In many cases a limited tax base means that hiring full time professional staff in the smaller cities and towns is financially unobtainable. Often these smaller communities rely on local volunteers or elected and appointed officials to perform many of the tasks normally handled by professional staff. It's not uncommon to have a volunteer city council persons or planning commissioner assigned the task of emergency management, grant writing or long range planning. Professional staff at MAG (and each of the three counties to some degree) help provide some technical and planning assistance to these smaller communities. This regional assistance is often limited by staffing capacity and funding. As funding allows, some communities are able to contract for professional services from private consultants.

Table 6.1: State and Regional Hazard Mitigation Resources MAG District

Agency/Group	Description
Utah Division of Emergency Management	Training, technical assistance and funding.
Utah League of Cities and Towns	Training, technical assistance and planning assistance
Utah Geologic Survey	Technical assistance, plan review
Mountainland Association of Governments	Technical assistance, plan review, GIS and Community Development Block Grants.

Table 6.1: State and Regional Hazard Mitigation Resources MAG District	
Agency/Group	Description
Local Health Departments	Emergency preparedness and response. Homeland security planning.
Local Chapters of the American Red Cross	Training, emergency preparedness and response.
Utah Association of Conservation Districts	Technical assistance and planning assistance.

Table 6.2: Local Level Hazard Mitigation Capability MAG District		
Jurisdiction	Professional Staffing (e.g. City Manager, Engineer, Planner)	Technical Capacity (In House)
SUMMIT COUNTY	County Emergency Management Coordinator, County Planner, Public Works, Building Inspector	GIS Staffing and equipment
Coalville	Volunteer\contracted consultant	None
Daniel	Volunteer\contracted consultant	None
Francis	Volunteer\contracted consultant	None
Henefer	Volunteer\contracted consultant	None
Hideout	Volunteer\contracted consultant	None
Independence	Volunteer\contracted consultant	None
Interlaken	Volunteer\contracted consultant	None
Kamas	Police, Planner, Public Works, Consultant	None
Oakley	Police, Planner, Public Works, Consultant	None
Park City	Emergency Manager, Planning Department, Public Works	GIS Staffing and equipment
UTAH COUNTY	Countywide Planner, Emergency Manager, Sheriff	Advanced GIS capability with customized application to Emergency Management.
Alpine	City Administrator, Planner, Public Works	Some GIS Capability
American Fork	Chief of Staff, Public Works, Police	GIS Capability and staffing
Cedar Fort	Volunteer\contracted consultant	None
Cedar Hills	City Administrator, Planner, Public Works	None

Table 6.2: Local Level Hazard Mitigation Capability MAG District		
Jurisdiction	Professional Staffing (e.g. City Manager, Engineer, Planner)	Technical Capacity (In House)
Eagle Mountain	City Administrator, Planner, Public Works	Some GIS Capability
Elk Ridge	Planner, Volunteer	Some GIS Capability
Fairfield	Volunteer\contracted consultant	None
Genola	Volunteer\contracted consultant	None
Goshen	Volunteer\contracted consultant	None
Highland	City Administrator, Planner, Public Works	Some GIS Capability
Lehi	City Administrator, Planner, Public Works	GIS Capability and staffing
Lindon	City Administrator, Planner, Public Works	Some GIS Capability
Mapleton	City Administrator, Planner, Public Works	Some GIS Capability
Orem	Emergency Management Department, Planning Department, City Engineers & Public Works.	Advanced GIS capability with customized application to Emergency Management.
Payson	City Administrator, Planner, Public Works	Some GIS Capability
Pleasant Grove	City Administrator, Planner, Public Works	Some GIS Capability
Provo	Emergency Management Department, Planning Department, City Engineers & Public Works.	Advanced GIS capability with customized application to Emergency Management.
Salem	City Administrator, Public Works	None
Santaquin	City Administrator, Planner, Public Works	Some GIS Capability
Saratoga Springs	City Administrator, Planner, Public Works	Some GIS Capability
Spanish Fork	City Administrator, Planner, Public Works	Some GIS Capability
Springville	City Administrator, Planner, Public Works	Some GIS Capability

Table 6.2: Local Level Hazard Mitigation Capability MAG District		
Jurisdiction	Professional Staffing (e.g. City Manager, Engineer, Planner)	Technical Capacity (In House)
Vineyard	Volunteer\contracted consultant	None
Woodland Hills	Volunteer\contracted consultant	None
WASATCH COUNTY	County Administrator, Countywide Planner , Emergency Manager, Sheriff	Advanced GIS capability with customized application to Emergency Management.
Charleston	Volunteer\contracted consultant	None
Heber	City Administrator, Planner, Public Works	Some GIS Capability
Midway	City Administrator, Planner, Public Works	Some GIS Capability
Wallsburg	Volunteer\contracted consultant	None
Daniel	Volunteer\contracted consultant	None
Independence	Volunteer\contracted consultant	None
Hideout	Volunteer\contracted consultant	None

POLICY AND PROGRAM CAPABILITY

All thirty-six jurisdictions in the MAG Region have an adopted General Plan. Although many communities have recently updated their General Plan, many are very outdated and have not been revised in years. Generally speaking, if these plans address natural hazards at all, it is usually limited to flood related hazards. For example, the section of Summit County Ordinance below is included in many city codes and is the most comprehensive Floodplain Management encountered in any code or ordinance.

“FLOOD DAMAGE PREVENTION ORDINANCE”

“WHEREAS , the State Legislature has in Title 17, Utah Code Annotated (1953) as amended, delegated the responsibility to the local government units to adopt regulations designed to promote the public health, safety, and general welfare of its citizenry; and, WHEREAS , the flood hazard areas of Summit County, Utah are subject to periodic inundation which results in loss of life and property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief and impairment of the tax base, all of which adversely affect the public health, safety and general welfare; and, WHEREAS , the flood losses are caused by the cumulative effect of obstructions in areas of special flood hazard which increase flood heights and velocities, and when inadequately anchored, damage uses in other areas, and uses that are inadequately flood proofed, elevated or otherwise protected from flood damage also contribute to the flood loss; NOW, THEREFORE , be it ordained by the Board of County Commissioners of Summit County, State of Utah, as follows: 12-1-1. PURPOSE It is the purpose of this ordinance to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions to specific areas by provisions designed to do the following: A. Protect human life and health; B. Minimize expenditure of public money for costly flood control projects; C. Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public; D. Minimize prolonged business interruptions; E. Minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, and streets and bridges located in areas of special flood hazard; F. Help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future flood blight areas; G. Ensure that potential home buyers are notified that property is in an area of special flood hazard; and, H. Ensure that those who occupy the areas of special flood hazard assume responsibility for their actions. Page 2 of 19 12-2- 2. METHODS OF REDUCING FLOOD LOSSES In order to accomplish its purposes, this ordinance includes methods and provisions for: A. Restricting or prohibiting uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or flood heights and velocities; B. Requiring that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction; C. Controlling the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel flood waters; D. Controlling filling, grading, dredging, and other development which may increase flood damage; and, E. Preventing or regulating the construction of flood barriers which will unnaturally divert flood waters or which may increase flood hazards in other areas. 12-1- 3. DEFINITIONS Unless specifically defined below, words or phrases used herein shall be interpreted so as to give them the meaning they have in common usage and to give this ordinance its most reasonable application. ALLUVIAL FAN FLOODING - means flooding occurring on the surface of an alluvial fan or similar landform which originates at the apex and is characterized by high-velocity flows; active processes of erosion, sediment transport, and deposition; and unpredictable flow paths. APEX - means a point on an alluvial fan or similar landform below which the flow path of the major stream that formed the fan becomes unpredictable and alluvial fan flooding can occur. AREA OF SHALLOW FLOODING - means a designated AO, AH, or VO zone on a community's Flood Insurance Rate Map (FIRM) with a one percent chance or greater annual chance of flooding to an average depth of one to three feet where a clearly defined channel does not exist, where the path of flooding is unpredictable and where velocity flow may be evident. Such flooding is characterized by ponding or sheet flow. AREA OF SPECIAL FLOOD HAZARD - is the land in the floodplain within a community subject to a one percent or greater chance of flooding in any given year. The area may be designated as Zone A on the Flood Hazard Boundary Map (FHBM). After detailed rate making has been completed in preparation for publication of the FIRM, Zone A usually is refined into Zones A, AE, AH, AO, A1-99, VO, V1-30, VE or V. BASE FLOOD -means the flood having a one percent chance of being equaled or exceeded in any given year. BASEMENT - means any area of the building having its floor sub-grade (below ground level) on all sides. CRITICAL FEATURE - means an integral and readily identifiable part of a flood protection system, without which the flood protection provided by the entire system would be

compromised. DEVELOPMENT -means any man-made change in improved and unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials. Page 3 of 19 ELEVATED BUILDING -means a non-basement building (I) built, in the case of a building in Zones A1-30, AE, A, A99, AO, AH, B, C, X, and D, to have the top of the elevated floor, or in the case of a building in Zones V1-30, VE, or V, to have the bottom of the lowest horizontal structure member of the elevated floor elevated above the ground level by means of pilings, columns (posts and piers), or shear walls parallel to the floor of the water and (ii) adequately anchored so as not to impair the structural integrity of the building during a flood of up to the magnitude of the base flood. In the case of Zones A1-30, AE, A, A99, AO, AH, B, C, X, and D, "elevated building" also includes a building elevated by means of fill or solid foundation perimeter walls with openings sufficient to facilitate the unimpeded movement of flood waters. In the case of Zones V1-30, VE, or V, "elevated building" also includes a building otherwise meeting the definition of "elevated building," even though the lower area is enclosed by means of breakaway walls if the breakaway walls met the standards of Section 60.3(e)(5) of the National Flood Insurance Program regulations. EXISTING CONSTRUCTION - means for the purposes of determining rates, structures for which the "start of construction" commenced before the effective date of the FIRM or before January 1, 1975, for FIRMs effective before that date. "Existing construction" may also be referred to as "existing structures." EXISTING MANUFACTURED HOME PARK OR SUBDIVISION - means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including, at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed before the effective date of the floodplain management regulations adopted by a community. EXPANSION TO AN EXISTING MANUFACTURED HOME PARK OR SUBDIVISION - means the preparation of additional sites by the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads). FLOOD OR FLOODING - means a general and temporary condition of partial or complete inundation of normally dry land areas from: 1. the overflow of inland or tidal waters. 2. the unusual and rapid accumulation or runoff of surface waters from any source. FLOOD INSURANCE RATE MAP (FIRM) - means an official map of a community, on which the Federal Emergency Management Agency has delineated both the areas of special flood hazards and the risk premium zones applicable to the community. FLOOD INSURANCE STUDY - is the official report provided by the Federal Emergency Management Agency. The report contains flood profiles, water surface elevation of the base flood, as well as the Flood Boundary-Floodway Map. FLOODPLAIN OR FLOOD-PRONE AREA - means any land area susceptible to being inundated by water from any source (see definition of flooding). FLOODPLAIN MANAGEMENT - means the operation of an overall program of corrective and preventive measures for reducing flood damage, including but not limited to emergency preparedness plans, flood control works and floodplain management regulations. FLOODPLAIN MANAGEMENT REGULATIONS - means zoning ordinances, subdivision regulations, building codes, health regulations, special purpose ordinances (such as a floodplain ordinance, grading ordinance and erosion control ordinance) and other applications of police power. The term describes such state or local regulations, in any combination thereof, which provide standards for the purpose of flood damage prevention and reduction. FLOOD PROTECTION SYSTEM -means those physical structural works for which funds have been authorized, appropriated, and expended and which have been constructed specifically to modify flooding in order to reduce the extent of the areas within a community subject to a "special flood hazard" and the extent of the depths of associated flooding. Such a system typically includes hurricane tidal barriers, dams, reservoirs, levees or dikes. These specialized flood modifying works are those Page 4 of 19 constructed in conformance with sound engineering standards. FLOOD PROOFING - means any combination of structural and non-structural additions, changes, or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures and their contents. FLOODWAY (REGULATORY FLOODWAY) - means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water

surface elevation more than a designated height. FUNCTIONALLY DEPENDENT USE - means a use which cannot perform its intended purpose unless it is located or carried out in close proximity to water. The term includes only docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers, and ship building and ship repair facilities, but does not include long-term storage or related manufacturing facilities. HIGHEST ADJACENT GRADE - means the highest natural elevation of the ground surface prior to construction next to the proposed walls of a structure. HISTORIC STRUCTURE - means any structure that is: 1. Listed individually in the National Register of Historic Places (a listing maintained by the Department of Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register; 2. Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district; 3. Individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the Secretary of Interior; or 4. Individually listed on a local inventory or historic places in communities with historic preservation programs that have been certified either: a) by an approved state program as determined by the Secretary of the Interior or; b) directly by the Secretary of the Interior in states without approved programs. LEVEE -means a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to provide protection from temporary flooding. LEVEE SYSTEM - means a flood protection system which consists of a levee, or levees, and associated structures, such as closure and drainage devices, which are constructed and operated in accordance with sound engineering practices. LOWEST FLOOR - means the lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking or vehicles, building access or storage in an area other than a basement area is not considered a building's lowest floor; provided that such enclosure is not built so as to render the structure in violation of the applicable non-elevation design requirement of Section 60.3 of the National Flood insurance Program regulations. MANUFACTURED HOME - means a structure transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when connected Page 5 of 19 to the required utilities. The term "manufactured home" does not include a "recreational vehicle". MANUFACTURED HOME PARK OR SUBDIVISION - means a parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale. MEAN SEA LEVEL -means, for purposes of the National Flood Insurance Program, the National Geodetic Vertical Datum (NGVD) of 1929 or other datum, to which base flood elevations shown on a community's Flood Insurance Rate Map are referenced. NEW CONSTRUCTION - means, for the purpose of determining insurance rates, structures for which the "start of construction" commenced on or after the effective date of an initial FIRM or after December 31, 1974, whichever is later, and includes any subsequent improvements to such structures. For floodplain management purposes, "new construction" means structures for which the "start of construction" commenced on or after the effective date of a floodplain management regulation adopted by a community and includes any subsequent improvements to such structures. NEW MANUFACTURED HOME PARK OR SUBDIVISION - means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed on or after the effective date of floodplain management regulations adopted by a community. RECREATIONAL VEHICLE - means a vehicle which is: 1. built on a single chassis; 2. 400 square feet or less when measured at the largest horizontal projections; 3. designed to be self-propelled or permanently towable by a light duty truck; and 4. designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use START OF CONSTRUCTION - (for other than new construction or substantial improvements under the Coastal Barrier Resources Act (Pub. L. 97-348)), includes substantial improvement and means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, rehabilitation, addition, placement, or other improvement was within 180 days of the permit date. The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or

footings, the installation of piles, the construction of columns, or any work beyond the stage of excavation; or the placement of a manufactured home on a foundation. Permanent construction does not include land preparation, such as clearing, grading and filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for basement, footings, piers or foundations or the erection of temporary forms; nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure. For a substantial improvement, the actual start of construction means the first alteration of any wall, ceiling, floor, or other structural part of a building, whether or not that alteration affects the external dimensions of the building. STRUCTURE - means a walled and roofed building, including a gas or liquid storage tank, that is principally above ground, as well as a manufactured home. SUBSTANTIAL DAMAGE - means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market Page 6 of 19 value of the structure before the damage occurred. SUBSTANTIAL IMPROVEMENT -means any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before "start of construction" of the improvement. This includes structures which have incurred "substantial damage", regardless of the actual repair work performed. The term does not, however, include either: 1. Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary conditions or 2. Any alteration of a "historic structure", provided that the alteration will not preclude the structure's continued designation as a "historic structure." VARIANCE - is a grant of relief to a person from the requirement of this ordinance when specific enforcement would result in unnecessary hardship. A variance, therefore, permits construction or development in a manner otherwise prohibited by this ordinance. (For full requirements see Section 60.6 of the National Flood Insurance Program regulations.) VIOLATION - means the failure of a structure or other development to be fully compliant with the community's floodplain management regulations. A structure or other development without the elevation certificate, other certifications, or other evidence of compliance required in Section 60.3(b)(5), (c)(4), (c)(10), (d)(3), (e)(2), (e)(4), or (e)(5) of the National Flood Insurance Program regulations is presumed to be in violation until such time as that documentation is provided. WATER SURFACE ELEVATION - means the height, in relation to the National Geodetic Vertical Datum (NGVD) of 1929 (or other datum, where specified), of floods of various magnitudes and frequencies in the floodplains of coastal or riverine areas. Chapter 2 GENERAL PROVISIONS 12-2-1 LANDS TO WHICH THIS ORDINANCE APPLIES This ordinance shall apply to all areas of special flood hazard within the jurisdiction of Summit County, Utah. 12-2-2 BASIS FOR ESTABLISHING AREAS OF SPECIAL FLOOD HAZARD The areas of special flood hazard identified by the Federal Emergency Management Agency in its Flood Insurance Rate Map (FIRM) dated March 16, 2006, is adopted by reference and declared to be a part of this ordinance. The FIRM is on file at the Office of the County Engineer located at 60 North Main, Coalville, Utah. 12-2-3 COMPLIANCE No structure or land shall hereafter be constructed, located, extended, or altered, or have its use changed without full compliance with the terms of this ordinance and other applicable regulations. 12-2-4 ABROGATION AND GREATER RESTRICTIONS Page 7 of 19 This ordinance is not intended to repeal, abrogate, or impair any existing easements, covenants, deed restrictions, or ordinances. However, where this ordinance and easement, covenant, deed restriction, or another ordinance conflict or overlap, whichever imposes the more stringent restrictions shall prevail. 12-2-5 INTERPRETATION In the interpretation of this ordinance, all provisions shall be: A. Considered as minimum requirements; B. Liberally construed in favor of the governing body; and C. Deemed neither to limit nor repeal any other powers granted under State statute. 12-2-6 WARNING AND DISCLAIMER OF LIABILITY The degree of flood protection required by this ordinance is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur on rare occasions. Flood heights may be increased by man made or natural causes. This ordinance does not imply that land outside the areas of special flood hazard or uses permitted within such areas will be free from flooding or flood damages. This ordinance shall not create liability on the part of Summit County, any officer, or employee thereof, or the Federal Emergency

Management Agency for any flood damages that result from reliance on this ordinance or any administrative decision lawfully made thereunder. Chapter 3. ADMINISTRATION 12-3-1 DESIGNATION OF ORDINANCE ADMINISTRATOR The County Engineer is hereby appointed to administer and implement this ordinance by granting or denying Flood Hazard Use Permit applications in accordance with the provisions set forth herein. 12-3-2 FLOODPLAIN DEVELOPMENT PERMIT A Floodplain Development Permit shall be obtained before any construction or development begins within any area of special flood hazard established in Section 12-2-2 herein. Application for a Floodplain Development Permit shall be made on forms furnished by the County Engineer and shall include, but not be limited to, the following: A. Three (3) copies of a topographic site plan drawn to scale showing the nature, location, dimensions, and elevations of the area in question; existing and proposed structures, fill, storage of materials, and drainage Page 8 of 19 facilities. B. Base flood elevation data for proposed development area. C. Elevation in relation to mean sea level of the lowest floor (including basements) of all structures. D. Elevation in relation to mean sea level to which any structure has been floodproofed. E. Certification by a licensed professional engineer that the floodproofing methods for any non-residential structure meet the floodproofing criteria in Section 12-4-2(B). F. Description of the extent to which any watercourse will be altered or relocated as a result of the proposed development. 12-3-3 DUTIES AND RESPONSIBILITIES OF ORDINANCE ADMINISTRATOR Duties and responsibilities of the Floodplain Administrator shall include, but not be limited to, the following: A. Maintain and hold open for public inspection all records pertaining to the provisions of this ordinance. B. Review permit application to determine whether proposed building site, including the placement of manufactured homes, will be reasonably safe from flooding. C. Review, approve or deny all applications for development permits required by adoption of this ordinance. D. Review permits for proposed development to assure that all necessary permits have been obtained from those Federal, State or local governmental agencies (including Section 404 of the Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. 1334) from which prior approval is required. E. Where interpretation is needed as to the exact location of the boundaries of the areas of special flood hazards (for example, where there appears to be a conflict between a mapped boundary and actual field conditions) the Floodplain Administrator shall make the necessary interpretation. F. Notify, in riverine situations, adjacent communities and the State Department of Natural Resources, prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the Federal Emergency Management Agency. Page 9 of 19 G. Assure that the flood carrying capacity within the altered or relocated portion of any watercourse is maintained. H. When base flood elevation data has not been provided in accordance with Section 12-2-2, the Floodplain Administrator shall obtain, review and reasonably utilize any base flood elevation data and floodway data available from a Federal, State or other source, in order to administer the provisions of Chapter 4. I. When a regulatory floodway has not been designated, the Floodplain Administrator must require that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community. J. Under the provisions of 44 CFR Chapter 1, Section 65.12, of the National Flood Insurance Program regulations, a community may approve certain development in Zones A1-30, AE, AH, on the community's FIRM which increases the water surface elevation of the base flood by more than one foot, provided that the community first applies for a conditional FIRM revision through FEMA (Conditional Letter of Map Revision). 12-3-4 PERMIT PROCEDURES Application for a Flood Plain Development Permit shall be presented to the Floodplain Administrator on forms furnished by him/her and may include, but not be limited to, plans in duplicate drawn to scale showing the location, dimensions, and elevation of proposed landscape alterations, existing and proposed structures, including the placement of manufactured homes, and the location of the foregoing in relation to areas of special flood hazard. Additionally, the following information is required: A. Elevation (in relation to mean sea level), of the lowest floor (including basement) of all new and substantially improved structures; B. Elevation in relation to mean sea level to which any nonresidential structure shall be floodproofed; C. A certificate from a registered professional engineer or architect that the nonresidential

floodproofed structure shall meet the floodproofing criteria of Section 12-4-2(B); D. Description of the extent to which any watercourse or natural drainage Page 10 of 19 will be altered or relocated as a result of proposed development. E. Maintain a record of all such information in accordance with 12-3-3 (A). Approval or denial of a Development Permit by the Floodplain Administrator shall be based on all of the provisions of this ordinance and the following relevant factors: F. The danger to life and property due to flooding or erosion damage; G. The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner; H. The danger that materials may be swept onto other lands to the injury of others; I. The compatibility of the proposed use with existing and anticipated development; J. The safety of access to the property in times of flood for ordinary and emergency vehicles; K. The costs of providing governmental services during and after flood conditions including maintenance and repair of streets and bridges, and public utilities and facilities such as sewer, gas, electrical and water systems; L. The expected heights, velocity, duration, rate of rise and sediment transport of the flood waters and the effects of wave action, if applicable, expected at the site; M. The necessity to the facility of a waterfront location, where applicable; N. The availability of alternative locations, not subject to flooding or erosion damage, for the proposed use; O. The relationship of the proposed use to the comprehensive plan for that area. 12-3-5 APPEAL and VARIANCE PROCEDURES A. The appeal Board as established by the community shall hear and render judgement on requests for variances from the requirements of this ordinance. B. The Appeal Board shall hear and render judgement on an appeal only Page 11 of 19 when it is alleged there is an error in any requirement, decision, or determination made by the Floodplain Administrator in the enforcement or administration of this ordinance. C. Any person or persons aggrieved by the decision of the Appeal Board may appeal such decision in the courts of competent jurisdiction. D. The Floodplain Administrator shall maintain a record of all actions involving an appeal and shall report variances to the Federal Emergency Management Agency upon request. E. Variances may be issued for the reconstruction, rehabilitation or restoration of structures listed on the National Register of Historic Places or the State Inventory of Historic Places, without regard to the procedures set forth in the remainder of this ordinance. F. Variances may be issued for new construction and substantial improvements to be erected on a lot of one-half acre or less in size contiguous to and surrounded by lots with existing structures constructed below the base flood level, providing the relevant factors in Section 12-3-4 of this Ordinance have been fully considered. As the lot size increases beyond the one-half acre, the technical justification required for issuing the variance increases. G. Upon consideration of the factors noted above and the intent of this ordinance, the Appeal Board may attach such conditions to the granting of variances as it deems necessary to further the purpose and objectives of this ordinance. H. Variances shall not be issued within any designated floodway if any increase in flood levels during the base flood discharge would result. I. Variances may be issued for the repair or rehabilitation of historic structures upon a determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as a historic structure and the variance is the minimum necessary to preserve the historic character and design of the structure. K. Prerequisites for granting variances: 1) Variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief. 2) Variances shall only be issued upon: Page 12 of 19 a) showing a good and sufficient cause; b) a determination that failure to grant the variance would result in exceptional hardship to the applicant which is not self imposed, and c) a determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, create nuisances, cause fraud on or victimization of the public, or conflict with existing local laws or ordinances. 3) Any application to whom a variance is granted shall be given written notice that the structure will be permitted to be built with the lowest floor elevation below the base flood elevation, and that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced lowest floor elevation. L. Variances may be issued for new construction and substantial improvements and for other development necessary for the conduct of a functionally dependent use provided that: 1) the criteria outlined in Section 12-5-5 are met, and 2) the structure or other development is protected by methods that minimize flood damages during the base flood and create no additional threats to public safety. Chapter 4. PROVISIONS FOR FLOOD HAZARD REDUCTION 12-4-1 GENERAL STANDARDS In all areas of special flood hazards the

following provisions are required for all new construction and substantial improvements: A. All new construction or substantial improvements shall be designed (or modified) and adequately anchored to prevent flotation, collapse or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy; B. All new construction or substantial improvements shall be constructed by methods and practices that minimize flood damage; C. All new construction or substantial improvements shall be constructed Page 13 of 19 with materials resistant to flood damage; D. All new construction or substantial improvements shall be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding. E. All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system; F. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the system and discharge from the systems into flood waters; and, G. On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding. 12-4-2 SPECIFIC STANDARDS In all areas of special flood hazards where base flood elevation data has been provided as set forth in (i) Section 12-2-2, (ii) Section 12-3-4(H), or (iii) Section 12-4-3, the following provisions are required: A. Residential Construction -new construction and substantial improvement of any residential structure shall have the lowest floor (including basement), elevated to or above the base flood elevation. A registered professional engineer, architect, or land surveyor shall submit a certification to the Floodplain Administrator that the standard of this subsection as proposed in Section 12-3-4, is satisfied. B. Nonresidential Construction - new construction and substantial improvements of any commercial, industrial or other nonresidential structure shall either have the lowest floor (including basement) elevated to or above the base flood level or together with attendant utility and sanitary facilities, be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. A registered professional engineer or architect shall develop and/or review structural design, specifications, and plans for the construction, and shall certify that the design and methods of construction are in accordance with accepted standards of practice as outlined in this subsection. A record of such certification which includes the specific elevation (in relation to mean sea level) to which such structures are floodproofed shall be maintained by the Floodplain Administrator. Page 14 of 19 C. Enclosures - new construction and substantial improvements, with fully enclosed areas below the lowest floor that are usable solely for parking of vehicles, building access or storage in an area other than a basement and which are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of flood waters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or meet or exceed the following minimum criteria: 1) A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided. 2) The bottom of all openings shall be no higher than one foot above grade. 3) Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of flood waters. D. Manufactured Homes - 1) Require that all manufactured homes to be placed within Zone A on a community's FHBM or FIRM shall be installed using methods and practices which minimize flood damage. For the purposes of this requirement, manufactured homes must be elevated and anchored to resist flotation, collapse, or lateral movement. Methods of anchoring may include, but are not limited to, use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable State and local anchoring requirements for resisting wind forces. 2) Require that manufactured homes that are placed or substantially improved within Zones A1-30, AH, and AE on the community's FIRM on sites (I) outside of a manufactured home park or subdivision, (ii) in a new manufactured home park or subdivision, (iii) in an expansion to an existing manufactured home park or subdivision, or (iv) in an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as a result of a flood, be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated to or above the base flood elevation and be securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement. Page 15 of 19 3)

Require that manufactured homes be placed or substantially improved on sites in an existing manufactured home park or subdivision with Zones A1-30, AH and AE on the community's FIRM that are not subject to the provisions of paragraph (D) of this section be elevated so that either: a) the lowest floor of the manufactured home is at or above the base flood elevation, or b) the manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade and be securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement. E. Recreational Vehicles - Require that recreational vehicles placed on sites within Zones A1-30, AH, and AE on the community's FIRM either: 1) be on the site for fewer than 180 consecutive days, 2) be fully licensed and ready for highway use, or 3) meet the permit requirements of Section 12-3-4, and the elevation and anchoring requirements for "manufactured homes" in paragraph (D) of this section. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions. 12-4-3 STANDARDS FOR SUBDIVISION PROPOSALS A. All subdivision proposals including the placement of manufactured home parks and subdivisions shall be consistent with Sections 12-1- 1(B), (C), & (E) of this ordinance. B. All proposals for the development of subdivisions including the placement of manufactured home parks and subdivisions shall meet Development Permit requirements of Section 12-2-2; Section 12-3-4; and the provisions of Section 12-3-3(H) of this ordinance. C. Base flood elevation data shall be generated for subdivision proposals and other proposed development including the placement of Page 16 of 19 manufactured home parks and subdivisions which is greater than 50 lots or 5 acres, whichever is lesser, if not otherwise provided pursuant to Section 12-2-2 or Section 12-3-4 of this ordinance. D. All subdivision proposals including the placement of manufactured home parks and subdivisions shall have adequate drainage provided to reduce exposure to flood hazards. E. All subdivision proposals including the placement of manufactured home parks and subdivisions shall have public utilities and facilities such as sewer, gas, electrical and water systems located and constructed to minimize or eliminate flood damage. 12-4-4 STANDARDS FOR AREAS OF SHALLOW FLOODING (AO/AH ZONES) Located within the areas of special flood hazard established in, Section 12-2-2, are areas designated as shallow flooding. These areas have special flood hazards associated with base flood depths of 1 to 3 feet where a clearly defined channel does not exist and where the path of flooding is unpredictable and where velocity flow may be evident. Such flooding is characterized by ponding or sheet flow; therefore, the following provisions apply: A. All new construction and substantial improvements of residential structures have the lowest floor (including basement) elevated above the highest adjacent grade at least as high as the depth number specified in feet on the community's FIRM (at least two feet if no depth number is specified). B. All new construction and substantial improvements of non-residential structures; 1) have the lowest floor (including basement) elevated above the highest adjacent grade at least as high as the depth number specified in feet on the community's FIRM (at least two feet if no depth number is specified), or; 2) together with attendant utility and sanitary facilities be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads of effects of buoyancy. C. A registered professional engineer or architect shall submit a certification to the Floodplain Administrator that the standards of this Section, are satisfied. Page 17 of 19 D. Require within Zones AH or AO adequate drainage paths around structures on slopes, to guide flood waters around and away from proposed structures. 12-4-5 FLOODWAYS Floodways - located within areas of special flood hazard established in Article 3, Section B, are areas designated as floodways. Since the floodway is an extremely hazardous area due to the velocity of flood waters which carry debris, potential projectiles and erosion potential, the following provisions shall apply: A. Encroachments are prohibited, including fill, new construction, substantial improvements and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge. B. If Section 12-4-5 (A) above is satisfied, all new construction and substantial improvements shall comply with all applicable flood hazard reduction provisions of Chapter 3. C. Under the provisions of 44 CFR Chapter 1, Section 65.12, of the

National Flood Insurance Regulations, a community may permit encroachments within the adopted regulatory floodway that would result in an increase in base flood elevations, provided that the community first applies for a conditional FIRM and floodway revision through FEMA. Chapter 5 PENALTY 12-5-1 No structure or land shall hereafter be constructed, located, extended, converted, or altered without full compliance with the terms of this ordinance and other applicable regulations. 12-5-2 Any person who is found guilty of violating any of the provisions of these rules and regulations, either by failing to do those acts required herein or by doing a prohibited act, is guilty of a Class C misdemeanor, pursuant to Section 26A-I- 123, Utah Code Annotated, 1995, as amended. If a person is found guilty of a subsequent similar violation within two years, he/she is guilty of a class A misdemeanor, pursuant to Section 26A-I-123, Utah Code Annotated, 1995, as amended. Each day such violation is committed or permitted to continue shall constitute a separate violation. Page 18 of 19 12-5-3 The County Attorney may initiate civil or criminal legal action, to abate any condition that exists in violation of these rules and regulations. In addition to other penalties imposed by a court of competent jurisdiction, any person(s) found guilty of violating any of these rules and regulations shall be liable for all expenses incurred by the County in removing or abating any violation of any of the provisions of these rules and regulations. Chapter 6 SEVERABILITY It is the intent of the Summit County Commissioners that all sections and provisions of this Ordinance have an independent existence, and should any section or provision be declared invalid or unconstitutional by a Court of competent jurisdiction, it is the intent of the Summit County Commission that any section or provision so declared shall be severable from and shall not affect the validity of the remainder of the Ordinance."

All of the thirty-six municipalities have an adopted zoning ordinance. Again, often these ordinances are outdated and often are not consistent with the jurisdiction's General Plan. Most zoning ordinances do not address natural hazards in any way. A few communities have a "sensitive area" or "hazard area" overlay zone. All communities issue building permits and enforce local building codes. Often this service is contracted for with the county.

Many of the smaller communities lack emergency response plans.

Authority

Federal: Public Law 93-288 as amended, established the basis for federal hazard mitigation activity in 1974. A section of this Act requires the identification, evaluation, and mitigation of hazards as a prerequisite for state receipt of future disaster assistance outlays. Since 1974, many additional programs, regulations, and laws have expanded on the original legislation to establish hazard mitigation as a priority at all levels of government. When PL 93-288 was amended by the Stafford Act, several additional provisions were also added that provide for the availability of significant mitigation measures in the aftermath of Presidentially declared disasters. Civil Preparedness Guide 1-3, Chapter 6- Hazard Mitigation Assistance Programs places emphasis on hazard mitigation planning directed toward hazards with a high impact and threat potential.

The Disaster Mitigation Act of 2000 was signed into Law on October 30, 2000. Section 322, defines mitigation planning requirements for state, local, and tribal governments. Under Section 322 States are eligible for an increase in the Federal share of hazard mitigation (HMGP), if they submit for approval a mitigation plan, which is a summary of local and/or regional mitigation plans, that identifies natural hazards, risks, vulnerabilities, and describes actions to mitigate the hazards, risks and vulnerabilities in that plan.

State: The State of Utah derives it's authority under the Emergency Management Act of 1981 (Utah Code 53-2, 63-5) as well as the Governor's Emergency Operations Directive and Executive Order of the Governor 11.

Association of Governments: The Association of Governments have been duly constituted under the authority of Title XI, Chapter13, Utah Code Annotated, 1953, as amended (The Inter-local Cooperation Act) and pursuant to Section 3 of the Executive Order of the Governor of the State of Utah, dated May 27, 1970, with the authority to conduct planning studies and to provide services to its constituent jurisdictions.

Local: Utah Code, Title 17, Chapter 27 is the County Land Use Development and Management Act that grants authority to counties. Utah Code, Title 10 Chapter 9 grants similar authority to municipalities.

The state of Utah maintains a philosophy of local responsibility for hazard mitigation. State agencies still provide an integrated network of support, services, and resources for hazard mitigation activities. As demonstrated during past disasters, these agencies are well organized in their delivery and coordination of services. The following is a review of State departments with disaster responsibilities describing their existing and planned mitigation programs.

An evaluation of the laws, regulations, authorities, policies, and programs used in Utah to mitigate hazards demonstrate that they work exceptionally well, as evidenced by the massive amount of mitigation accomplished in Utah, the few numbers of disasters, and the limited nature of those emergencies that do occur. According to the Utah SHMT, the only changes that could be considered by the Legislature might be ones that parallel the Federal Disaster Mitigation Act of 2000, which would integrate pre-disaster mitigation considerations into the code of various state agencies.

Utah Division of Emergency Management

For Associated state laws see “Authority” at the beginning of this plan.

Capabilities of DESHS Hazard Mitigation Program

Prepare, implement, and maintain programs and plans to provide for preventions and minimization of injury and damage caused by disasters.

Identify areas particularly vulnerable to disasters.

Coordinate hazard mitigation and other preventive and preparedness measures designed to eliminate or reduce disasters.

Assist local officials in designing local emergency actions plans.

Coordinate federal, state, and local emergency activities.

Coordinate emergency operations plans with emergency pans of the federal governments.

Through the State Hazard Mitigation Program, the following occurs:

- Provides a state coordinator for hazard mitigation, the State Hazard Mitigation Officer.
- Provides a central location of the coordination of state hazard mitigation activities.
- Provides coordination for the Federal Pre-Disaster Mitigation Program.
- Provide for coordination of Project Impact.
- Provide coordination for Comprehensive Multi-hazard Mitigation Plan development, implementation, and monitoring.
- Provide for interagency coordination
- Provide development of procedures for grant administration and project evaluation.
- Provide State Hazard Mitigation Team assistance to local governments.
- Provide for development of specific hazard mitigation plans, such as drought and wildfire.
- Provide for local hazard and risk analysis.
- Provide for development of SHMT mitigation recommendations following disasters.

Utah Department of Agriculture

The Utah Department of Agriculture administers programs serving the state's large agricultural sector. The department's response role during and after a disaster period has been to coordinate damage reports for funding needs and provide loan and recovery program information and assistance to disaster victims. This service is provided for flood, drought, insect infestation, fire, livestock disease, and frost.

Assistance During Drought Disasters:

A damage reporting network coordinated through the existing County Emergency Board was established during the drought disaster of 1996. Each county agent assembled damage reports in his area and transmitted them through a computer network based at Utah State University. The individual damage reports from each county were recapped in the Department of Agriculture and formed the basis of documentation for an appeal to the legislature for additional funds to mitigate the damage.

Loans Handbook

The department has prepared a handbook listing the types of loans available for flood damage to agriculture, the funding requirements, and applications procedures. This includes loans from both state and federal sources. There are three loan programs operated by the agriculture department, all of which can be used for flood damage: 1) Rural Rehabilitation Loan Program (federally funded and operated by the state); 2) Agriculture Resource Development Loan Program (state funded); and 3) Emergency Loan Program (state funded).

Soil Conservation Program

The Department of Agriculture also administers the ongoing Soil Conservation Program. In each of the state's thirty-nine soil conservation districts, three unpaid, elected supervisors offer technical assistance and consultation on watershed protection. The state offers limited technical and planning assistance through a staff member. The program works cooperatively with the federal Soil Conservation Service which provides most of the technical assistance. The ongoing program is not regulatory, but is directed at improved water use and soil conservation.

Disaster Easements:

Because of the similarity between past events the department in now working on a permanent hazard mitigation concept known as “Disaster Easements”, which may have widespread agreements with irrigation companies, water districts, or water users associations for the purpose of routing flood water through town.

Monitoring Ground Water Quality:

The Department also monitors groundwater quality of private individuals wells and springs throughout the State.

Non-Point Source Pollution:

The Departments Non-Point Source Pollution Program focuses on flood prevention through reduction of erosion, vegetating streams, and restoring “natural stream structure” The Department also monitors drought conditions, which are a precursor to wildfire.

Department of Community and Economic Development

Community Impact Board

The Utah Permanent Community Impact Fund Board provides loans and/or grants to state agencies and sub-divisions of the state, which may be socially or economically impacted by mineral resource development of federal lands.

Permanent Community Impact Fund:

The Permanent Community Impact Fund provides loans and/or grants to state agencies and subdivisions of the state, which are or may be socially or economically impacted, directly or indirectly, by mineral resource development on federal lands.

Under the Federal Mineral Lease Act of 1920, leaseholders on public land make royalty payments to the federal government for the development and production of non-metalliferous minerals. In Utah, the primary source of these royalties is the commercial production of fossil fuels on federal land held by the U.S. Forest Service and the Bureau of Land Management. Since the enactment f the Minerals Lease Act of 1920, a portion of these royalty payments, called mineral lease payments, have been returned to the state in an effort to help mitigate the local impact of energy and mineral developments on federal lands.

Funding Options:

The Board has the option of funding projects with loans and/or grants. The Board's preferred financing mechanism is an interest-bearing loan.

Loan Requirements:

In providing financial assistance in the form of a loan, the Board may purchase an applicant's bonds only if the bonds are accompanied by legal opinion of recognized municipal bond counsel to the effect that the bonds are legal and binding under applicable Utah Law.

The Board may purchase either a taxable or tax-exempt bond. The board may purchase taxable bonds if it determines, after evaluating all relevant circumstances, including the applicant's ability to pay, that the purchase of the taxable bonds is in the best interest of the state and the applicant.

Grants

Grants may be provided only when the other financing mechanisms cannot be utilized, where no reasonable method of repayment can be identified, or in emergency situations regarding public health and/or safety.

Community Development Block Grant:

The Community Development Block Grant, or CDBG program, provides funding from the federal government's Department of Housing and Urban Development or HUD, to small cities and counties in the State of Utah.

Utah Division of State History

The Utah State Historical Society, Utah's Division of State History, was founded in 1897 on the 50th anniversary of the first settlement in the Salt Lake Valley by the Mormon Pioneers. The Society became a state agency in 1917, now housed in the historic Rio Grande Depot since 1980. The Division stimulates archaeological research, study; oversees the protection and orderly development of sites; collects and preserves specimens; administers site surveys; keeps excavation records; encourage and supports the preservation of historic and pre-historic sites and publishes antiquities records. The Division also issues archaeological permits and consults with agencies and individuals doing archaeological work.

Preserving and Sharing Utah's Past

The mission of the State Division of History is "preserving and sharing Utah's past for the present and the future."

State Historical Preservation Officer (SHPO)

The SHPO administers the Section 106 process (national Historic Preservation Act) in Utah. The SHPO also serves on the Utah State Hazard Mitigation Team, providing guidance on historical and cultural preservation regulations.

Historic properties include districts, buildings, structures, objects, landscapes, archeological sites, and traditional cultural properties that are included in, or eligible for inclusion in, the National Register of Historic Places. These properties are not just "old buildings" or "well-known historic sites, but places important in local, state, or national history. Facilities as diverse as bridges and water treatment plants my, be considered historic.

Utah Geological Survey (UGS)

The Utah Geologic and Mineral Survey is the principal state agency concerned with geologic hazards. Through years of study, the UGS has developed considerable information on Utah's geologic hazards. When geologic events occur or threaten to occur, the UGS is consulted by other state agencies, local governments, and private organizations for assistance in defining the threat from natural hazards. The

UGS works in partnership with other agencies, such as DESHS, in relating the threats from natural hazard to the communities at risk.

Functions:

The functions of the UGS include the following:

Evaluation of individual geological hazards;

Participation on local government and state agency technical teams;

Prediction of the performance on individual slides once they began to move;

Coordination and awareness of research efforts undertaken by other agencies;

Provide information on status of individual geologic hazards;

Reconnaissance reports on status of hazards statewide;

Advise Division of Water Rights on geologic hazards associated with dam sites; and

Provide geologic information for use during planning of remedial actions.

Laws/authorities/policies of the Utah Geological Survey for conducting mitigation

Utah Code Annotated

Chapter 73 Geological and Mineral Survey

Section 68-73-6 Objectives of Survey

(e) Determine and investigate areas of geologic and topographic hazards that could affect the safety of, or cause economic loss to, the citizens of this state; (f) assist local and state government agencies in their planning, zoning, and building regulations functions by publishing maps, delineating appropriately wide special earthquake risk areas, and, at the request of state agencies, review the siting of critical facilities:

Utah State Office of Education (USOE) Rule R277-455 Standards and Procedures for building plan review

R277-455-4 Criteria for Approval

To receive approval of a proposed building site, the local school district must certify that:

Staff of the Utah Geologic Survey have reviewed and recommended approval of the geologic hazards report provided by the school districts geotechnical consultant.

Division of Water Resources

Mitigation Functions

The Divisions role of planning, funding and constructing water projects serves as both active and passive hazard mitigation against drought and flood situations throughout the state. The various State water plans contain brief summaries of flood threat and risk for each drainages.

The Division is one of seven agencies in the State Department of Natural Resources. The eight member Water Resources Board, appointed by the governor, administers three state water conservation and development funds. They are:

Revolving Construction fund – This fund started in 1947 with 1 million legislative appropriation to help construct irrigation projects, wells and rural culinary water systems. Further appropriations have added to this fund.

Conservation and Development Fund – This fund was created in 1978 wit the sale of 25 million in general obligations bonds. Money was added to this fund with bond sales in 1980 and 1983. The C & D Fund generally helps sponsors finance larger multi-purpose dams and water systems.

Cities Water Loan Fund – Established with an initial legislative appropriation of 2 million dollars in 1974, and with continued appropriations, this fund provides financing to help construct new culinary water projects for cities, towns, improvement districts, and special service districts.

Construction Funds: In addition to overseeing these three construction funds, the Division also manages the State funds appropriated each year for renovation and reconstruction of unsafe dams. As the funding arm of the state for water resource projects the Division works closely with Water Rights, the Regulatory arm of the state charged with jurisdiction over all private and state owned dams.

Water Resource Planning: The Division is also charged with the general water resource planning for the state. The State Water Plan is a process that is coordinated to evaluate existing water resources in the state, determine water-related issues that should be confronted and recommend how and by whom issues can be resolved. The plan identifies programs and practices of state and federal agencies, water user groups and environmental interests and describes the state's current, future, and long-term water related needs. The plan is continually updated using current hydrologic databases, river basin simulations, water supply and demand models and water related land use inventories. Revisions reflect the latest water conservation and development options concerning water rights, water transfers, population, zoning, and many other complex issues for the next 50 years in the state's major river basins.

Utah Division of Forestry, Fire, and State Lands

The Division of Forestry, Fire & State Lands utilizes the principles of stewardship and ecosystem management to assist non-federal landowners in management of their natural resources. The agency provides wildland fire protection for non-federal landowners commensurate with risk; and optimizes the benefits from ecosystem based, multiple-use management of resources held in the public trust. Wildfires are managed from six area offices 1) Bear River Office, 2) Northeast Area, 3)Wasatch Front Area, 4) Central Area, 5) Southwest Area, and 5) Southeast Area.

The Division operates under the authority of the Utah Code Annotated 65-A-3-1 though 10.

The Flame-n-Go's (pronounced Flamingoes): In 1978 the Division of Forestry, Fire, and State Lands and the Utah State Prison signed a cooperative agreement establishing Utah's first volunteer, inmate wildland fire hand-crew. The inmates named themselves the "Flame-N-Go's" and designed a logo that has become well known in the wildland fire fighting community.

All Flame-N-Go's are carefully screened for the program. They must complete rigorous training and sign a yearly contract committing themselves to preserving Utah's natural resources and building responsible lives.

The Flame-N-Go's are divided into three crews, each of which can respond to fires anywhere in the United States. A twenty-man type II handline crew is the backbone of the group, responding to each

assignment with all tools and equipment needed to do battle on the fireline. An Engine Strike Team, (five fire engines, outfitted with men and equipment) is ready to respond when needed as an Engine Strike Team or a Type II Handline Crew. The Hotshot crew is trained to tackle the most dangerous fires in the most rugged terrain. All crews during peak fire season are on 24-hour call to respond within an hour's notice. These crews respond to an average of 50 fires per year and typically spend 45,000 hours fighting fires each season. At least one Division of Forestry, Fire, and State Lands supervisor and two Department of Corrections staff accompany each crew.

Each year, Flame-N-Go's are put through at least 80 hours of extensive training including classroom work and practical field exercises. Safety, individual, and team skills, and professionalism are stressed.

National Fire Plan: The Division administers the State responsibilities of the National fire Plan, a current emphasis of the U.S. Congress, which also addresses hazard and risk analysis and hazard mitigation.

Living With Fire Committee: The Division works in partnership with the U.S. Forest Service, Bureau of Land Management, and various other entities tasked with suppressing wildland fires on the "Living With Fire" program promoting wildland fire mitigation.

Utah Division of State Parks and Recreation

The goal of the Division of Parks and Recreation is to enhance the quality of life for residents and visitors of our state through parks, people, and programs. They are responsible for protecting, preserving, and managing many of Utah's natural and heritage resources.

Hazard and Risk Analyses: The Division develops hazard and risk analyses for the State Parks as part of the park resource management plans. The Utah Division of Emergency Management produced one analysis for Snow Canyon State Park in Washington County.

Non-Motorized Trail Program: The Recreational Trails Act of 1991 charged Utah State Parks and Recreation with coordinating the development of a statewide network of non-motorized trails. The Non-Motorized Trail program makes state and federal funds available on a 50/50 matching basis to any

federal, state, or local government agency, or special improvement district for the planning, acquisition, and development of recreational trails.

Grants from State Parks Boards: The council advises the Division of Parks and Recreation on non-motorized trail matters, reviews requests for matching grant fiscal assistance, rates and ranks proposed trail projects and along with State Park's staff provides recommendations for funding to the State Parks Board.

Riverway Enhancement Program: In 1986, the Utah Legislature passed a bill which established the Riverway Enhancement Program. The program makes state funds available on a 50/50 matching basis to state agencies, counties, cities, towns, and/or special improvement districts for property acquisition and/or development for recreation, flood control, conservation, and wildlife management, along rivers and streams that are impacted by high density populations or are prone to flooding. Public outdoor recreation should be the primary focus of the project.

Utah Division of Water Rights

The Division of Water Rights is the state agency that regulated appropriation and distribution of water in the State of Utah. It is an office of public record. The Utah State Engineer's Office was created in 1897. The State Engineer's Office is the chief water rights administrative officer. A complete "water code" was enacted in 1903 and was revised and reenacted in 1919. This law, with succeeding complete reenactments of State statutes, and as amended, is presently in force mostly as *Utah Code, Title 73*. In 1963, the name was changed from State Engineers office to the Division of Water Rights.

All water in Utah are public property. A water right is a right to the use of water based upon 1) quantity, 2) source, 3) priority date, 4) nature of use, 5) point of diversion, and 6) physically putting water to beneficial use.

Regulate Dams: The State engineer has the authority to regulate dams for the purpose of protecting public safety. Dams are classified according to hazard, size, and use. The dam inventory gives the identification, location, construction parameters, and the operation and maintenance history of the dams in Utah.

Stream Alterations Program: The Utah state Engineer's Office administers a Stream alterations program with the purpose of regulation activities affecting the bed or banks or natural streams. The State Engineer's working definition of a natural stream is any natural waterway in the state, which has flows of sufficient duration to develop a characteristic ecosystem distinguishing it from the surrounding environments. Any individual planning an activity that will affect a natural stream must first obtain a Stream Alterations Permit from this office.

Most proposals reviewed by the State, are covered by General Permit 40, which authorizes the state to have its Stream Alteration Permit fulfill the requirements of Section 404 of the Clean Water Act for most activities. General permit 40 does not apply in some instances and a U.S. Army Corps of Engineers Individual Permit is required. Projects requiring this additional permit include those involving wetlands, threatened or endangered species, properties listed on the National Historic Register, stream relocation, or the pushing of streambed material against a stream bank.

Dam Safety Program: The Dam Safety Section of the Division of Water Rights was established under Chapters 73-5a 101 thru 73-5a 702 including chapters 73-2-22 for Flood Control and the Chapter 63-30-10 Waiver of Immunity of the Utah Code and Rules R655-10 thru R655-12-6A. The program basically has jurisdiction over all private and state owned dams in the state during design, construction, operation, and decommissioning. This involved periodic inspections according to hazard classifications, inventory maintenance, design, and construction approval and systematic upgrade of all the high hazard structures to current dam safety Minimum Standards and creation of Emergency Action Plans for High Hazard dams. Since 1991, detailed dam reviews have been undertaken by the staff and by private consulting firms. Since 1995, the State Legislature has provided 3-4 million dollars per year to finance 50 % of the instrumentation, investigations, and design and 80 to 90 % of the construction costs of retrofitting and upgrading deficient dams, starting with the worst dams in the most hazardous locations.

The impetus for this dam safety program has been in reaction to dam failures, both in Utah and in other states, including the Teton Dam in Idaho and the Trial Lake Dam in Summit County and the Quail Creek Dam near St. George Utah. Since the establishment of our Minimum Standards program we have fostered the repair of dozens of dams and have not had a catastrophic failure since.

Future recommendations include continuation of the funding for dam upgrades for all the high hazard dams, and then the moderate hazard dams, continued annual inspections for maintenance items and

dangerous deficiencies, upgrading EAP, and hazard assessment to reflect downstream development. Inclusion of the scanned design drawings and inundation maps from the EAP studies is being considered for our web page for public information and emergency access. Possible expansion of the program to cover canals and dikes has been considered.

Utah Division of Wildlife Resources

It is the mission of the Utah Division of Wildlife Resources to serve people of Utah as trustee and guardian of the State's wildlife. Regulates hunting, fishing and trapping, and promotes recreational, educational, scientific and aesthetic enjoyment of wildlife.

Wildlife Habitats and Hazards: Wildlife species and/or their habitats are frequently exposed to hazards. These may be either natural or human influenced (i.e. drought, flood, fire, wind, snow, wetland drainage, water diversions, hazardous material spills, improper/illegal chemical use, earthquake, and other land or water construction/development). Impact resulting either directly or indirectly, from individuals or an accumulation of several hazards, may cause but not be limited to: decreased water supply, stream/lake channel/basin morphology change, riparian/upland vegetation loss or degradation, and impairment of water quality. These in turn have a varying influence, in the extreme causing death or at a minimum temporary stress, on wildlife populations and their habitats. Hazards mentioned may affect a fairly large geographic area or be very localized in nature.

While the Division of Wildlife Resources (DNR) is charged with the management of wildlife, they do not have regulatory authority over water appropriations, water quality, development, or land management; except as allowed or occurring on properties they own. Therefore, when hazards occur, outside DWR property, DWR is limited to be a participating influence only through comments to the other regulatory agencies or individuals.

DWR management of wildlife is carried out largely through regulation of taking controlling, disturbance and/or possession of wildlife, and introduction of movement of species. However, there are numerous non-regulatory means (i.e. conservation agreements, memorandum of understanding, contract, lease agreements, cooperative agreements, and technical assistance) by which DWR interacts with other agencies, groups and individuals, to have an influence on wildlife and/or their habitat.

Hazard Areas of Commentary Interaction

While not being able to control/regulate many of the elements necessary for the benefit of wildlife; DWR provides technical comments for the maintenance, protection, and enhancement of wildlife and/or habitats for various value reasons. It is too extensive list all the areas of comment; however, the following are examples of fairly frequent concern:

- Steam Channel Alteration Permit Applications
- Water Rights Filings
- Energy and Mineral Exploration and Extraction Applications
- Federal Agency land management plans
- Waste Water Discharge Permit Applications
- Hydroelectric plant licensing or regimenting
- Urban and rural development project planning
- Utility transmission line style and locations
- Wetland alteration
- Federal land management planning
- Highway constructions

The Utah Division of Drinking Water

Division of Drinking Water's Mission Statement is to " protect the public against waterborne heath risks through assistance, educations, and oversight". The Division acts as the administrative arm of the Utah Drinking Water Board. It implements the rules, which they adopt. As such, it is engaged in a variety of activities related to the design and operation of Utah's public drinking water system. The Utah Drinking Water Board is an 11-person board appointed by the Governor. It is empowered by Title 19, Chapter 4 of the Utah Code to adopt rules governing the design, operations, and maintenance of Utah's "public drinking water system".

Safe Drinking Water Act: There is a Federal Safe Drinking Water Act which applies to all public drinking water systems in the country. The U.S. Environmental Protection Agency (EPA) has given Utah "primacy" for enforcing the federal act within its boundaries. To qualifiy for this Utah's laws and rules governing public drinking water systems must be at least as strict as the federal law.

Sanitary Surveys: The Division performs sanitary surveys on the water systems, which is a compliance action that identifies system deficiencies.

Emergency Response Plans: The Division of Drinking Water requires water utilities to prepare emergency response plans under the State Safe Drinking Water Act, Utah Code Section 19-4. The

Division operates according to DDW Rules: R309 gives them authority to administer actions: R309-301 through R309-104 and R309-113, R309-150, R309-301, and R309-211.

Utah Division of Solid and Hazardous Waste

The Tier II Chemical Inventory report, required by the Federal Emergency Planning and community Right-to-Know Act, requires facilities to submit lists of hazardous chemicals present on site. These reports are computerized and the information is provided to local emergency planning committees, the general public, and others for contingency planning purposes. To implement the Federal law, the State operates under Utah State Code, Section 63-5-5. The Division of Solid and Hazardous Waste requires that hazardous waste treatment storage and disposal facilities prepare and emergency response plan as required by regulations authorized by the State Solid and Hazardous Waste Act, Utah Code Section 19-6.

Other Agency programs are regulatory in nature requiring proper use or disposal of hazardous substances or pollutants. For example the Division of Solid and Hazardous Waste regulates the disposal of hazardous waste, the Division of Radiation Control regulates the proper usage and disposal of radioactive materials. As such there is a threat mitigation nature to these programs.

Utah Division of Water Quality

The Utah Division of Water Quality protects, maintains, and enhances the quality of Utah's surface and underground water for appropriate beneficial uses; the Division of Water Quality regulates discharge of pollutants into surface water, and protects the public health through eliminating and preventing water related health hazards which can occur as a result of improper disposal of human, animal, or industrial wastes while giving reasonable consideration to the economic impact.

Water Quality Fund and Wastewater Treatment Project Fund: The Division Manages the Water Quality Revolving Fund that can be used by local governments for water quality projects and a Wastewater Treatment Project Fund.

Abating Watershed Pollution: Federal and State regulations charge the Division with "preventing, controlling, and abating" watershed pollution. Other state and local agencies have similar responsibilities. The Watershed Approach forms partnerships with these groups to pool resources and increase the effectiveness of existing programs. For each watershed management unit, a watershed plan will be prepared. The watershed plan addresses management actions at several spatial scales ranging from those that encompass a watershed management unit to specific sites that are tailored to specific environmental conditions. Ground water hydrologic basins and eco-region areas encompassed within the units will also be delineated.

State Revolving Fund Program: In 1987, Congress replaced the Construction Grants Program, with the State Revolving Fund Program. Rather than provide direct grants to communities, the federal government provides each state with a series of grants, then each state contributes a 20 percent state match. Grants from the federal government are combined with state funds in the Water Quality Project Assistance Program (WQPAP) and are used to capitalize a perpetual source of funds to finance water quality construction control activities at below market interests rates. Projects eligible for WQPAP financing include such traditional activities as construction of wastewater treatment plants and sewers. The program also will finance non-traditional water quality-related activities such as agricultural runoff control, landfill closures, contaminated industrial property (Brownfield) remediation, stream bank restoration, and wellhead protection.

Part XI
Methods

Hazard Definitions and Analysis Methodologies

MAG collected data and compiled research on nine hazards: dam failure, earthquake, infestation, flooding, landslide, severe weather, drought, and wildfire. Research materials came from a variety of agencies including DES, AGRC, USGS, USACE, UGS, UFFSL, county GIS, city GIS, County Assessors, and County Emergency Managers. Historical data used to define historic disasters was researched through local newspapers, interviewing residents, local knowledge derived through committee meetings, historic state publications, Utah Museum of Natural History, and recent and historic scientific documents and studies.

Vulnerability Methodology

Geographic Information Systems (GIS) were used as the basic analysis tool to complete the hazard analysis for this plan. The goal of the vulnerability study is to estimate the number of structures and infrastructure vulnerable to each hazard and assign a dollar value to this built environment. For most hazards a comparison was made between digital hazard data and the Regional Inventory.

Regional Inventory

In order to determine the possible extent of damage caused by potential events, a regional inventory was developed. This regional inventory is a compilation of residential, commercial, and critical facilities, their locations and their values. In addition, future development was identified and included in the analysis using general plans and demographic projections.

Residential- Parcel, assessor, and building permit data from each of the three counties were analyzed and added to determine current numbers, locations, and values of housing units.

Commercial – As with residential, parcel, assessor, and building permit data from each of the three counties were analyzed and added to determine current numbers, locations, and values.

Critical Facilities* – GIS data, local knowledge and parcel data were used to identify Critical Facilities within the region. Critical Facilities for the purpose of this plan are defined as Schools, Fire, Police, Hospitals, and Emergency Operation Centers.

*It was determined by the planning committee that critical infrastructure facilities such as water sewer and power structures be left out of this plan in order to minimize their vulnerability to outside threats (terrorism). Most of the jurisdictions have been advised by security experts to limit the public exposure of these facilities. However, each jurisdiction has been given the option, if they so choose, to have a separate vulnerability assessment of these structures done. The results would not be made available for public consumption or included in this plan for security reasons. At the publication date of this document, no jurisdiction or entity has requested such an assessment.

All the analysis takes place within the spatial context of a GIS. With the information available in spatial form, it is a simple task to overlay the natural hazards with the regional inventory to extract the desired information. However, some of the hazards identified are not isolated to specific locations within the region or spatial data is unavailable and are therefore discussed at a regional level.

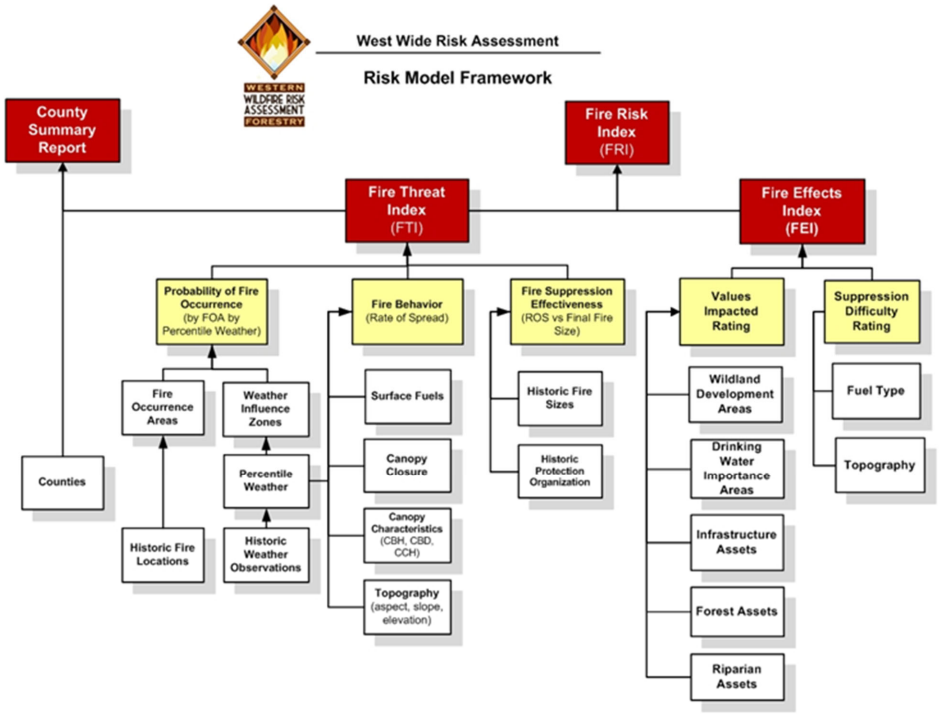
In terms of hazard mapping presentation in this document, simple, letter size maps were created for each city to provide a graphical illustration of location. Larger maps can be plotted out upon request. A web based data manipulation and maps application was also created as a planning tool, to allow interested persons within Utah, Wasatch and Summit Counties in Utah select a certain jurisdiction and view the various hazards on maps as well as the assessment data. The application has been available on the Mountainland Website since the creation of the data.

This information should not take the place of accurate field verified mapping from which ordinances need to be based off of. Owners of critical facilities should, and in most cases do, have detailed pre-hazard mitigation plans for their specific facilities.

Processing Hazard Layers

Fire

The Bureau of Land Management and Forest Service provided locations, both area and point, of historic fires from 1918-2014. The Fire Threat Index was created by an in-depth assessment by the Council of Western State Foresters and the Western Forestry Leadership Coalition. It is derived from the Fire Threat Index (likelihood of an acre burning) and the Fire Effects Index (potential losses). The online map shows the fine Fire Risk Index, combining both Fire Effects (potential losses) and Fire Threat (likelihood of an acre burning). When determining the buildings at risk, however, only the Fire Threat Index was used in order to focus on the assets the city is responsible for and not those of the Forest Service, BLM, gas company, etc.



The categories for the Fire Indices are relative to the risk and effects in each county. Being an index, the final numbers do not represent a concrete value but are rather used to categorize the land into percentages of risk, as seen in the table following.

Fire Index Breakdown

	Category	% Range	Cat. %	
	1	0 – 32.9%	32.9%	
	2	33.0 - 63.5%	30.5%	Lowest 70%
	3	63.5% - 70.0%	6.5%	
	4	70.0 - 77.5%	7.5%	
	5	77.5 - 85.5%	8.0%	Highest 30% used to determine at risk buildings
	6	85.5 - 92.5%	7.0%	

	7	92.5 - 96.5%	4. 0%	
	8	96.5 - 98.5%	2. 0%	
	9	98.5 - 100.0%	1. 5%	

The findings of any calculation using the Fire Risk Index at a home-by-home scale are not to be used in creating a plan for that individual home. The Fire Indices have a 30-meter resolution best suited for local plans, not household ones.

These are the steps we took to manipulate the data to our needs.
Using the Fire Threat Index and Fire Risk Index
1) Import Utah-specific symbology from WWA, and apply it to classified values.
2) Using the Reclassify Raster tool, change the index values to values 1-9
3) Use the Raster to Polygon tool in order to overlay the data on the regional inventory to produce loss estimates
4) For better map display, use a low-pass filter to eliminate salt-and-pepper

Flood

Because many of FEMA'a Flood Insurance Rate Maps (FIRMs) maps have not been updated for decades, we opted to combine the FIRMs with 100 yr. and 500 yr. floodplain maps produced by a FEMA software program called HAZUS. HAZUS uses the latest elevation data (for example, LiDAR for the Wasatch Front) to create flood depth grids for 100 year and 500 year floods. We joined FEMA A-level (100 year) floods to polygon of HAZUS 100-yr flood depth grid, then did the same with shaded-X level (500 year) flood and HAZUS 500-yr flood depth grid. To provide more clarity in mapping we exported 100 year and 500 year layers with dissolved boundaries (for display only, not analysis).

Multiple cities were concerned about the sudden increase in floodplain area determined by HAZUS. When such concerns were stated the methodology was explained and maps delineating NFIP versus HAZUS floodplains were provided. In some cases, HAZUS estimates were closely aligned with actual flooding experienced by a city.

Dams

The U.S. Army Corps of Engineers provided dam information for all Federal dams in Summit, Utah and Wasatch counties. Utah Division of Water Rights includes a Dam Inventory consisting of dam points, hazard level, first downstream town, and notes from the latest inspections. Utah Division of Water Rights also has shapefiles of some dam inundation extents. Both were used wherever possible. Jordanelle and Deer Creek dam failure extents come from a 1994 study by the Bureau of Reclamation. There exist 2012 maps showing extent and depth, but these are carefully kept by the Bureau of

Reclamation for safety purposes. Emergency Managers are able to view and plan with these maps, but Mountainland is not permitted to reproduce them for the public.

The primary purpose of the inundation maps is for warning and evacuation in the event of a dam failure or a large reservoir release. Values chosen to approximate physical characteristics such as dam failure breach parameters, channel roughness coefficients, etc., are based on assumptions and are used to produce best estimates of the downstream inundation. Thus, actual inundation, were it to occur, could be greater or less than that indicated on the inundation maps.

Deer Creek/Jordanelle Dam Study

For this study, the results of the one dimensional National Weather Service (NWS) DAMBRK model performed by the Denver Office was used to obtain the dam break flows from both Jordanelle Dam to Deer Creek Dam and from Deer Creek Dam to the mouth of Provo Canyon. However, the terrain beyond the mouth of Provo canyon is an alluvial fan, which unlike the narrow confined canyon, is a broad, flat plain. A two dimensional model is more appropriate for this type of terrain. It provides a more accurate depiction of the topography and allows for the water to spread and follow multiple drainage paths. The modeling tools used for the Orem/Provo areas utilized the Danish Hydraulic Institute's MIKE 21 two-dimensional hydrodynamic flow model. MIKE 21 is a 2-D finite difference model that simulates unsteady 2-D flows in (vertically homogeneous) fluids using the Saint Venant equations. ARCINFO GIS software is used as both a pre and post processor for the MIKE 21 model. Data used for the Deer Creek Dam models came from 7.5 minute, 10-meter resolution, digital elevation models (DEM) prepared by Land Info Inc., of Aurora, Colorado. The 10-meter data was then resampled at 30-meter cell size for use in the MIKE 21 models. The 10-meter elevation data appeared to be satisfactory for this study however for a more detailed study of the metropolitan area a better resolution of elevation data is recommended.

Commented [SM6]: Moved to Methods

Landslides

All counties include a simple landslide-susceptibility map consisting of all slopes 30% and over. Additional datasets from the Utah Geological Survey show areas of past landslides, debris flow, and alluvial-fan deposition in the Holocene epoch (everything since Earth's last "ice age"). As with other hazard methodologies, the simple and effective spatial methodology was to overlay these data sets with the regional inventory within GIS to produce loss estimates.

Building Analysis Methodology

Each county provided parcel data with building and tax information. Parcels were determined to be either Residential, Commercial, Industrial, Educational, Public, Religious, or Null (parcels without buildings). Next, a manual sampling comparing satellite data was performed to find areas of misclassification. Not every parcel was checked because going through tens of thousands of parcels was not feasible for this project.

After checking for accuracy, the parcel polygons were converted to points. I then looked at the parcel points (heretofore called building points) with the hazard layers and moved building points on the edges of any hazard to the buildings which they represented while editing any points I found to be in error (ie: an agricultural building misclassified as residential). At this point I was confident that most buildings points were classified correctly and located with their respective hazard areas.

1) Identifying Buildings at Risk

To determine the number of buildings at risk, I selected all buildings within a city's boundary then intersected those with each hazard. I ran a report for each city's hazard with the improvement value of the parcel, aka the building value without the land, and the acreage, meaning the acreage of the parcel on which the at-risk building sets. Some hazards were straightforward, but others required a categorical intersection with the building points.

Hazard Profile Methodology

Each hazard profile relied on the following criteria to create meaningful comparisons between hazards.

Standards from FEMA IS 235: Emergency Planning Course

Potential magnitude (Percentage of the community that can be affected):

Catastrophic: More than 50%

Critical: 25 to 50%

Limited: 10 to 25%

Negligible: Less than 10%

Frequency of Occurrence

Highly likely: Near 100% probability in next year

Likely: Between 10 and 100% probability in next year, or at least one chance in next 10 years.

Possible: Between 1 and 10% probability in next year, or at least one chance in next 100 years.

Unlikely: Less than 1% probability in next 100 years

Standards we modified to fit our region

Severity (our definition) **per incident**

Catastrophic: Many lives, a great deal of property

Critical: Multiple lives lost, but mostly property loss.

Limited: Some property loss, less than 3 lives lost.

Negligible: Some property, no life lost.

Summary of Hazard Mitigation Action Plan for Saratoga Springs

Hazard Listed in the Same Order as the MAG Plan	Proposed Mitigation Actions (Y/N)	Description of Potential Mitigation Construction Project Actions	Timeline (10 year time line used.)	Estimated Costs (to City)*	Potential Funding Sources**	Mitigation Possible by New Zoning or Building Code Actions (Y/N)	Mitigation Possible by Public, Business, and Community Awareness Outreach
Debris Flow	Y	Construction of Loose Canyon Debris Flow Mitigation Measures	2017 to 2019	$800,000	PDM,HMGP FMA, DNR	Y	N
		Study of Other Potential Debris Flow Hazards	2019 to 2020	$100,000		Y	N
		Other Debris Flow Mitigation Construction Projects	2021 to 2026	$1,000,000		Y	N
Wildfire	Y	Implement Fuel Reduction in Cooperation with Other Agencies	2018 to 2026	$100,000	PDM,HMGP DNR	Y	N
		Construct Fire Breaks in Cooperation with Other Agencies	2018 to 2026	$300,000		Y	N
		Continued Public Awareness Training	2017 to 2026	To be determined		Y	Y
Severe Weather	Y	Acquisition on Installation of Emergency Generators	2018 to2020	$400,000	PDM,HMGP	Y	N
Flood	Y	Continued Zoning Restrictions	2017 to 2026	n/a	n/a	Y	Y
		Berm Construction at Lift Stations	2018 to 2026	$500,000	PDM,HMGP	N	N
Explosion Induced by Natural Hazard	Y	Enhanced Zoning Restrictions	2017 to 2026	n/a	n/a	Y	Y
Earthquake Ground Shaking- Nonstructural	Y	Design and Construction of Seismic Retrofit Measures for Existing Facilities	2018 to 2020	$100,000	PDM, HMGP	N	N
Earthquake Induced Damage- Structural	N	Enhanced Requirements for New Critical Facilities	2018 to 2026	To be determined	To be determined	Y	N

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Earthquake Induced Liquefaction	Y	Enhanced Requirements for New Critical Facilities	2018 to 2026	To be determined	To be determined	Y	N
		Retrofit Design and Construction of Vulnerable Below Grade Utilities	2022 to 2026	$1,500,000	PDM, HMGP	Y	N
Earthquake Induced Lateral Spreading or PGD	TBD	Retrofit Design and Construction of Vulnerable Below Grade Utilities	2018 to 2026	To be determined	To be determined	Y	N
Natural Hazard Induced Hazardous Material Spill	Y	Enhanced Requirements for New Critical Facilities	2018 to 2026	To be determined	To be determined	Y	Y
Drought	Y	Cooperation with Other Entities to Construct Canal Lining or Piping Projects	2018 to 2026	To be determined	WS	Y	Y
		Continue Ongoing Conservation Efforts	2017 to 2016	In current budgets	WS	Y	Y
Dam Failure	N	Dams Themselves Not Within City's Jurisdiction.	n/a	n/a	n/a	N	Y
Earthquake Induced Seiche	N	Not a High Risk. Limited Response Time Would Exist if a Seiche Occurs.	n/a	n/a	n/a	N	Y

* Estimated costs may be revised as final engineering is completed. The City of Saratoga Springs is considering projects shown. Final decisions on project implementation are subject to year by year fiscal planning done by the City.

** PDM= FEMA Pre-disaster Mitigation Grants
HMGP = Hazard Mitigation Grant Program
WaterSMART= (WS used as shorthand) Bureau of Reclamation Water Savings Grants
DNR = Utah Division of Natural Resources
FMA= FEMA Flood Mitigation Assistance Grants