2022

PRE-DISASTER MITIGATION PLAN

For Summit, Utah, and Wasatch Counties

MAG

Expert Resources. Enriching Lives.

This page intentionally left blank

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 the public's awareness of 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 Pre-Disaster Mitigation 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 Jan 1, 2022 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, Liquefaction, Earthquake, Drought, Severe Weather, Climate Change, Avalanche, and Infestation.

Participating towns, cities, counties, and others

Summit County: Coalville, Francis, Henefer, Kamas, Oakley, Park City, and South Summit School District.

Utah County: Alpine, American Fork, Cedar Fort, Cedar Hills, Eagle Mountain, Elk Ridge, Fairfield, Genola, Goshen, Highland, Lehi, Lindon, Mapleton, Nebo School District, 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.

* Saratoga Springs has separate Pre-Disaster Mitigation Plans

Table of Contents

Part 1 Introduction

The MAG region 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.

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. The National Institute of Building Services estimates that every $1 spent on mitigation saves $6 in recovery when the event occurs.

National Institute of BUILDING SCIENCES	ADOPT CODE	ABOVE CODE	BUILDING RETROFIT	LIFELINE RETROFIT	FEDERAL GRANTS
Overall Benefit-Cost Ratio	11:1	4:1	4:1	4:1	6:1
Cost ($ billion)	$1/year	$4/year	$520	$0.6	$27
Benefit ($ billion)	$13/year	$16/year	$2200	$2.5	$160
Riverine Flood	6:1	5:1	6:1	8:1	7:1
Hurricane Surge	not applicable	7:1	not applicable	not applicable	not applicable
Wind	10:1	5:1	6:1	7:1	5:1
Earthquake	12:1	4:1	13:1	3:1	3:1
Wildland-Urban Interface Fire	not applicable	4:1	2:1	not applicable	3:1

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 ensure 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 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.

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 Interlocal 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.

Region Description

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 and lakes. 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. The preservation of open space within urban settings is crucial to quality of life and community well-being.

The cities of Provo and Orem have always been the urban core of Utah County, but this is changing. The two largest metropolitan areas in the state, Salt Lake City and Provo/ Orem, converge at the Point of the Mountain, creating a natural center for high growth in both jobs and population. Since the year 2000, the West Area (including Lehi, Eagle Mountain, and Saratoga Springs) has been the epicenter of statewide population growth, adding more than 102,000 people. Future growth explodes in the West Area. Most of Provo and Orem are developed established areas that have increased in density since 2000, adding 32,000 new people. Another 96,000 people are forecasted to move to the area, with increased density and Vineyard building up and out.

Population

The Mountainland area comprises three counties located in north central Utah having an estimated combined population of over 712,000 residents

Mountainland Region Population by County and Multi-County District 2020-2050

	2020 Census	2030	2040	2050
MAG Total	712,471	960,578	1,197,730	1,429,516
Summit County	42,145	50,558	57,983	63,097
Utah County	636,235	861,852	1,080,082	1,297,515
Wasatch County	34,091	48,168	59,665	68,904

Sources: U.S. Bureau of the Census; Utah Population Estimates Committee

Percent Population by Race and Hispanic Origin Mountainland Counties, 2020 (most recent available)					
	White	Black	Amer. Indian Aleut, Eskimo	Asian or Pac. Isle	Hispanic
Summit	94.5	1.2	0.6	2.0	11.5
Utah	92.7	0.8	0.8	2.8	12.2
Wasatch	95.4	0.8	0.7	1.2	13.7

Source: US Census Bureau, Census 2020

Part 2 Planning Process

Process

Project Approval

The Pre-Disaster Mitigation Plan process was presented to the MAG Executive Council (with elected officials for every jurisdiction) in October 2018. The Executive Council unanimously approved the process, which designated MAG planner Shauna Mecham to prepare a multi-jurisdictional plan for adoption by each community. In 2019 the Executive Council was informed that FEMA had awarded MAG $71,250 in federal monies with a $23,750 local match to update the Hazard Mitigation Plan.

Kick-off Meetings

In late 2019/early 2020 meetings were scheduled in each county and municipalities were encouraged to send representatives to learn the mitigation process and renew their strategies. MAG also presented hazard maps at a January Wasatch County Health Department event. Over 50 people stopped to interact with the map or ask questions.

Wasatch County, November 14 2019	**North Utah County, December 11, 2019**	**Central Utah County, December 11, 2019**	**South Utah County, December 18, 2019**
Special Speaker: Travis Wright of FFSL on Fire Mitigation	*Special Speaker: Brad Bartholomew on BRIC grants*	*Special Speaker: Amy VanHorn and Dale Hamilton of the Bureau of Reclamation*	*Special Speaker: Ryan L. and Scott Elliott of the Bureau of Reclamation*
Lewis Hastings, WCHD	Scott DaBell, Lehi	Allison Jester, UC Sheriff's Office	Ryan Selee, Salem
Shane Owens, Midway	Mike Hadley, Eagle Mountain	Peter Quittner, Utah County EM	Jason Bond, Santaquin
Troy Morgan, WCFD	Jeff Weber, Eagle Mountain	Chris Blinzinger, Provo City	Erik Robinson, BoR
Ivan Spencer, Wasatch GIS	Kim Struthers, Lehi City	Heath Stevenson, Orem City EM	Jill Spencer, Payson
Jamie Baron, Heber City	Gary LeCheminant, Highland City	Taggart Bowen, Orem City	Travis Jockumsen, Payson

Jan McCosh, Hideout	Jennifer Hansen, FFSL	Don Overson, Vineyard	Scott Spencer, Payson
Ross Funk, Heber City	Julie Murphy, FFSL	Marty Beaumont, Pleasant Grove	
	Alan Jenkins, NUCWCD	Aaron Spencer, Pleasant Grove	
	Larry Mendenhall, NUCWCD	Adam Cowie, Lindon	
		John Little, Spanish Fork	
		Liz Hart, Vineyard	
		Caleb Christen, Springville	

MAG also presented to the Summit County Council of Governments in the same timeframe, attended by many of the mayors and commissioners in Summit County.

These meetings discussed hazard mitigation and the planning process, examples of successful FEMA mitigation grants, additional concerns that should be incorporated in the plan, and recent disasters. Partners were also invited to present on items of concern to the area. MAG used these meetings to focus on particular hazards or add hazards such as air quality and to build relationships with other agencies.

Shortly after these kick-off meetings COVID shut-downs drastically slowed the plan process. MAG took this time to review the previous plan, made additions, corrections, and update maps and projections.

Individual Meetings

For this plan update MAG made a special effort to have one-on-one contact with each jurisdiction to allow for better discussion of risk and explore mitigation strategies.

In the summer of 2021 MAG met with each jurisdiction and pertinent stakeholders to present their risk analysis, explore hazard maps, and brainstorm mitigation strategies. A complete list of contact information and dates contacted can be found in the Appendix.

Representatives from each community who participated in the hazard mitigation meetings

Summit County		
Position	**Name**	**Meeting**
Coalville Public Works	Kyle Clark	10/28/2021
Coalville Wastewater Treatment	Sam Adams	10/28/2021
Francis Planner	Katie Henneuse	6/14/2021

Francis/Kamas	Scott Kettle	6/14/2021
Henefer Mayor	Kay Richins	8/11/2021
Oakley	Amy Rydalch	8/16/2021
South Summit School District	Kip Bigelow	7/19/2021
South Summit School District	Kathy Carr	7/19/2021
Summit County Planner	Ray Milliner	8/18/2021
Park City Emergency Manager	Mike McComb	3/09/2022
Park City Fire District	Mike Owens	3/09/2022
Park City Chief Building Official	Dave Thacker	3/09/2022
Utah County		
Position	**Name**	**Meeting**
Alpine	Shane Sorensen	6/17/2021
American Fork Engineer	Scott Sensanbaugher	6/14/2021
American Fork Public Works/Engineer	Ben Hunter	6/14/2021
Cedar Fort Mayor	David Gustin	12/17/2020
Cedar Hills City Manager	Chandler Goodwin	6/14/2021
Cedar Hills/AF Fire	Aaron Brems	6/14/2021
Central Utah Water Conservancy District	Mike Whimpey	12/8/2021
CUWCD	Blake Buehler	12/8/2021
CUWCD	Chris Elison	12/8/2021
CUWCD	Cort Lambson	12/8/2021
CUWCD	KC Shaw	12/8/2021
Eagle Mountain	Greg Stone	6/22/2021
Eagle Mountain Fire Chief	Embret Fossum	6/22/2021
Eagle Mountain Primary	Jeff Weber	6/22/2021
Elk Ridge City Manager	Royce	7/8/2021
Fairfield Mayor	Brad Gurney	12/17/2020
Genola Town Clerk	Lucinda Daily	7/29/2021
Goshen Mayor	Steven Staheli	6/9/2021
Health Dept Emergency Response Coordinator	Ryan Strabel	6/30/2021
Highland Finance Director	Tyler Bahr	6/17/2021
Highland Planning	Nathan Crane	6/17/2021

Lehi Emergency Management Committee director	Scott DaBell	7/7/2021
Lehi Emergency Management Committee director	Scott Sampson	7/7/2021
Lehi Engineering	Ross Spencer	7/7/2021
Lehi Planning	Kim Struthers	7/7/2021
Lehi Planning	Mike West	7/7/2021
Lindon Administration	Adam Cowie	6/15/2021
Lindon Emergency Manager	Kelly Johnson	6/15/2021
Mapleton Planner	Brian Tucker	6/30/2021
Mapleton Public Works	Steven Lord	6/30/2021
Nebo Risk Management	Kathy Carling	7/20/2021
Orem Emergency Manager	Heath Stevenson	6/22/2021
Orem Engineer	Sam Kelly	6/22/2021
Payson	Jill Spencer	6/14/2021
Payson	Travis Jockumsen	6/14/2021
Payson Facilities Manager	Shane Spencer	6/14/2021
Payson Fire Marshall	Scott Spencer	6/14/2021
Pleasant Grove Engineering	Aaron Wilson	6/15/2021
Provo	Melissa McNalley	6/10/2021
Provo Airport	Donavon Cheff	6/11/2021
Provo EM	Chris Blinzinger	6/10/2021
Provo Planner	Robert Mills	6/10/2021
Provo Stormwater Engineer	Jared Penrod	6/10/2021
Santaquin	Jason Bond	7/26/2021
Santaquin EM	Chris Lindquist	7/26/2021
Santaquin Engineer	Jason Lidet	7/26/2021
Santaquin Engineer	Norm Beagley	7/26/2021
Santaquin Fire Chief	Ryan Lind	7/26/2021
Spanish Fork	Travis Warren	6/9/2021
Spanish Fork Economic Development	Dave Anderson	6/9/2021
Spanish Fork Emergency Manager	Trevor Sperry	6/9/2021
Spanish Fork Public Works	Marlo	6/9/2021
Springville Engineer	Jeff Anderson	6/30/2021

Utah Co. Emergency Manager	Peter Quittner	6/30/2021
Utah County	Emily, Lindsey, James	6/30/2021
Utah County Emergency Management	Allison Jester/Janeen Olson	6/30/2021
Utah County Fire Warden FFSL	Josh Berg	6/30/2021
Vineyard	George Reid	6/7/2021
Vineyard Engineer	Nassim	6/7/2021
Vineyard Planner	Briam Perez	6/7/2021
Woodland Hills	Corbett Stephens	7/8/2021
WUI Coordinator	Dax Reid	6/30/2021
Wasatch County		
Position	**Name**	**Meeting**
Charleston Mayor	Brenda Kozlowski	8/25/2021
Daniel	Eric Bunker	7/7/2021
Heber City EM	Lt. Jeremy Nelson	6/15/2021
Heber City Planner	Jamie Baron	6/15/2021
Hideout	Lynnette Shindurling	8/4/2021
Independence	Lauren Boldger	8/25/2021
Interlaken Clerk	Bart Smith	8/27/2021
Interlaken Mayor	Greg Harrigan	8/27/2021
Midway	Michael Henke	7/7/2021
Wallsburg Mayor	Celeni Richins	8/23/2021
Wasatch Co GIS	Ivan Spencer	6/15/2021
Wasatch County Emergency Manager	Jeremy Hales	6/15/2021

Notice given to partner organizations

All school districts, water districts, public lands agencies, and surrounding MPOs and emergency responders were invited to attend the kick-off and Draft Plan Presentation meetings. Central Utah Water Conservancy District, South Summit School District, and Nebo School District were active participants.

See the Appendix for a complete list of those offered the opportunity to attend and comment.

Other Presentations:

MAG's Technical Advisory Committee, July 26 202: Twenty+ engineers and planners in Utah County

Utah County Emergency Manager's Committee, October 26 2021: Roughly 15 Emergency Managers and Fire Chiefs from cities, universities, and utility companies in Utah County

Central Utah Water Conservancy District Participation

The Central Utah Water Conservancy District (CUWCD or District) was formally established pursuant to the provisions of the Water Conservancy Act in 1964. The District presently serves all or part of the following eight counties in the State of Utah: Duchesne, Juab, Salt Lake, Sanpete, Summit, Uintah, Utah, and Wasatch Counties. Consistent with its mission and values, the District acts as a provider of wholesale water to various water conservancy districts, metropolitan water districts, municipalities, individuals, and corporations within the boundaries of the District. The District has had two previous FEMA approved hazard mitigation plans and will be updating its plans during 2022. The future development of the CUWCD water system will mainly be with a strong emphasis on water conservation, planning of needed additional regional water supply facilities, and incorporation of natural hazard mitigation. The District will also continue in its current efforts to address and incorporate natural hazard mitigation (i.e., seismic upgrades/standards, lightning protection, backup power, wildfire – both direct and indirect effects, etc.) into future design and construction projects whether they are for new facilities or for capital replacement projects. The included projects will help fulfill said efforts.

Because CUWCD has some sensitive information, they looked at their assets and facilities independently to create and prioritize mitigation strategies. Their methodology is included in the Methods sections of this plan.

Public Input

Website

In October 2019 MAG updated hazard mitigation page on its website, Mountainland.org/hazards, with information on the plan and the planning process and contact information so interested parties could email comments on the draft plan from the web site. MAG also emailed all the contacts from the 2017 plan and began updating contact information. As the plan came together in 2021 MAG posted Story Maps and, in October

2021, the Draft Plan on its website. In December 2021 the Draft Pre-Disaster Mitigation Plan was featured on the main page with a comment box.

Open Houses

Normally, the Plan would have been presented at open Houses were held in conjunction with a Transportation Open House. MAG was able to present at a Wasatch County Preparedness Fair on 11 Nov, 2019 where they interacted with 50+ members of the public as well as several Wasatch County Fire Personnel. COVID restrictions on group gatherings made traditional meetings impossible for most of 2020 and 2021. MAG chose to focus on small meetings with cities and asked cities to promote the draft plan through their social media platforms, MAG lacking social media itself. As open houses begin again MAG will seek opportunities to share the final plan with the public.

Draft Plan Presentations

MAG shared the draft plan in a series of lunch meetings similar to the kick-off meetings, but with an emphasis on inviting elected officials such as city councilors. FEMA's Mitigation Specialist, Brandon Webb, also presented on BRIC grants and successful mitigation efforts. These meetings served to connect communities internally, to nearby communities, and state resources.

Draft Pre-Disaster Mitigation Plan Presentation Attendees	
Wasatch County	**October 13**
Heber City Planner	Jamie Baron
Heber City Planning Director	Tony Kohler

Wasatch County	Lewis Hastings
Independence	Lauren Boldger
Daniel Councilmember	Mary Duggin
FEMA	Daniel Webb
Midway Councilmember	Luke Robinson
Wasatch County Councilmember	Kendall Crittenden
CUWCD	Roger Pearson
Midway Councilmember	Steve Dougherty
Heber City Administrator	Matt Brower
Heber City Mayor	Keleen Potter
Summit County	**October 28**
Emergency Manager	Kathryn McMullin
Summit Co Public Works	Derrick Radke
Summit Co Manager's Office	Janna Young
Summit Co	Glenn Wright
Summit Co Environmental Health	Spencer Smith
Coalville Public Works	Kyle Clark
Coalville Wastewater Treatment	Sam Adams
Oakley City	Kelly Kimber
Francis/Kamas	Scott Kettle
Francis Planner	Katie Henneuse
Park City Fire District	Ashley Lewis
North Summit Fire District	Ian Nelson
FFSL /County Fire Warden	Bryce Boyer
S Summit School District	Kip Bigelow
S Summit School District	Kathy Carr
North Utah County	**October 20**
Alpine	Shane Sorensen
Lehi Planning	Kim Struthers
Lehi Emergency Management	Scott DaBell

Lehi Emergency Management	Scott Sampson
Lehi Planning	Mike West
Lehi Environmental Sustainability	Todd Munger
Lehi City Council	Paige Albrecht
American Fork Engineer	Scott Sensanbaugher
Eagle Mountain Primary	Jeff Weber
Eagle Mountain	Greg Stone
Eagle Mountain Fire Chief	Embret Fossum
Eagle Mountain Engineer	Chris Trusty
Highland Mayor	Rod Mann
South Utah County	**October 21**
Salem	Greg Gurney
Payson	Jill Spencer
Payson	Travis Jockumsen
Santaquin	Jason Bond
Santaquin EM	Chris Lindquist
Santaquin Engineer	Norm Beagley
Santaquin	Jon Lundell
Genola Town Clerk	Lucinda Daily
WUI Coordinator	Dax Reid
Central Utah County	**October 25**
Orem Emergency Manager	Heath Stevenson
Provo EM	Chris Blinzinger
Provo Stormwater Engineer	Jared Penrod
Provo	D Cheff
Provo Planner	Robert Mills
Lindon Administration	Adam Cowie
Lindon Emergency Manager	Kelly Johnson
Vineyard	George Reid
Vineyard Engineer	Nassim

Spanish Fork Economic Development	Dave Anderson
Spanish Fork	Travis Warren
Mapleton Planner	Brian Tucker
PG Engineering	Marty Beaumont
PG Engineering	Aaron Wilson

Identifying Hazards

MAG identified several hazards addressed in the Hazard Mitigation Plan. The hazards were identified through a process that included researching past disasters, Geographic Information System (GIS) data, and the Utah State Hazard Mitigation Plan.

The original hazard mitigation plan identified several potential hazards for the region. The list was reviewed by staff and at the kick-off meetings. MAG used GIS to overlay current development with hazard data. This data was used to identify which hazards had the greatest risk for each city. These hazards were then presented in greater detail in the following county portions of this plan.

Updating the 2017 Plan

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

Online Resources – MAG created a simplified, interactive, online version of the plan for city staff, elected officials, and interested public. It will be easier to navigate than a lengthy .pdf and should make using the plan easier.

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.

Future Development – As MAG experiences incredible growth, emphasis was placed on examining the locations of development pressure within communities and discussing appropriate mitigation measures through zoning, building codes, and land preservation.

Mitigation Strategies – Individual meetings with each community served to brainstorm locally-relevant mitigation strategies and support strategies mentioned in other community plans.

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 much of the plan may seem to look similar to the 2017 plan, each portion has been reviewed and updated to reflect the most current information possible.

Incorporating Existing Plans

Existing Plans, Studies, Reports and Technical Information Reviewed	How Incorporated
Utah State Hazard Mitigation Plan	Comparing MAG counties to the state as a whole, describing the impact of some hazards not prevalent in MAG counties, county-level earthquake and drought losses.
National Integrated Drought Information System https://www.drought.gov/historical-information	Historic drought information by county, used to calculate probability.
The Utah Roadmap: Positive Solutions for Air Quality and Climate Change	Air Quality information and mitigation strategies for Air Quality and Climate Change
HAZUS Provo Segment 7.2 ShakeMap Scenario (2009)	County-wide earthquake losses estimate
U of U Seismograph Catalog https://quake.utah.edu/earthquake-information-products/earthquake-catalogs	Locations and magnitude of past earthquakes
FEMA National Flood Insurance Program	Floodplain maps of 100-yr, 500-yr, and levee-protected areas used in risk analysis, also example code requirements for city NFIP participation
Community Improvement Projects (see city websites)	Identify desired projects relating to mitigation in various communities

Governor's Office of Planning and Budget (2020 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 (2019). Utah Division of Water Rights. www.waterrights.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, clipped to MAG boundaries and risk adjusted for local highs and lows. Data has since been updated.
National Oceanic and Atmospheric Administration (NOAA) Storm Events Database	Locating weather and other disaster events; date, location, severity, and $ losses.
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.
FEMA NFIP Inundation Maps	Used to visualize and analyze 100 yr. and 500 yr. flood risk. Many maps had been updated since 2017, with some communities seeing significant changes in the number of homes in the floodplain.

Utah AGRC	Locations of critical buildings and infrastructure i.e., schools, fire stations, hospitals, etc.
UDOT Open Data Portal	GIS data for roads, bridges, and culverts used to estimate losses.

Part 3 Risk Assessment

Profiling Hazard Events

Visit the County Sections, Parts 5-7, for hazard analysis specific to each county. This section includes general descriptions, definitions, and mitigation strategies for hazards identified by MAG.

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 2019 State Hazard Mitigation Plan

Hazard	Number of Events	Years in Record	Recurrence Interval (years)	Hazard Frequency and Probability/Year
Droughts (<-2 PDSI)	17	123	7.2	14%
Earthquakes (≥ 5.0)	60	168	2.8	36%
Landslides *	unknown	unknown	unknown	unknown
Flood (injuries)	23	18	0.8	127%
Tornadoes (all)	134	150	1.1	89%
Avalanches (fatalities)	116	60	0.52	193%
Wildfires (>100,00 total acres burned in a year)	8	15	1.9	53%
Lightning (fatalities)	67	69	1	97%

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.

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 (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).

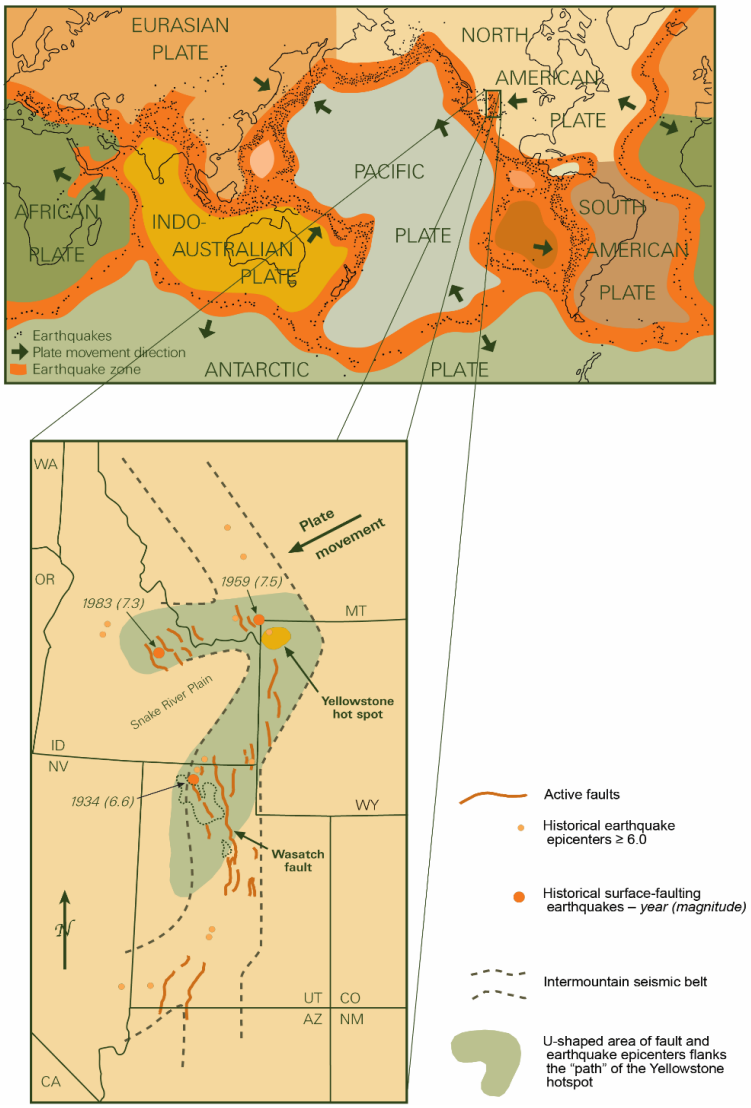


Figure Utah Geological Survey

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.

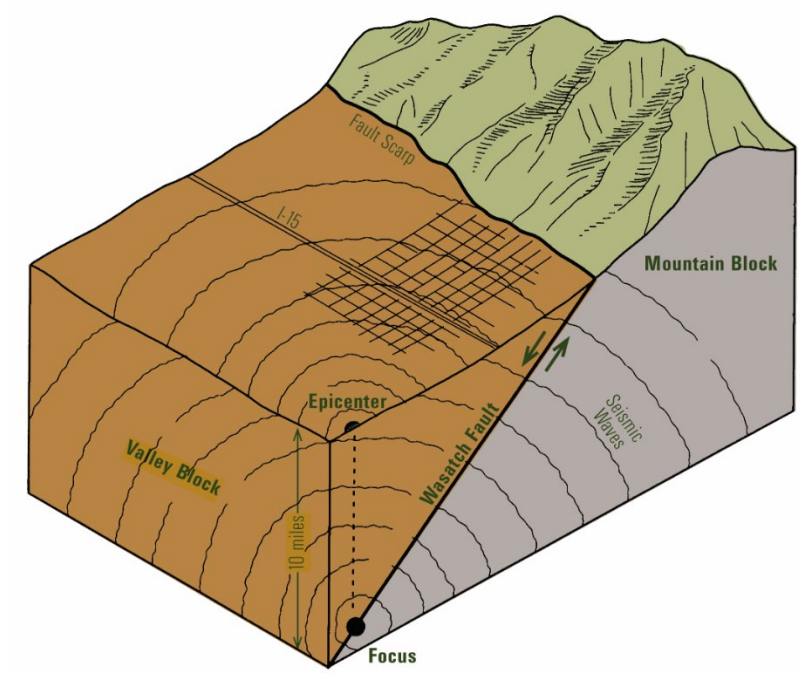


Figure Utah Geological Survey

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 the 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.

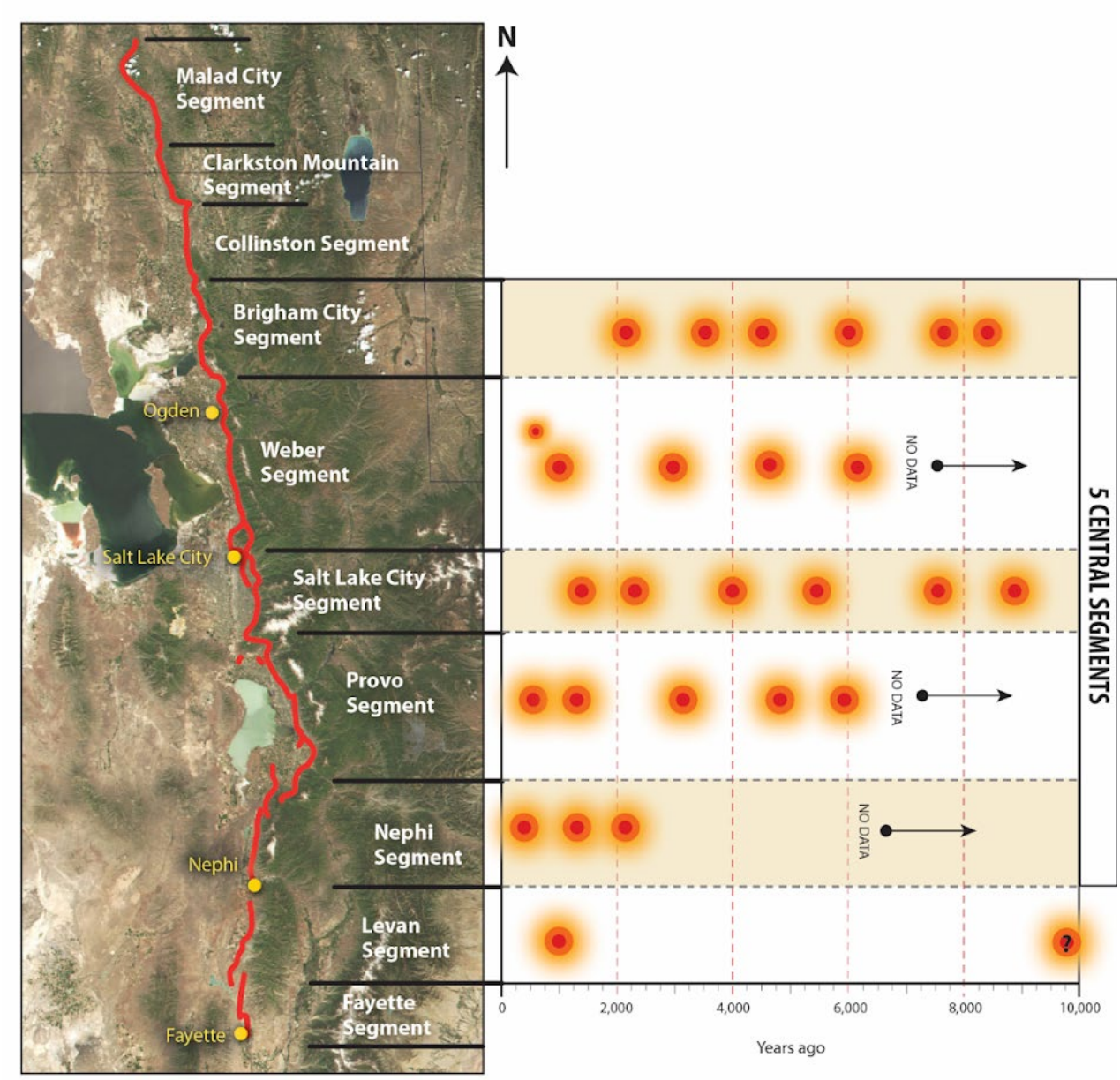


Figure 3 Utah Geological Survey

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

Sandbagging in Provo during the 1983 floods

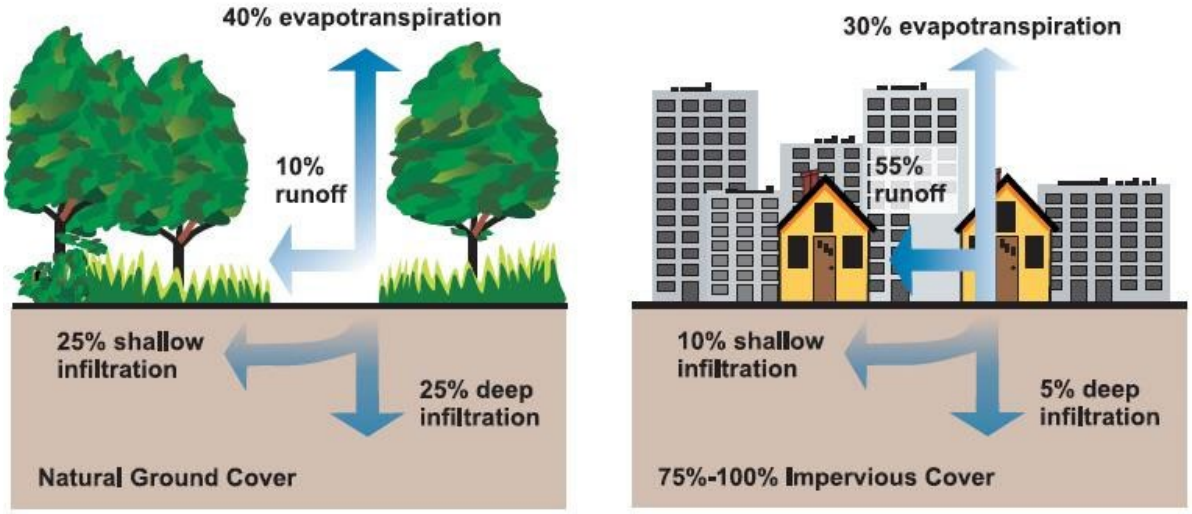
Humans have always sought out water for survival; drinking, agriculture, travel and energy. Some features like basins, plains, and alluvial fans appear ideal for homes built on flat ground or a gentle slope. Periodic flooding in riverine areas carries nutrients to soil ideal for agricultural production. 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 hazards 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 and 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 snowpack, 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.



Effects of Urbanization (EPA)

Conditions which may exacerbate floods:

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

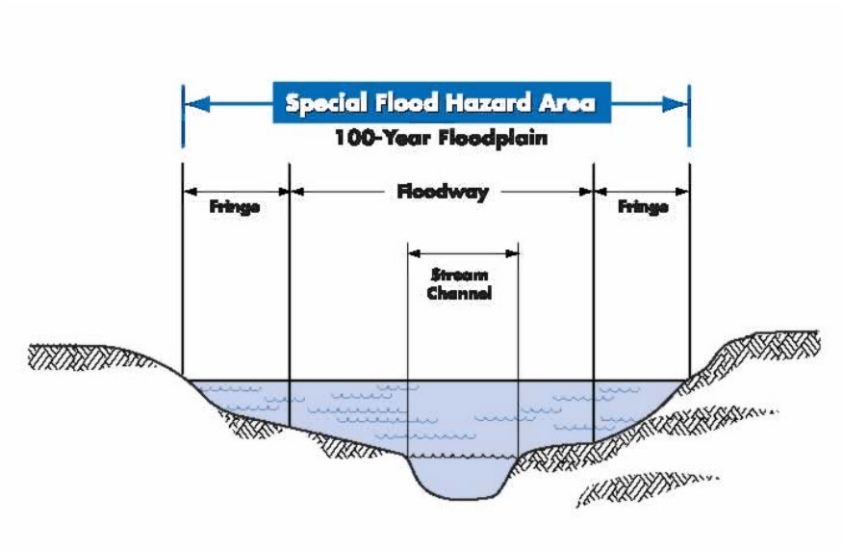
Explanation of Common Flood Terms

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 flood areas
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 downgrade flooding. The diagram below depicts common features of dams.

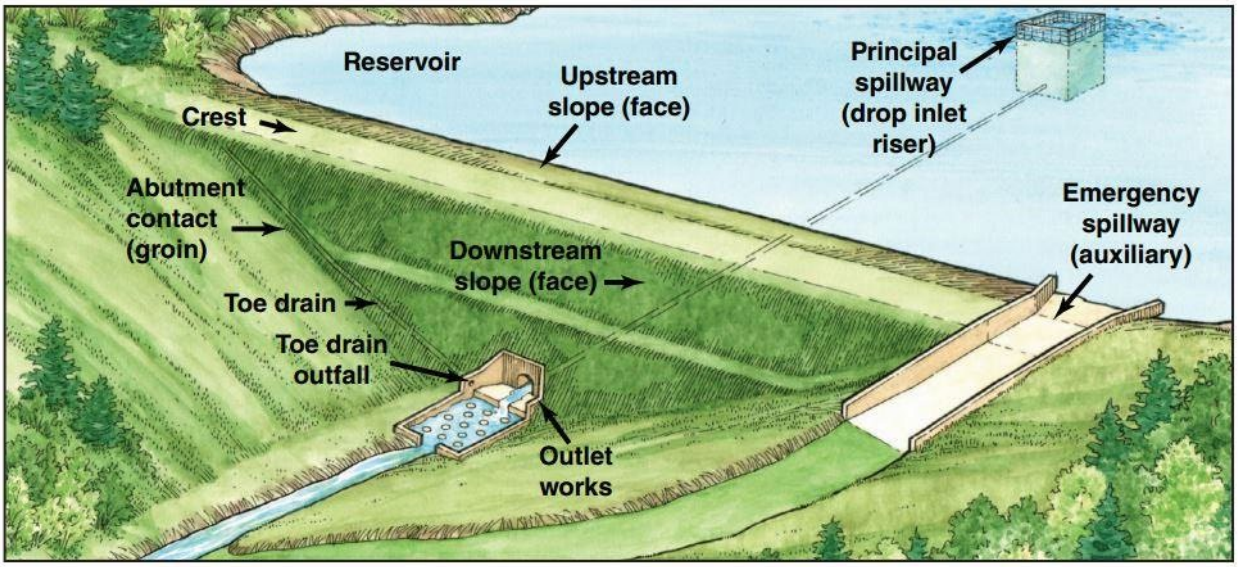


Figure 6 Dam Features. Created by the Forest Service and FEMA

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.

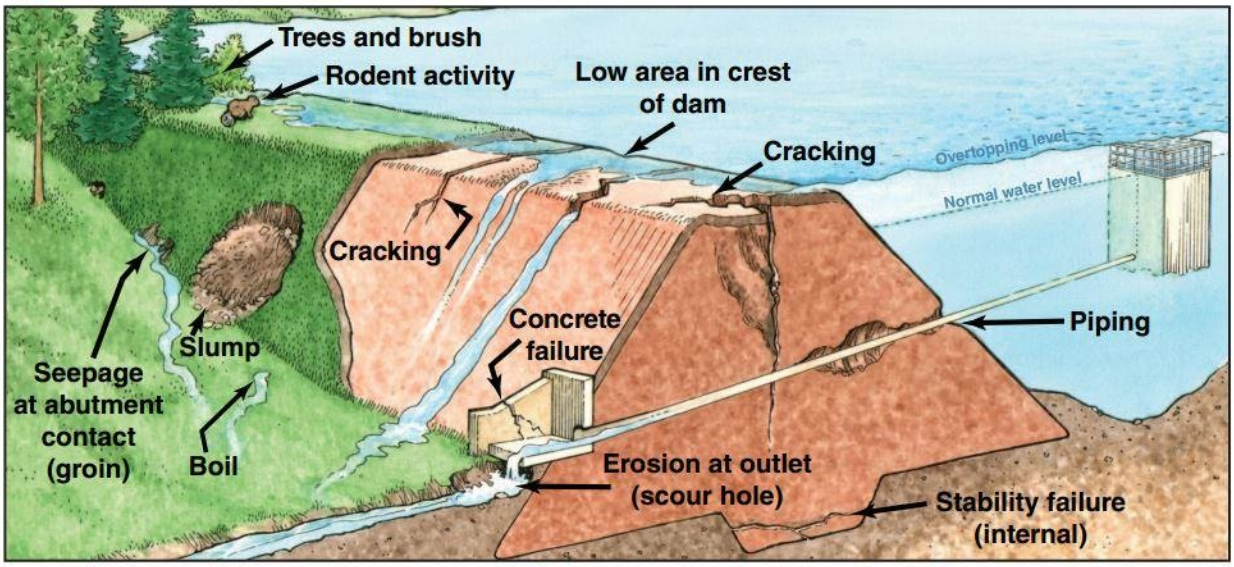


Figure 7 Possible dam problems. Graphic created by the Forest Service & FEMA.

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.

According to the Dam Safety Program, During the last several decades, there has been a better understanding of how dams function, and new minimum standards have been established. In order to provide for public safety, the Legislature has provided grant funding since 1992 in various amounts to the Board of Water Resources to appropriate for dam safety projects. From 1997 to 2007, approximately $4.3 million was appropriated per year. In 2008, the amount was reduced to approximately $700,000. From 2009 to present, funding has been $3.8 million per year for high hazard dam rehabilitations. These projects become necessary due to infrastructure aging, hazard creep and standards modernization. (Regular maintenance and other work may not be eligible for grant funding.)

Historically, the cost of each dam safety project has averaged about $2-3 million. (Cost varies depending on the size of the dam and the extent of the deficiencies.) **At the current level of funding, the state can fund, on average, only one or two dam safety projects each year**. With each passing year, inflation chips away at the dollar's buying power, and the ability to complete projects continues to diminish.

In order for the remaining high hazard dams to be brought up to minimum safety standards, an estimated $250 million is needed. **At the current funding rate, this is estimated to take about 66 years.** If funding were increased by $6.2 million to a total of $10 million per year, the dams could be upgraded in approximately 25 years.

The Board of Water Resources will continue to work with the Dam Safety program to determine which dams are the highest priority and to address these projects as funds allow, but the current level of funding is insufficient to address all the minimum standard issues. As a result, dam safety projects are being delayed due to a lack of funds. Additional funding would accelerate urgent dam safety upgrades.

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. The Bureau of Reclamation is in the process of reviewing their policies for sharing this information with the public and MAG hopes to use more recent maps in the next plan update.

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 earth fill 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 Deer Creek Dam	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. Fuel and oxygen are readily available in the MAG 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 wildfires 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 effect on 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 Reduce Risk through Land Use Planning Develop a Wildland-Urban Interface Code	• Use GIS mapping to analyze planning decisions, zoning, development, etc. • Designate high-risk areas and specify conditions for use and development • 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 Conduct Maintenance	• Create defensible space around power lines, oil and gas lines, etc. by removing vegetation and flammable materials • Replace flammable vegetation with less flammable species • 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 Increase Wildfire Risk Awareness Educate Property Owners about Wildfire Mitigation Techniques	• Consult Firewise guidance in encouraging best practices for the community • Organize local fire department tour to show officials vulnerable areas • Install fire mitigation systems such as interior and exterior sprinklers • Remove dead or dry leaves and other combustibles near/on homes

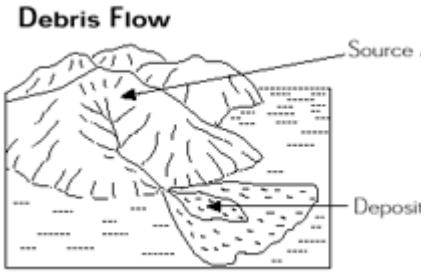
*Adapted from FEMA's "Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (2013)

Landslides

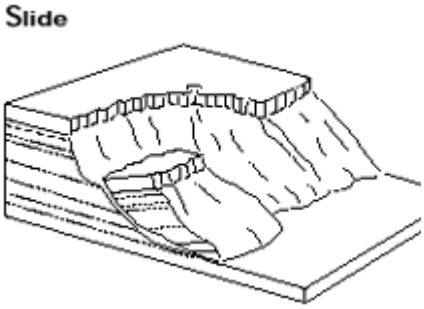
Many hazards are characteristically intertwined. Lightning may start a Wildfire or excessive rain could lead to a dam failure. Landslides are no exception. Landslides, often referred to as mass movement, occur any time the driving forces of gravity outweigh the resisting forces (friction, cohesion, strength 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 homeowners 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.

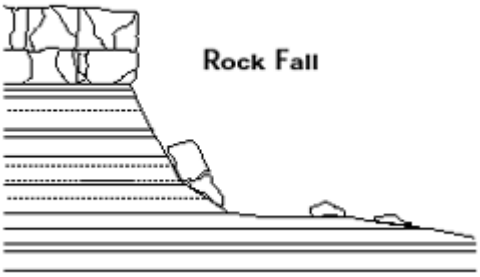
Three Common Types of Landslides in Utah



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 4 Regional Hazards

Introduction

Many hazards are difficult to map at a county level due to their unpredictability or wide-spread effects. Severe weather, infestations, algal blooms, 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 impractical due to the lack of specific spatial data and their widespread nature. Each jurisdiction has the opportunity to address these hazards on an individual mitigation level.

Air Quality

Description
Poor air quality is caused by harmful emissions from vehicles, homes, industry, and wildfire that have serious health, climate, and environmental consequences.

Although air quality is gradually improving, air pollution reduces the lifespan of the average Utahan by 2 years. Vehicle emissions account for half of air pollution. The Wasatch Front's geography makes inversions especially severe while the entire West suffers during wildfire season.

Probability: High in Utah County, low in Summit and Wasatch Counties

Severity: Critical, causes hospital visits and premature deaths.

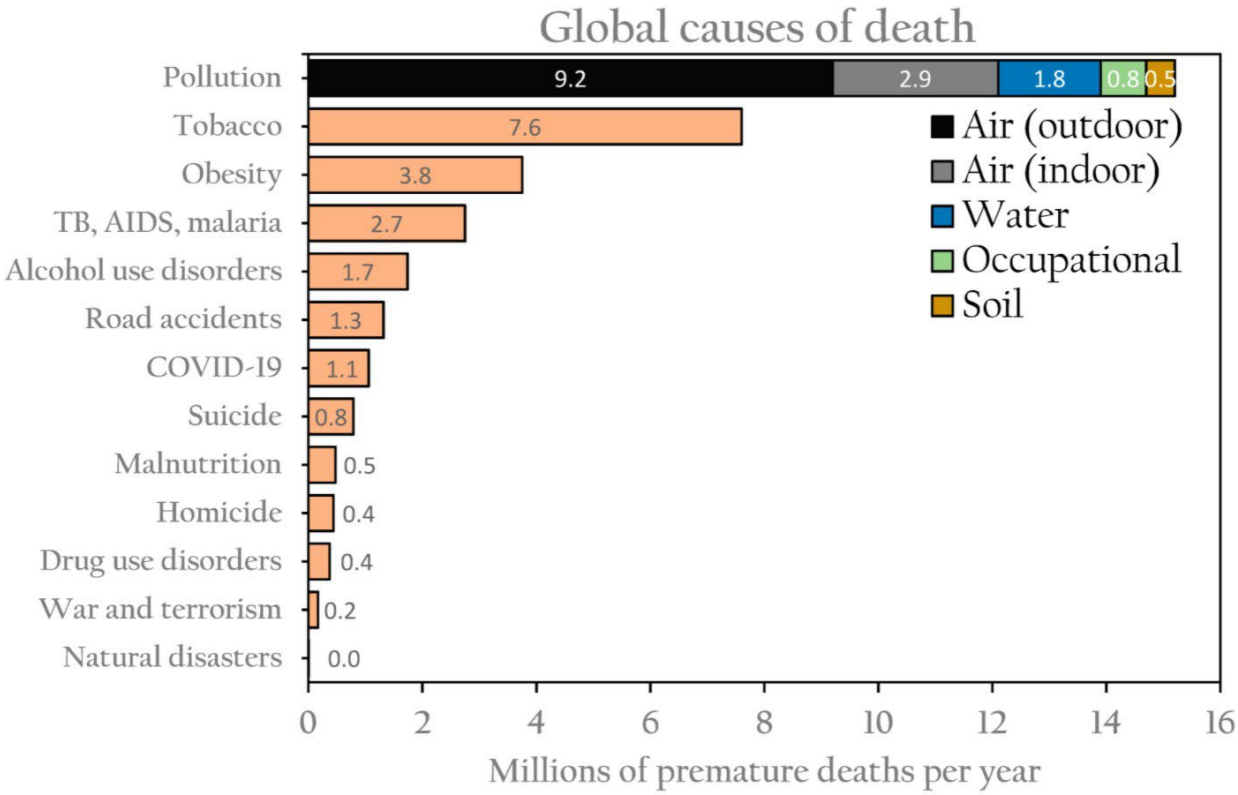
Vulnerability
Children, the elderly, those with health conditions, and fetuses are at greater risk for hospitalization on bad air days. Utah County's pollution is bad enough that it must submit plans to the EPA to improve its air, but Wasatch County is also concerned about the pollution and has had monitors in place since 2016.

Mitigation Strategies

- Adopt emissions reduction goals

- Promote teleworking
- Support research
- Accelerate Quality Growth efforts (i.e., denser, more walkable places)
- Encourage Electric Vehicles and infrastructure
- Consider market-based approaches
- Reduce auto-dependency

Experts estimated that air pollution in Utah causes 2480 to 8000 premature deaths annually (90% confidence interval) and decreases the median life expectancy by 1.1 to 3.6 years. Economic costs of air pollution in Utah totaled **$0.75 to $3.3 billion annually**, up to 1.7% of the state's gross domestic product. Worldwide, outdoor air pollution accounts for far more deaths and natural disasters.



- (Errigo et al, Human Health and Economic Costs of Air Pollution in Utah: An Expert Assessment. ***Atmosphere***. 2020; 11(11):1238. https://doi.org/10.3390/atmos11111238)

Algal Blooms

Algal blooms occur when naturally occurring cyanobacteria in the water multiply very quickly in warm conditions, producing cyanotoxins that can pose serious health risks.

Probability: High, especially in Utah Lake
Severity: Critical, can cause injuries or deaths

While blooms can happen naturally in pristine mountain lakes and impaired urban waterways, certain conditions (i.e., usually warmer waters and high concentrations of phosphorus and nitrogen) can increase the likelihood of blooms. As global temperatures increase, scientists have noticed blooms at an increasing frequency. Nitrogen and phosphorus are common pollutants that can come from sewage treatment plants, erosion and urban and agricultural runoff.

Vulnerability
Lake-adjacent cities and businesses that depend on water recreation are adversely affected by algal blooms, as is the perception of water safety at large. Children and pets are more likely to ingest water.

Mitigation Strategies
Proper land management and the investment in new technologies to treat wastewater can reduce the likelihood of blooms.
-Reduce the amount of fertilizer use on lawns
-Use phosphorus-free fertilizer and detergent when possible
-Fix leaking septic systems
-Keep yard debris such as leaves or grass clippings from washing into storm drains
-Pick up pet waste

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 tornadoes 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 exceedingly locally/regionally defined advisory (typical value is -18°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 15°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 amounts of rain which do not cause a flash flood or flood, but cause 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

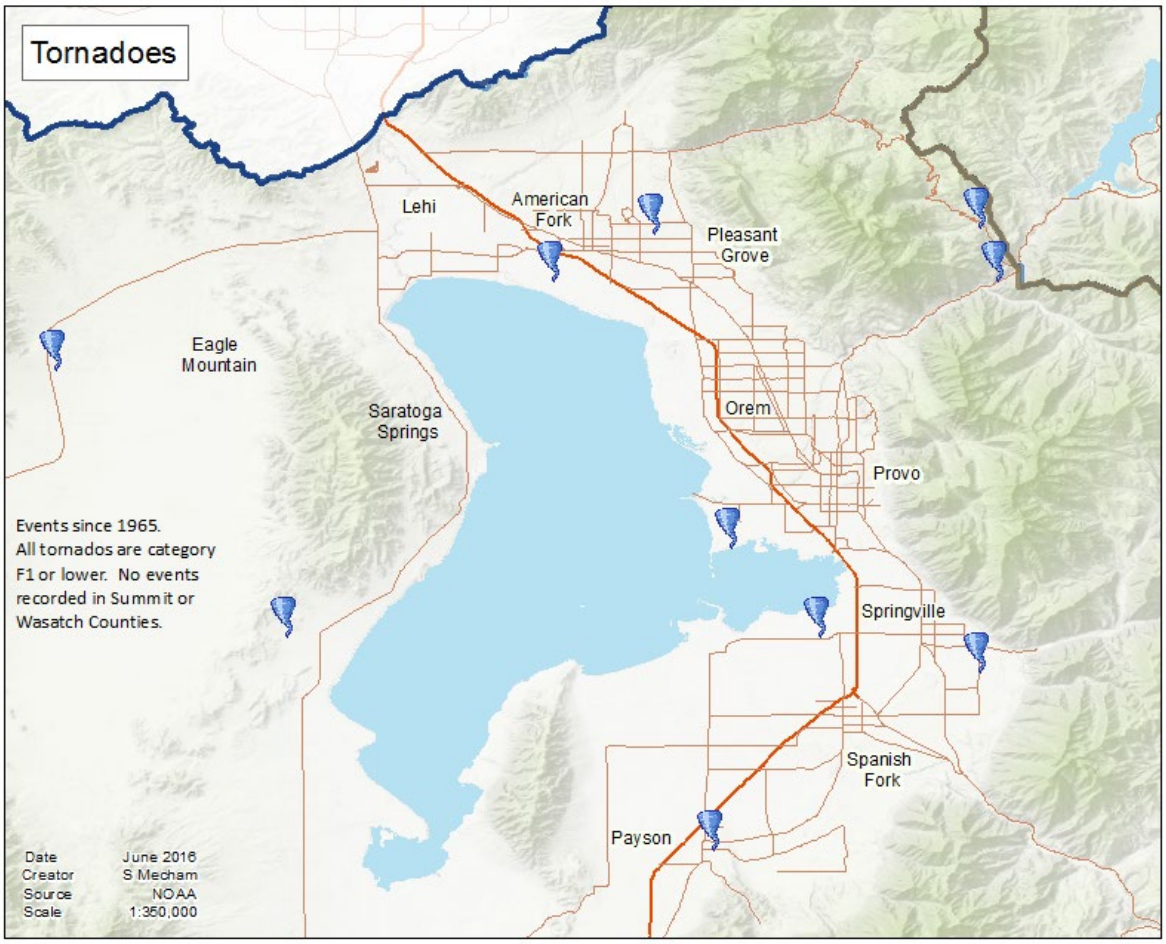
A severe winter storm deposits four or more inches of snow during a 12-hour period or six inches of snow during a 24-hour period. According to the official definition given by the U.S. Weather Service, the winds must exceed 35 miles per hour and the temperature must drop to twenty degrees Fahrenheit (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. Tornadoes 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.



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 travel. The run-out zone is where an avalanche stops and deposits the snow.

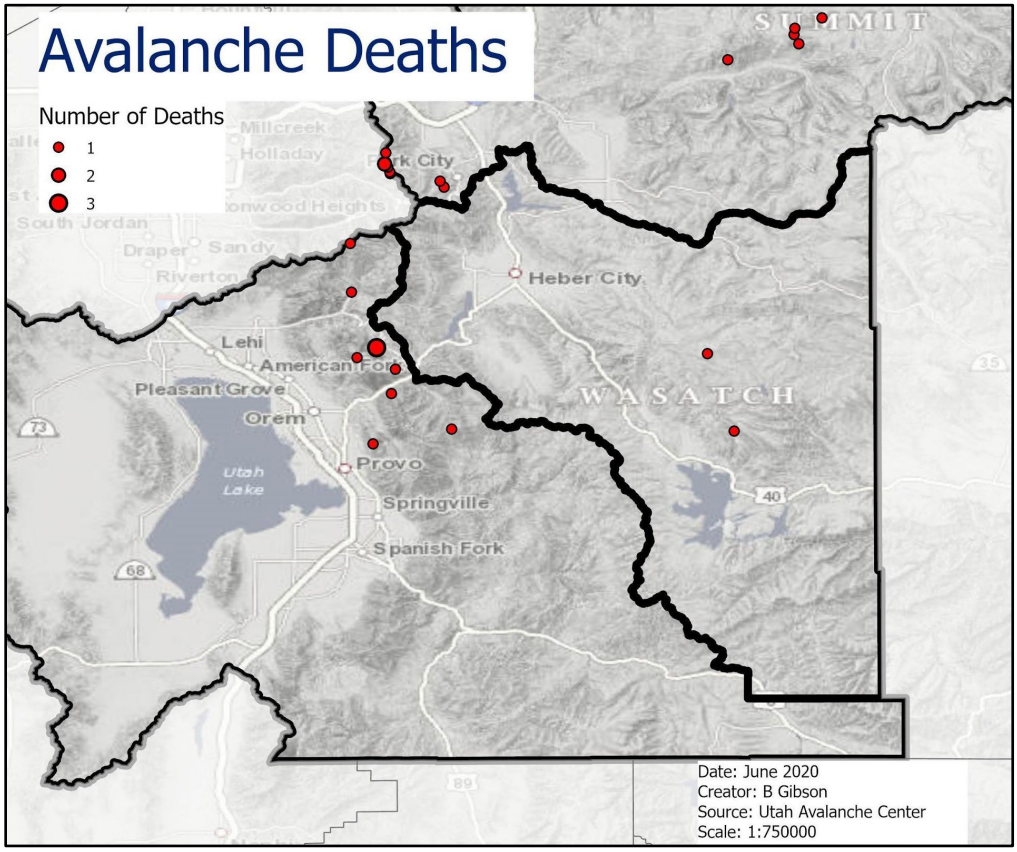
The two main factors affecting avalanche activity include weather and terrain, large frequent storms combined with steep slopes result in avalanche danger. Additional factors that contribute to slope stability are the amount of snow, rate of accumulation, moisture content, snow crystal types and the 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, thereby preventing 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	
Conduct Winter Weather Risk Awareness	• Distribute family and traveler emergency preparedness information • Encourage homeowners to install CO monitors and alarms
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. Climate change could increase the amount of energy in the air, resulting in more powerful summer storms and their related hazards.

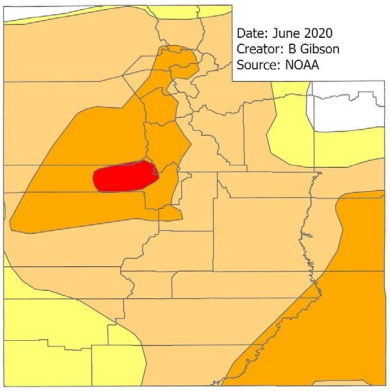
Profile

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.

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

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: 10% (PDSI -2.0 or lower) Severe: 4% (PDSI -3.0 or lower)
*Estimates according to NIDIS data based on tree-ring data from year 0 to 2017	

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 one'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 the remaining farmers' 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.

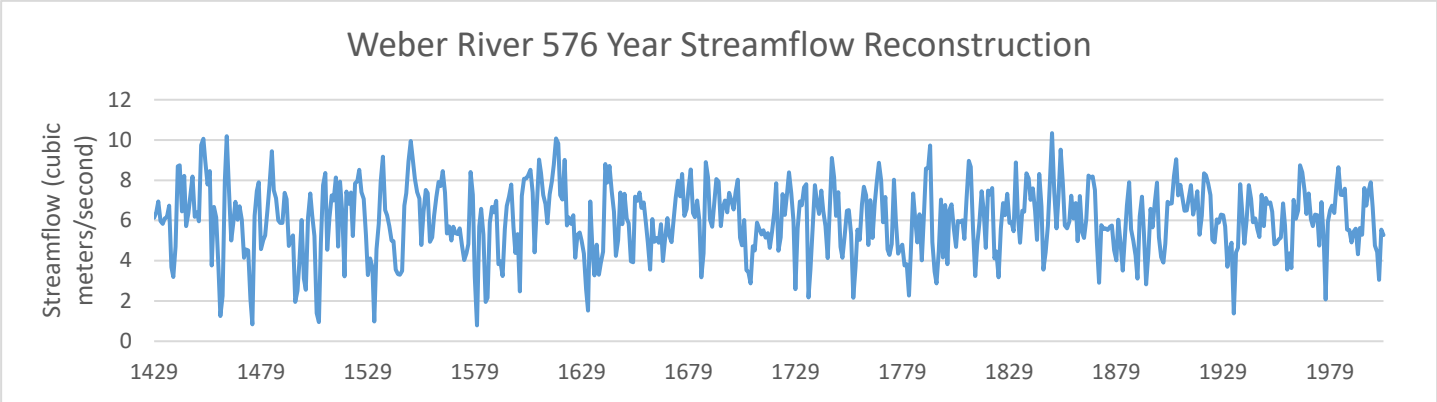
Development Trends

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. Current projections suggest that additional heat will result in a milder

winter with less snow and more rainfall in the spring. Since the region depends on snowmelt as a sort of "time release" source the lack thereof necessitates other methods of storing water in addition to greater efficiencies.

History

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. The National Integrated Drought Information System was used to calculate probability for MAG's counties.



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

Mitigation

Installing secondary meters saves water. Data shows significant savings of 20-30%. Over the last few years, legislation has been passed to require meters on new secondary connections, and $2 million annually has been appropriated in matching grant funds to offset the cost of installation in first- and second-class counties.

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 reduced 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)

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 they 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 be 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 almost 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 is 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.

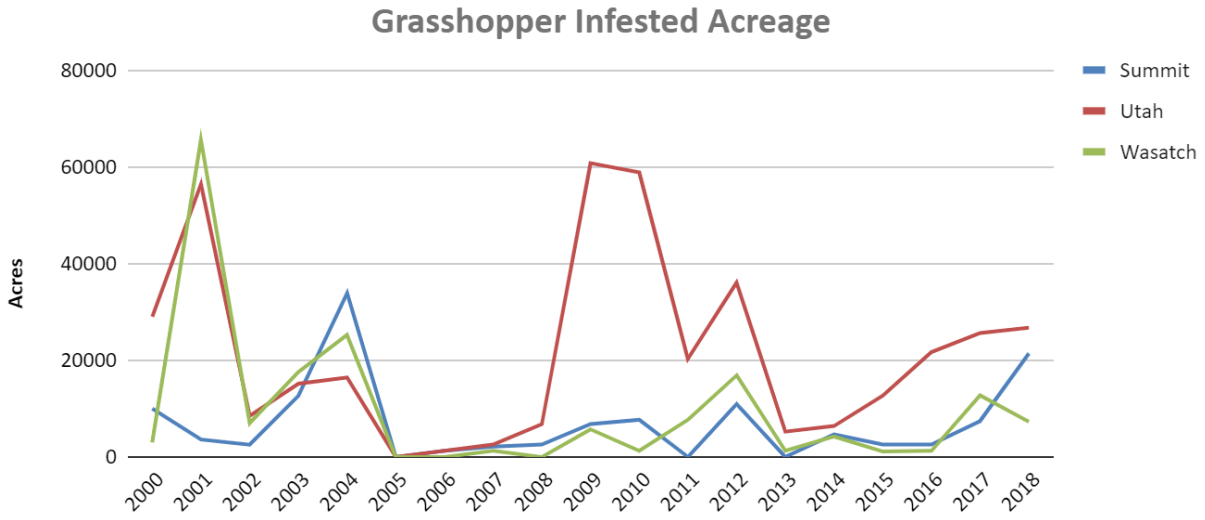


Figure 8. Utah Mormon Cricket and Grasshopper Report 2018, UDAF

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, 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.

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 is inevitable 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	2016	2017	2018	2019
Human	0	0	1	0	0	0	1	7	1	0
Horse	0	0	0	0	0	0	0	7	0	0
Mosquito Pools	0	0	2	2	5	0	0	11	0	4

*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 rickettsii. 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 to be an effective treatment when RMSF is identified early (especially in the first 5 days). RMSF has a mortality rate of 30% in untreated patients.

Mitigation

For diseases transmitted by mosquitoes and ticks, the best prevention is to use insect repellents 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 are always important when infection is possible.

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. Local Extension Offices of the Utah Department of Agriculture and Food provide species specific strategies.

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)	

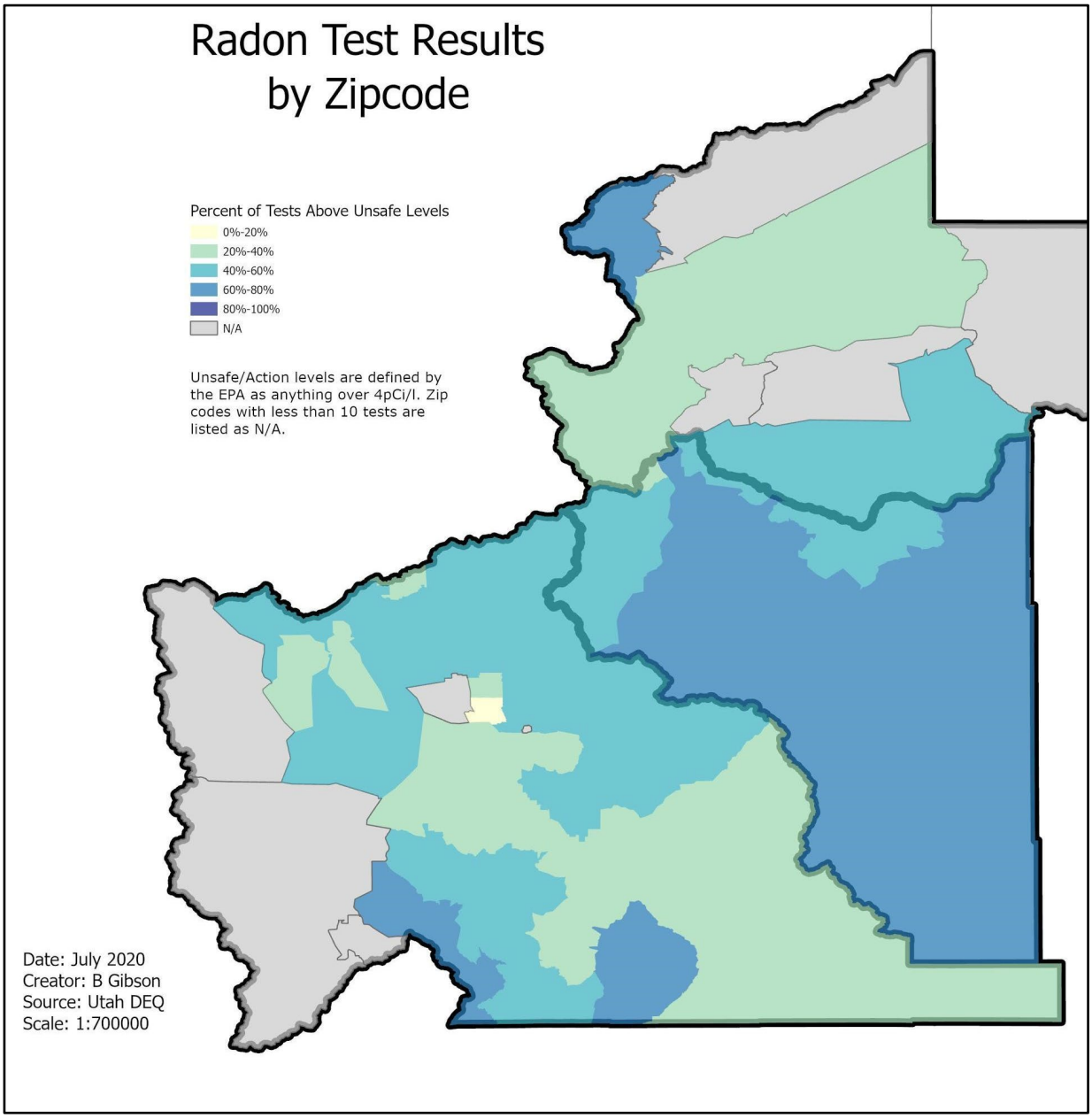
Note: If you are a former smoker, your risk may be higher.
* Lifetime risk of lung cancer deaths from EPA Assessment of Risks from Radon in Homes (EPA 402-R-03-003).
** Comparison data calculated using the Centers for Disease Control and Prevention's 1999-2001 National Center for Injury Prevention and 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 higher 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 5 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.

History: 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. Currently, skiing 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)

Population

The following table shows current and projected population data:

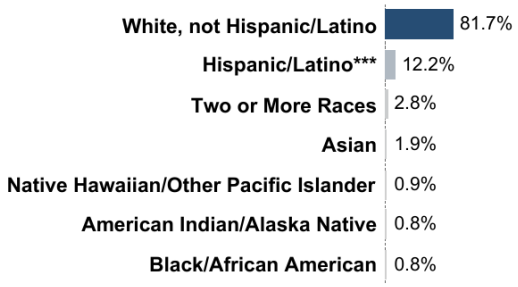
	2020 Census	2030	2040	2050
MAG Total	712,471	960,578	1,197,730	1,429,516
Summit County	42,145	50,558	57,983	63,097
Utah County	636,235	861,852	1,080,082	1,297,515
Wasatch County	34,091	48,168	59,665	68,904

Select Area Utah County

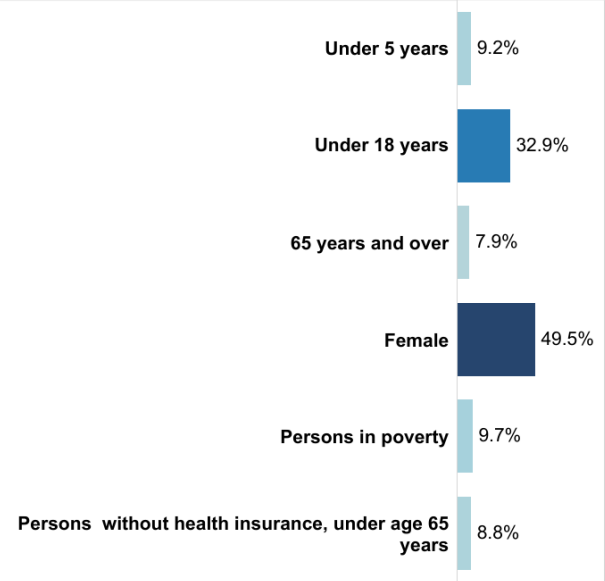
Demographics Utah County

In Utah County, more than a third of residents are children under the age of 18, with less than 8% of the population over the age of 64. The average travel time to work is 22 minutes due in large part to those commuting to Salt Lake County for jobs.

2019 Race and Ethnicity



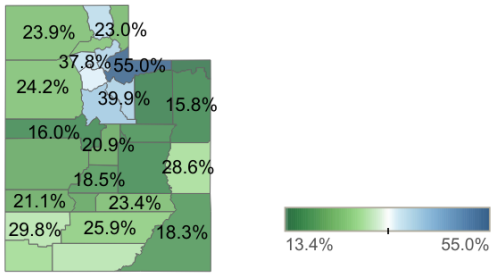
Population Shares, 2015-2019



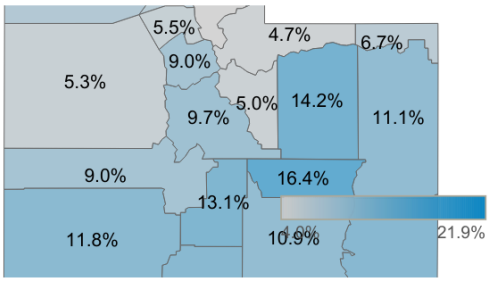
Other Facts

Households, 2015-2019	165,991
Housing units, July 1, 2019	186,554
Median value of owner-occupied housing units, 2015-2019	305,500
Persons per household, 2015-2019	4
Mean travel time to work (minutes), workers age 16 years+, 2015-2019	22
Veterans, 2015-2019	14,296
Veteran-owned firms, 2012	3,003
Women-owned firms, 2012	13,891

Bachelor's Degree or Higher, 2015-2019*



Persons Below Poverty, 2019



Updated 7/13/2021 8:10:38 PM

* Population 25 years and older. ** Population 5 years and older. *** Hispanics/Latinos may be of any race; also included in applicable race category. ****Civilian Population 16 years and older.

Source: U.S. Census Bureau. For more information: http://www.census.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 and desires to host another Winter Olympics, economic growth in the tourism sector should continue in the future.

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

Hazard	Years in Record	Yearly Probability	Deaths Annualized	Injuries Annualized	$ Losses Annualized	Source
Avalanche Fatalities	23	204%	2.16	1	$2,800	NOAA

Drought, Moderate	2018	9%	0	0	NA	National Integrated Drought Information System, USDA
Earthquake		1%	NA	NA	$1,500,000	HAZUS Salt Lake City 7.0 Magnitude Scenario
Floods	23	39%			$224,000	NOAA, HAZUS 2019 State Hazard Mitigation Plan
Hail	60	17%	0	0	$0	NOAA
Landslides/ Debris Flow	56	4%	0	0	$411,000	SHELDUS
Lightning	25	16%	0.16	0.35	$0	NOAA
Wildfires	6	250%			$734,000	Utah Division of Forestry Fire and State Lands and BLM with cost of fighting fire
Wind	60	50%	0	0.1	$7,400	NOAA (High Wind, Strong Wind and Thunderstorm Wind)
Winter Weather	19	242%	0.48	2.64	$64,224	NOAA (Blizzards/Heavy Snow/Winter Storm/Winter Weather)
Tornadoes	71	0%				NOAA
Volcanoes	5,000,000	0%	0	0	$0	

*Probability: Number of Events/Years in Record

Standards from FEMA IS 235: Emergency Planning Course
Potential Magnitude
Catastrophic: More than 50% of community affected
Critical: 25 to 50%
Limited: 10 to 25%
Negligible: Less than 10%

Probability Calculated using # of event/years in record
Highly likely: Near 100% probability in next year
Likely: 10 -100% probability in next year, or at least one chance in next 10 years.
Possible: 1-10% probability in next year, or at least one chance in next 100 years.

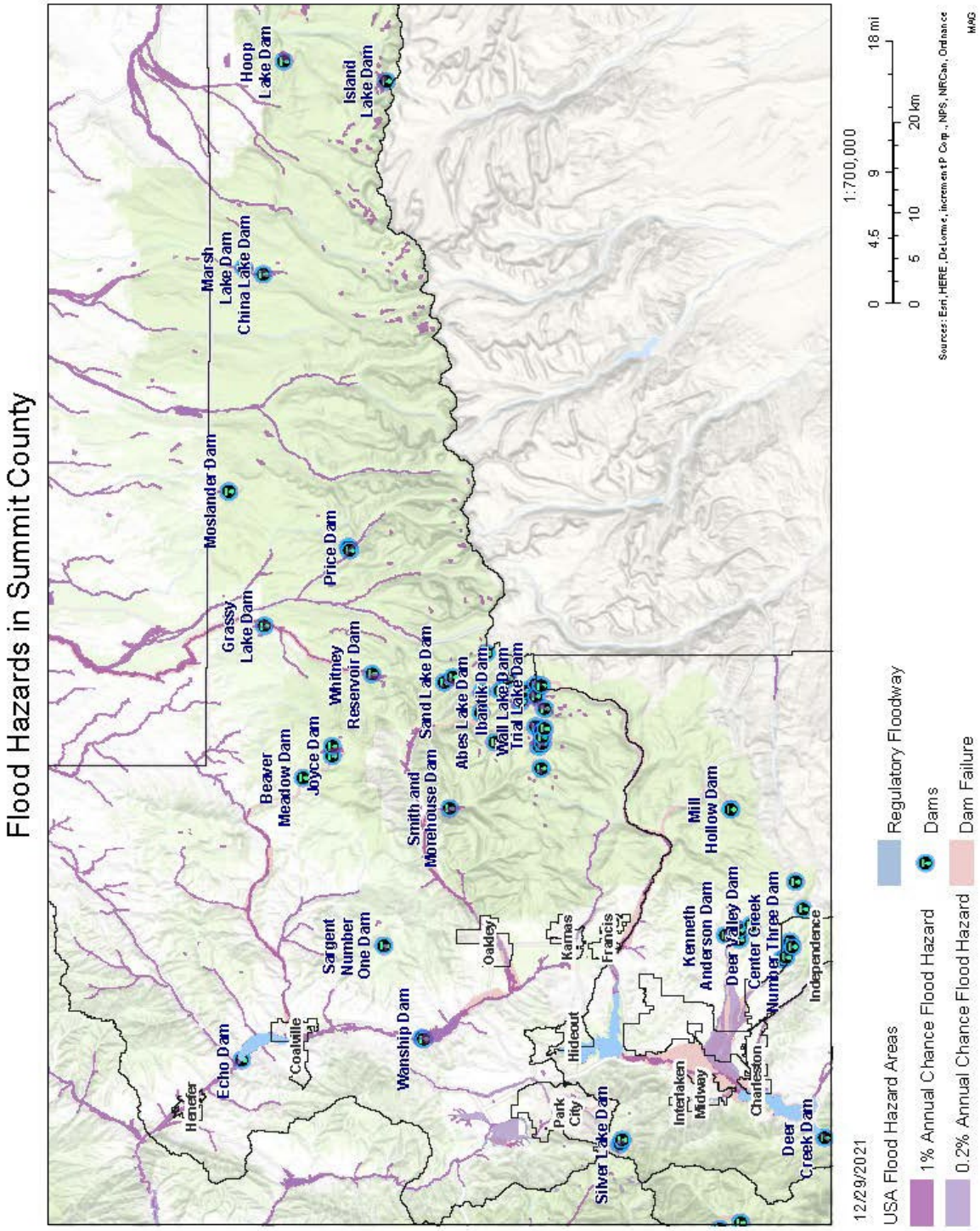
Unlikely: Less than 1% probability in next 100 years

Standards we modified to fit our region

Severity per incident

Catastrophic: Many lives, a great deal of property
Critical: Multiple lives lost and/or multiple properties affected
Limited: Some property loss, less than 3 lives lost
Negligible: Some property, no life lost

Flooding


Flood Hazards in Summit County
Hoop Lake Dam
Island Lake Dam
Marsh Lake Dam
China Lake Dam
Moslander Dam
Price Dam
Grassy Lake Dam
Whitney Reservoir Dam
Sand Lake Dam
Abes Lake Dam
Ibantik Dam
Mill Lake Dam
Trial Lake Dam
Beaver Meadow Dam
Joyce Dam
Smith and Morehouse Dam
Sargent Number One Dam
Mill Hollow Dam
Kenneth Anderson Dam
Deer Valley Dam
Center Creek Number Three Dam
Independence
Oakley
Kamas
Francis
Hideout
Wanship Dam
Echo Dam
Coalville
Hoytsville
Park City
Silver Lake Dam
Interlaken
Midway
Charleston
Deer Creek Dam
0 4.5 9 18 mi
0 5 10 20 km
1:700,000
Sources: Esri, HERE, DeLorme, increment P Corp., NPS, NRCan, Ordnance
MAG
12/29/2021
USA Flood Hazard Areas
1% Annual Chance Flood Hazard
0.2% Annual Chance Flood Hazard
Regulatory Floodway
Dams
Dam Failure

Overview

Although Utah is considered a dry desert state, flooding does occur. Most floods have occurred either from snow melt or severe thunderstorms. Often, 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.

Profile

Frequency	Flooding happens within Summit County on a fairly 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 to ensure that it is in compliance with NFIP guidelines.

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

Jurisdiction	Floodplain	Current Effective Map Date	Floodplain Admin
Coalville	Participating in NFIP. Coalville has ordinances for Flood Damage and Prevention, Provisions for Flood Hazard	March 2021	Paul Taylor, City Engineer

	Reduction in pertaining to water infrastructure, as well as a Sensitive Lands Ordinance prohibiting building within 100' of a floodplain.		
Francis	Participating in the NFIP, adopted and incorporated most recent FIRMs	March 2021	Katie Henneuse, City Planner
Kamas	Adopted March 2021 FIRMs, more homes now in the mapped floodplain. Has a Flood Damage and Prevention Ordinance.	March 2021	Amanda Huffmyer, City Planner
Oakley	Participating in NFIP. Chapter 8 of city code deals addresses Flood Control.	March 2021	Planner Stephanie Woolstenhulme
Park City	Participating in the NFIP, has Flood Damage Prevention and Sensitive Lands ordinances.	March 2021	Engineer John Robertson
Summit County	Participating in NFIP	March 2021	Engineer Michael Kendell

Assessing Vulnerability: Addressing Repetitive Loss Properties

There are no repetitive loss properties in Summit County (FEMA, 2021).

History

Flooding

Location/Extent	Date	Fatalities	Damages	Source
Summit	7/29/1969	0	$1,250	SHELDUS
Summit County	4/30/1983	0	$4,761,905	FEMA Disaster Declaration
Summit County	6/7/1986	0	$50,000	SHELDUS
Summit and Wasatch Counties: Heavy rains combined with snowmelt to bring the Emigration Creek above its banks and flood 5 homes along the bank. Damage amounts estimates from newspaper clippings.	4/15/2006	0	$50,000	NOAA
Peoa: Abnormally warm temperatures in early June, combined with a deep late season snowpack, led to excessive snowmelt across northern Utah. This	6/6/2010	0	$5,000,000	NOAA

caused flooding on both Little Cottonwood Creek and the Weber River near Oakley.				
Peoa	6/24/2011	0	$20,000	NOAA
Coalville Much of the precipitation remained as rain in Coalville, and two straight days of rain proved to be too much for one of the open culverts in the town. When that drainage system failed to handle the volume of water, four homes were flooded along 150 South in Coalville, with two of those homes experiencing extensive flooding. One of the significantly damaged homes was flooded with a couple feet of water, and the other had 6 inches of water.	2/9/2014	0	$40,000	NOAA

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

Dams

Summit County also has 4 High Hazard dams. Each has an Emergency Action Plan that can be found at waterrights.utah.gov. Trial Lake Dam failed in 1986 from piping of organics in the foundation contact. It was rebuilt in 1990 by the Central Utah Water Conservancy District with CH2M Hill as the project engineer. As part of the Central Utah Project, BOR assumed responsibility for the dam in 2005. It is no longer listed as a high hazard dam.

Name	Miles to 1st Downstream Town	First Downstream Town
Boyer Lake	12	Coalville
Fish Lake	21	Oakley
Smith and Morehouse	14	Oakley
Whitney	38	Evanston

Mitigation

Strategies include:

Incorporate flood mitigation into local planning by developing a floodplain management plan, mitigating hazards during planning, establishing a “green infrastructure” program to link greenways, and obtaining easements for water retention and drainage

Form partnerships to support floodplain management such as a regional watershed council or citizen committee to discuss issues and recommend projects.

Limit or restrict development in floodplain areas by providing incentives to develop elsewhere, protecting buffers around water resources, limiting impervious surfaced within developed parcels, or prohibiting development in the floodplain.

Adopt and enforce building codes and development standards such as the International Building Code and increasing "freeboard" requirements aka the number feet above base flood elevation that new building must have.

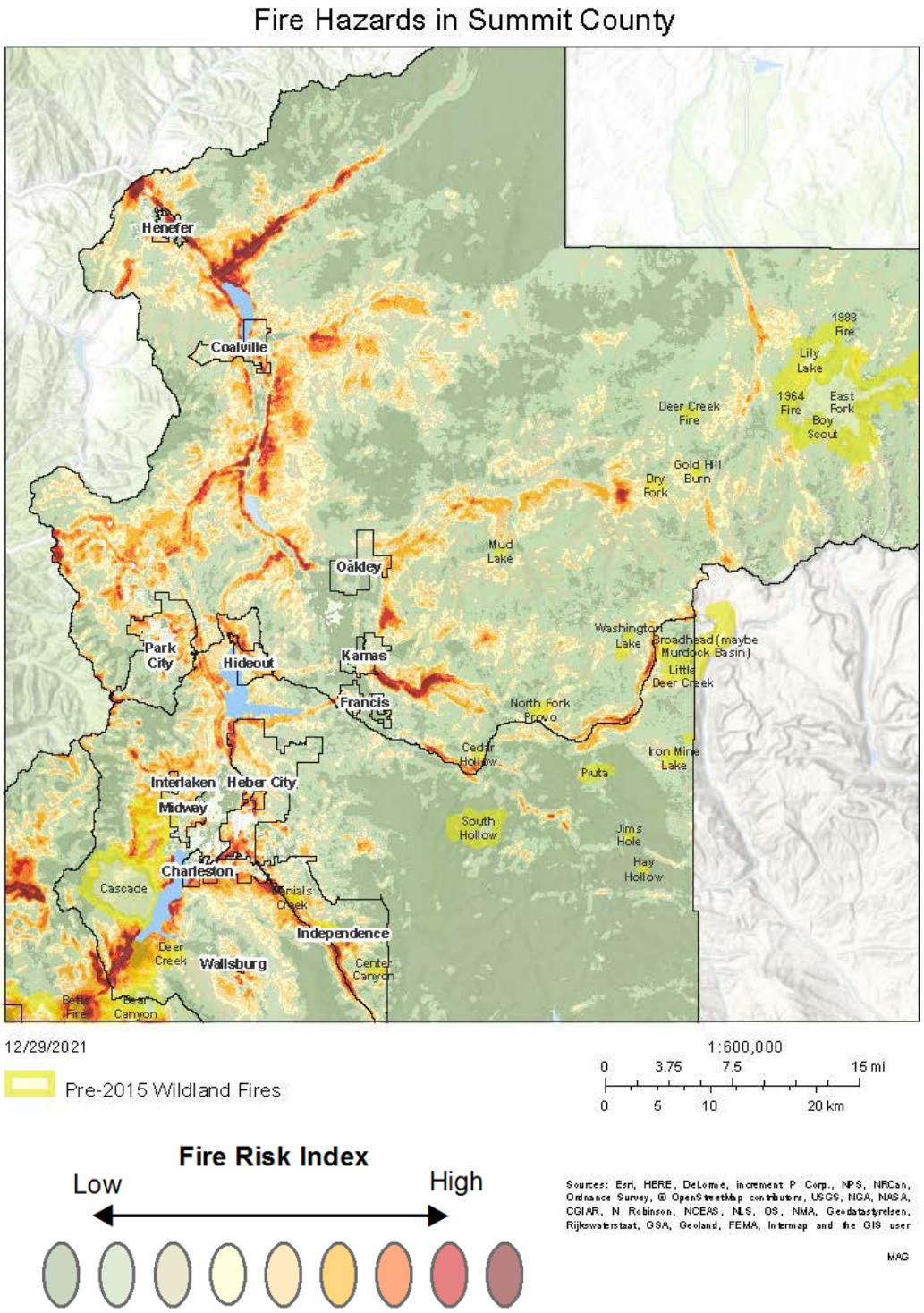
Improve stormwater management planning by completing stormwater drainage studies and master plans, regulating development in upland areas to reduce runoff, and encouraging low impact development techniques.

Adopt policies to reduce runoff such as more trees, on-site retention for stormwater and firefighting, and encouraging porous pavement and vegetation in parking areas.

Use natural systems such as preserving wetlands and riverbanks, restoring vegetation, acquire open space in targeted areas, and offer density bonuses to developers for leaving flood-prone areas vacant.

Protect and enhance infrastructure and critical facilities by elevating roads and bridges, floodproofing water treatment facilities, stabilizing shoulders and embankments, installing backup generators, expanding culverts, and require new critical facilities be built outside the floodplain.

Wildland Fire



Overview

Fire is a natural part of every ecosystem, but decades of wildland fire suppression during a historically cooler time period resulted in a buildup of fuels (vegetation) and development in wildfire-prone areas. With the 2010's megadrought, increased outdoor recreation, development pressure particularly along the Wasatch back (Wasatch and Summit counties), and climate change, the likelihood of damaging fire is increasing.

Though we have more assets in high-risk areas, the technology for early warning and fire-hardened homes has also advanced. This combined with better planning and enforcement can improve protection of assets already in place.

Wildfire is the most frequently occurring natural hazard within the Summit County area. It can also pose the most imminent danger to current and future residents. Each jurisdiction is surrounded by mountains and has 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, developers and homeowners need to be 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 losses.

Profile

Frequency	Multiple wildland fires occur in Summit 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

History

Following are a few of the most significant since 2016. More than half of fires are human caused and even relatively small fires, if near critical facilities, can be quite costly. Fortunately, no lives have been lost and few structures destroyed in the past decade.

Incident Name	Start Date	Total Spent Fighting Fire	Acres	Fire Cause	Specific Cause
Slate	August 24, 2018	$1,099,629	666	Natural	Lightning
Monvisto	June 21, 2018	$1,015,773	64	Human	Uncontrolled/ Unattended
Box Canyon	July 28, 2016	$796,704	1,200	Human	null
Tervels	September 3, 2018	$583,872	586	Human	Arson
State Line	August 20, 2019	$250,150	14	Unknown	Other Small Equipment
Fire Canyon	October 17, 2020	$208,701	1,671	Human	Other
Tollgate Canyon	July 30, 2018	$207,036	286	Human	Other Small Equipment
Echo Road Shed	August 28, 2016	$111,487	309	Undetermined	Fire Arms Use
Echo 80	August 29, 2019	$69,261	46	Unknown	Lightning
Fire Canyon	June 14, 2018	$23,780	83	Natural	Lightning

Communities At Risk

The following list consists of communities throughout Utah that have been determined by wildland fire officials to be at risk from wildland fire. The “Overall Score” represents the sum of multiple risk factors analyzed for each community. Examples of some risk factors are fire history, local vegetation, and firefighting capabilities. The Overall Score can range from 0 (No risk) to 12 (Extreme risk). This score allows Utah’s fire prevention program officials to assess relative risk and

create opportunities for communications with those communities on the list. Bolded communities are those with a Community Wildfire Preparedness Plan.

Community Name	Overall Score	Community Name	Overall Score
Bear River Lodge Christmas Meadow	11	River Song Ranch	9
Big Canyon Ranch	11	Silver Springs	9
Jeromy Ranches/Red Hawk	11	**Stage Coach**	9
Kamas East	11	Stillman Ranch	9
Manorlands/Unitalands	11	**Summit Park**	9
Pine Meadows/Forest Meadows	11	Upton	9
Pine Mountain	11	Weber Wild	9
Promontory	11	**Alpine Acres**	8
The Pines	11	Black Hawk	8
Two Bear	11	Freeman Ranch	8
1000 Peaks Ranch	10	Grass Creek	8
Aerie	10	Mountain Valley Ranches	8
Bridge Hollow	10	**Park City**	8
Deer Valley	10	**Silver Creek**	8
Garff Ranches	10	Sun Peak	8
Gorgoza Park	10	The Canyons	8
Hidden Cove	10	Weber Meadowview	8
Hidden Lake	10	Wild Willow	8
Holiday Park	10	Woodland	8
Maple Ridge Ranches	10	**Beaver Springs**	7
Marion Ranches	10	**Canyon Rim**	7
Mill Hollow Scout Camp	10	Deer Mountain	7
North Bench Farms	10	Glenndale	7
Rockport Ranches	10	Highland Estates	7
Samak	10	**Aspen Mountain**	6
Silver Summit	10	Francis	6
Solamere	10	Henefer	6
South Fork	10	Hoytsville	6
South Ridge	10	Kamas	6
Bear Hollow	9	Oakley	6
Cherry Canyon Ranches	9	Wanship	6
Colonies at White Pine	9	Coalville	5

Echo Creek Ranches	9	Marion	5
Little Dipper	9	Peoa	5
Meadow Haven	9	Snyderville	5
Monvisto	9		
Pinebrook	9		
Pineway	9		
Ranch Place	9		
*Bolded Communities have a Community Wildfire Protection Plan (CWPP) Developed with FFSL.			

Mitigation

The Utah Division of Forestry, Fire, and State Lands (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

Other strategies include limiting development in the Wildland Urban Interface, fuel management, prescribed burns, hardening buildings against fire with appropriate shingles, vent covers to prevent embers entering home, maintaining an emergency water supply and appropriate water pressures, using appropriate plantings around homes, and much more. See **wildfirerisk.org** or FEMA's **Strategies handbook** for a more complete list.

Landslide

Overview

Landslides are common natural hazards in Utah that often occur when the pull of gravity becomes greater than the cohesion of soil. Land movement can occur without warning and can result in destructive, costly outcomes. Various types of landslides in Utah are debris flows, slides, and rockfalls.

Steep slopes, mountainous terrain, rock types, and narrow, debris-choked canyons all contribute to our region's susceptibility to landslide hazards. Wildfire can remove stabilizing vegetation and increase landslide risk. Many hillslopes are prone to mass movement, particularly where development has taken place on existing landslides or where grading has modified a slope and reduced its stability. Therefore, historical landslides, prehistoric landslides, and steep slopes prone to mass movement must be thoroughly investigated prior to development activities, along with regional groundwater and landscape and other irrigation activities. Excessive irrigation can easily cause a neighbor near or on a slope to lose their home from a landslide by elevating the groundwater table.

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 the development occurring not only in Park City but also other towns throughout the county, 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 minimizes potential loss.

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	Likely – 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 are not recorded in disaster databases.

Mitigation Strategies

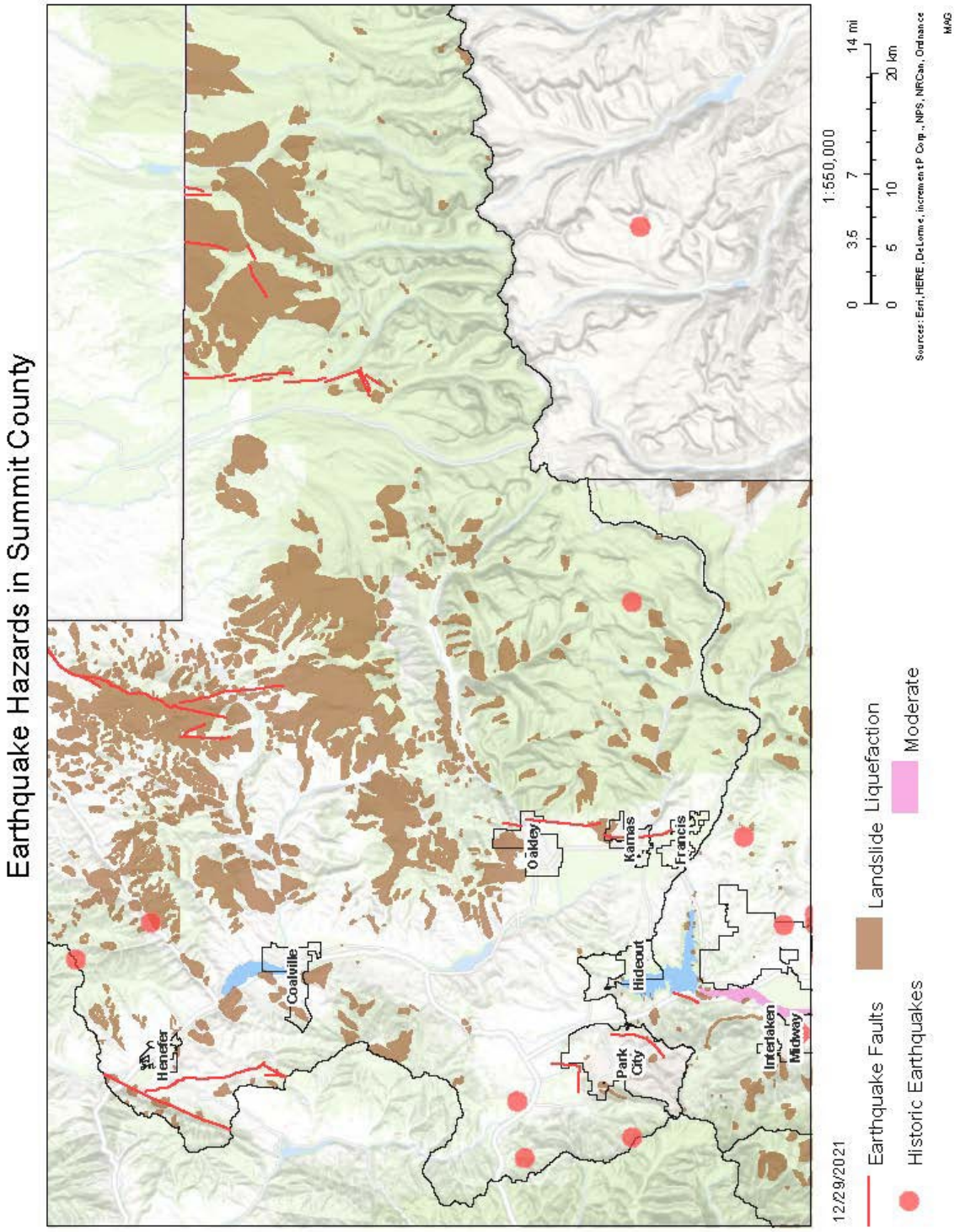
Nearly all recent landslides have occurred as reactivations of pre-existing landslides. Some strategies include:

Prohibit building on steep slopes, require thorough investigations and geotechnical studies for buildings in areas prone to landslides, and prevent over-irrigating. The use of very-low water xeriscape landscaping and/or smart irrigation controllers that adjust the amount of water applied to landscapes based on weather, plant/turf, and soil data, can significantly reduce the amount of excess water that percolates through the soil as groundwater and save money.

- Creating a plan to implement reinforcement measures in high-risk areas.
- Defining steep slope/high-risk areas in land use and comprehensive plans and creating guidelines or restricting new development in those areas.
- Creating or increasing setback limits on parcels near high-risk areas.
- Locating utilities outside of landslide areas to decrease the risk of service disruption.
- Restricting or limiting industrial activity that would strip slopes of essential top soil.
- Incorporating economic development activity restrictions in high-risk areas.

See FEMA's **Strategies handbook** for a more complete list.

Earthquake


Earthquake Hazards in Summit County
Henefer
Coalville
Oakley
Kamas
Francis
Hideout
Park City
Interlaken
Midway
12/29/2021
Earthquake Faults
Historic Earthquakes
Landslide
Liquefaction
Moderate
1:550,000
0 3.5 7 14 mi
0 5 10 20 km
Sources: Esri, HERE, DeLorme, increment P Corp., NPS, NRCan, Ordnance
MAG

Overview

Earthquakes occur when tectonic plates suddenly release tension built up over decades of strain. The Wasatch Fault has a strong earthquake about every 300 years and we are "due" for another. While some scenic homes are built directly on a fault, the way a building is constructed and the stability of soils underneath are a large factor in its resilience. Pre-1990's brick homes are usually unreinforced and very brittle, posing a great risk to occupants during a quake.

As development occurs in Summit County, more buildings and people will be in danger from earthquakes. However, newer buildings will be built to higher 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 of the three categories of design criteria; seismic zone, wind shear and snow load; the design criteria for wind shear overrules 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
Yearly 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 Summit County.

Losses	The State HAZUS Salt Lake 7.0 scenario estimates $1.5 million annualized losses for Summit County.

History

There have been few events of note in recorded history within Summit County, but a 2020 event in Magna, Salt Lake County, gave the state a glimpse of what could happen. The State of Utah has also put a few earthquake scenarios through its HAZUS software, yielding loss estimates and maps of potential damages on the Wasatch Front.

Magna Earthquake: Days after the US shutdown to slow the COVID 19 pandemic, a 5.7 earthquake struck Magna township in Salt Lake County. The most noticeable damages occurred in multi-story building such as the brick façade of a large commercial building, but several mobile homes were condemned and the Utah Department of Public Safety estimates $70-100 million in public structure and infrastructure damage. Fortunately, no one was injured or killed and the public facilities were insured.

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
S of Summit Park	3.3	9/18/2017

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

Mitigation

Strategies include restricting building on known fault lines or steep slopes, requiring geotechnical studies for buildings on problem soils, retrofitting critical infrastructure, educating homeowners on retrofitting options and securing items to the wall, requiring large/reinforced foundations or piers in liquefaction areas, and many more. See **Utah Earthquake Safety** or FEMA's **Strategies Handbook** for more details.

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.

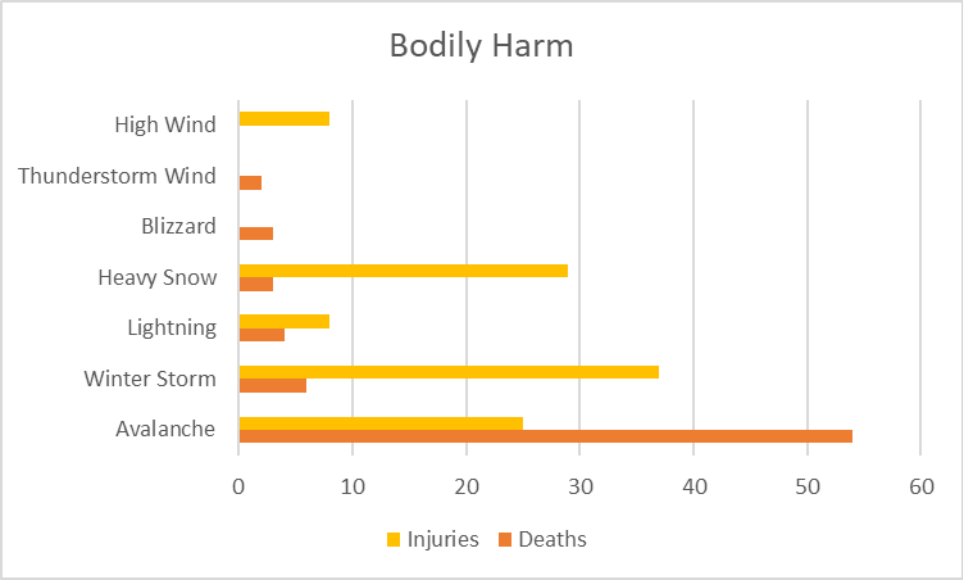
Profile

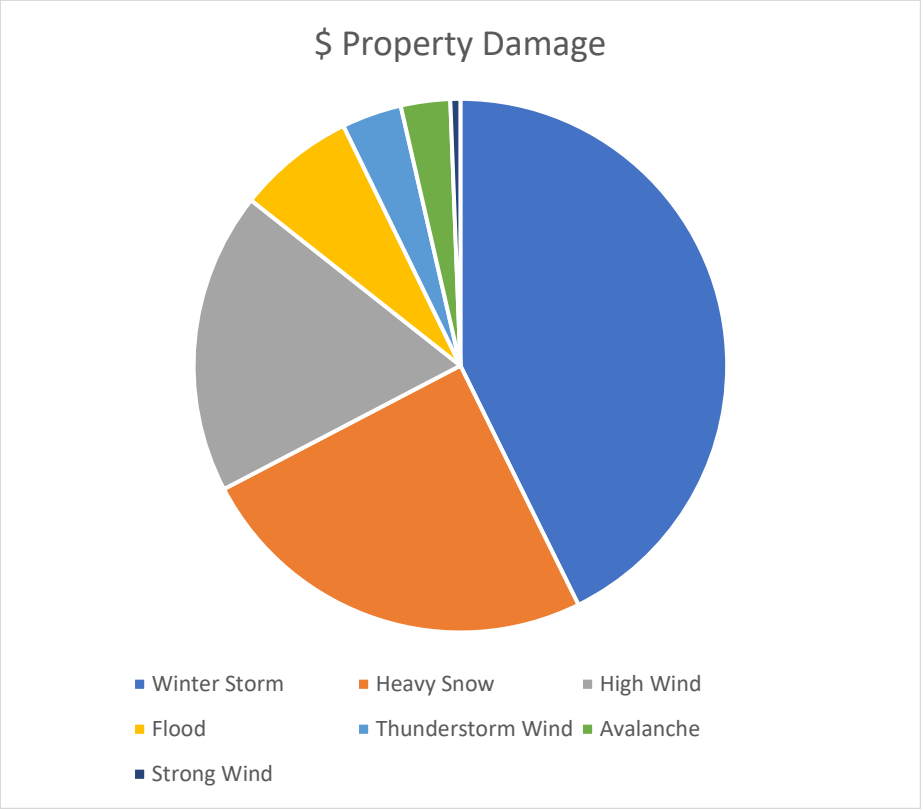
Frequency	Frequent Multiple events happen each year.
Severity	Moderate
Location	Region wide with some locations more frequent due to geography.
Seasonal Pattern	All year depending upon the type of event.
Duration	Seconds to Days
Speed of Onset	Immediate
Probability of Future Occurrences	Very Probable.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

History

NOAA Storm Event Database 1950-2021

Row Labels	Deaths	Injuries	$ Property Damage	$ Crop Damage
Avalanche	54	25	70000	0
Blizzard	3	0	0	0
Cold/wind Chill	0	0	0	0
Flood	0	0	167000	0
Hail	0	0	0	200
Heavy Snow	3	29	577000	8600
High Wind	0	8	428600	0
Lightning	4	8	0	0
Strong Wind	0	0	14200	0
Thunderstorm Wind	2	0	85000	0
Winter Storm	6	37	1000000	20000
Winter Weather	0	0	0	0
Grand Total	**72**	**107**	**2341800**	**28800**





Mitigation

For buildings: Adopt and enforce building codes related to roof snow loads and wind speeds. Require CO monitors.
For Infrastructure: Install redundancies in power lines, lightning protection and surge protection on critical infrastructure, and snow sheds over roadways.
For everyone: Educate homeowners on protecting water pipes during cold weather and travelling safely. Encourage participation in emergency alerts.

See FEMA's **Strategies handbook** for a more complete list.

Community Risks and Strategies

Overview

Listed below are the damage assessments for each of the participating jurisdictions followed by an update of the community's mitigation strategies from the 2017 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
-

The guiding factor in prioritizing mitigation strategies for local communities was the principle that mitigation should provide the ***greatest amount of good to the greatest number of people, after considering resources, staffing, and other constraints.*** Probability of occurrence, past events, and damage estimates compiled during the risk assessment in this plan were heavily considered. Overall, each community individually considered their own capabilities, staffing, and resources as they prioritized their own mitigation strategies.

Summit County

Hazard	# Buildings	$ Buildings (thousands)	Major Road Miles	Transmission Miles	Railroad Miles
Dam Failure	1,254	427,897	2.66	16.50	0.00
Fire Risk High	2,212	1,202,856	40.00	25.95	27.48
Fire Risk Moderate	9,545	5,831,456	73.29	47.99	10.58
Flood 1% Yearly Probability	1,591	478,128	21.86	5.51	15.07
Landslide	940	335,659	14.03	12.46	2.15
Liquefaction Moderate to High	0	0	0.00	0.00	0.00

Statement of Vulnerabilities: Summit County is very concerned with protecting its critical lands, such as waterways, riparian areas, ridgelines, steep slopes, and groundwater sources. There are also issues with mine tailings and soil contamination in and near Park City. Development pressure in the Snyderville basin incentivized to not build on critical lands. If a sewer line were installed in the North-South Summit Corridor development would skyrocket, but there are no plans to do so. As any development occurs it is important to keep people out of high-fire risk areas or have appropriate mitigation measures for buildings in fire-prone land.

Mitigation Strategy	Hazard	Priority	Timeline	Cost	Funding	Responsibility
Assess County Courthouse for possible retrofits in addition to those include in the 1990's remodel	Earthquake	Mod	1-2 yrs.	2k	Local gov	Local gov
Prohibit building on slopes >30% and require soils studies for proposed buildings in landslide-prone areas	Landslide	Mod	Ongoing	Minimal	Local gov, Developers	Local gov, Developers

Bolster regulations for building near avalanche paths	Avalanche	Mod	1 yr.	Staff time	Local gov	Local gov
Require 5,000 gallons of water storage for homes in East Summit along with defensible space	Fire	High	Ongoing	Minimal	Local gov, homeowner	Local gov, homeowner
Discourage building in areas with dense vegetation and require city council approval for proposed sites	Fire	High	Ongoing	Staff time	Local gov	Local gov
Begin a 5-year review of buildings required to have defensible space	Fire	High	1 yr.	Staff time	Local gov	Local gov
Fire Department reviews all applications for building in fire risk areas	Fire	High	Ongoing	Staff time	Local gov	Local gov
Update landscape ordinance to be more waterwise by reducing turf and encouraging grey water/rainfall storage	Drought	Mod	1 yr.	Staff time	Local gov	Local gov
Work with HOAs to install and maintain firewise and waterwise landscaping	Fire, Drought	Mod	Ongoing	Staff time	Local gov	Local gov, HOA
East Summit Sewer Advisory Committee must approve water and sewer plans for new development	Drought	Mod	Ongoing	Staff time	Local gov	Local gov
Follow FEMA requirements for building in the floodplain, such as foundation vents, elevating above base flood level, and prohibiting basements	Flood	Mod	Ongoing	Staff time	Local gov	Local gov
Use Critical Lands Overlay to protect waterways, riparian areas, steep slopes,	All	High	Ongoing	Staff time	Local gov	Local gov

ridgelines, etc. and work with builders to develop elsewhere						
Participate in chipping program through the State Fire Program for single family residences	Fire	Mod	Ongoing	75k	Local gov, State Fire Program	Summit County
Promote Firewise Community Certification to all communities within the wildland-urban interface	Fire	High	Ongoing	Staff time	Local gov	Local governments, Summit Co support
Host biannual meetings for the Wildfire Summit group, focused on HOAs and what they need to accomplish goals described in their CWPPs.	Fire	High	Ongoing	Staff time	Summit County, HOAs	Summit County, HOAs
Share funding information for fuel mitigation efforts through Wildfire Summit Group	Fire	Mod	Ongoing	Staff time	Summit County	Summit County
Meet with HOAs individually to provide guidance and information regarding wildfire	Fire	Mod	Ongoing	Staff time	Summit County	Summit County, HOAs
Perform home inspections to help homeowners "harden" their homes in the event of a wildfire	Fire	Mod	Ongoing	Staff time	Summit County, individuals	Summit County, individuals
Get estimates for flood mitigation for the Courthouse, located in the SFHA, which has records stored in the basement.	Flood	Mod	1-2 yrs.	TBD	Summit County	Summit County

Install generators in the Public Works and Health Dept/Library buildings	All	High	2-3 yrs.	~35k/generator	Summit County, Grants	Summit County

2017 Update

Protecting Current Residents and Structures

Hazard	Action	Priority	Timeline	Cost	Funding	Responsible Party	Completed? If not, why?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	USDI – Bureau of Reclamation, Local Government UDEM, FEMA, UDHS, MAG	Yes
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government, MAG, UDEM, FEMA	Not necessary. Only pre-2000 building was retrofitted in late 1990's
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, Utah Div. of FFSL, County Fire Districts	Yes
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	Yes
All-Hazards Planning	CEMPC – (Community Emergency Management Planning Committee)	High	Ongoing	Minimal	Local Cash, Grants	Local Government UDEM, FEMA	Yes
HazMat Planning	LEPC	High	Ongoing	Minimal	Local Cash, Grants	Local Government UDEM, FEMA	Yes
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	Yes

Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, MAG, UDEM, FEMA	Yes
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	Yes
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	No, efforts fell through
All-Hazards Planning	CEMPC (Community Emergency Management Planning Committee)	High	Ongoing	Minimal	Local Cash, Grants	Local Government UDEM, FEMA	Yes
HazMat Planning	LEP (Local Emergency Planning Committee)	High	Ongoing	Minimal	Local Cash, Grants	Local Government UDEM, FEMA	Yes

Coalville

Hazard	# Buildings	$ Buildings (thousands)	Major Road Miles	Transmission Miles	Railroad Miles
Dam Failure	103	15,426	0.37	0.00	0.00
Fire Risk High	67	20,207	0.51	0.39	0.00
Fire Risk Moderate	83	18,761	1.74	0.88	0.00
Flood 1% Yearly Probability	76	12,849	0.71	0.39	0.00
Landslide	1	4	0.00	0.89	0.00
Liquefaction Moderate to High	0	0	0.00	0.00	0.00

Statement of Vulnerabilities: Coalville recently annexed land on the West side of town in a fire-prone area. Making sure that there are appropriate evacuation routes and buildings are well-constructed is very important. In the 1984 floods the efforts of citizens with sandbags were able to channel floodwaters down Main Street. Coalville will sure new development doesn't exacerbate potential flooding.

Mitigation Strategy	Hazard	Priority	Timeline	Cost	Funding	Responsibility
New subdivisions must have retention ponds, multiple evacuation routes, and provisions for Active Transportation.	Flood, Fire	High	Ongoing	Staff time	Local gov	Local gov
Consider more fire-resistant building codes in the WUI	Fire	Mod	1-2 yrs.	Staff time	Local gov	Local gov
Add a water treatment facility	Drought	High	2 yrs.	5 million	USDA grant, Local gov	Local gov
Install xeriscaping examples at public buildings	Drought	Mod	2-3 yrs.	Minimal	Local gov	Local gov
Continue to look into Electric Vehicle charging stations like the ones at the Courthouse	Climate Change	Mod	2-4 yrs.	2k/station	Local gov, State Grants	Local gov

2017 Strategy Update

Hazard	Action	Priority	Timeline	Cost	Potential Funding	Responsibility	Completed?
Flooding/ Dam Failure	Bridge/Culvert Expansion along Chalk Creek	High	4 years	$800,000	Grants and Local Cash	Local Government	No
Wildfire	Fire Restriction ordinance	High	6 months	No cost	N/A	Local Government	Yes
Landslide	Incorporate Landslide maps into Hazards Lands Map	High	1 year	Minimal	Local Cash	Local Government	Yes
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	No, lack of resources
Wildfire	Review and update Sensitive Land Ordinance so that it specifically addresses and incorporates FIREWISE landscaping requirements and allows for creating	Medium	2 years	Minimal	Local Cash, Grants	Local Government	Partially, could do more.

	defensible zones around power lines, oil and gas lines and other infrastructure systems.						
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	Partly, could do more in W annexation
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	Yes
Landslide	Enforces existing restrictions and/or limit activity that would strip slopes of essential topsoil and vegetation.	Medium	2 years	Minimal	Local Cash	Local Government, USGS, UGS	Ongoing
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	Yes
Flooding	Better understand the capacity of the city storm water system by updating the city's Stormwater Master Plan.	High	2 years	$70,000	Local Cash/Grants	Local Government	Yes

Central Utah Water Conservancy District

Due to the sensitive nature and complexity of CUWCD assets, they performed an independent risk analysis to create and prioritize the following mitigation strategies. Contact Blake Buehler of CUWCD for more information.

Vulnerabilities: The future development of the CUWCD water system will mainly be with a strong emphasis on water conservation, planning of needed additional regional water supply facilities, and incorporation of natural hazard mitigation. The District will also continue in its current efforts to address and incorporate natural hazard mitigation (i.e., seismic upgrades/standards, lightning protection, backup power, wildfire – both direct and indirect effects, etc.) into future design and construction projects whether they are for new facilities or for capital replacement projects. The following proposal is to help fulfill said efforts.

Package Priority	Mitigation Package: Facilities	County	B/C Ratio	Mitigation Description	Outside Contractor	In-House	CUWCD O&M	CUWCD CRP	CUWCD CIP	FEMA Grant	Implementation Timeline	Package Subtotal
Low	General Pipeline #1 - Stockpile Materials	Summit, Utah, & Wasatch	-	Material Stockpiling		X	X	X			6-10 Years	$755,950
Low	General Pipeline #2 - Training	Summit, Utah, & Wasatch	-	Training	X	X	X				6-10 Years	$19,538

Francis

Hazard	# Buildings	Building value (thousands)	Major Road Miles	Transmission Miles	Railroad Miles
Dam Failure	1	$51	0.21	0.00	0.00
Fire Risk High	2	$514	0.06	0.00	0.00
Fire Risk Moderate	206	$63,268	0.46	0.00	0.00
Flood 1% Yearly Probability	11	$2,082	0.19	0.00	0.00
Landslide	0	$0	0.00	0.00	0.00
Liquefaction Moderate to High	0	$0	0.00	0.00	0.00

Statement of Vulnerabilities: Francis is experiencing some development pressure on the fire and flood-prone hillside. It's greatest current need, however, is a new water tank.

Mitigation Strategy	Hazard	Priority	Timeline	Cost	Funding	Responsibility

Any proposed subdivisions in the Wildland Urban Interface must have defensible space and fire-resistant materials	Fire	High	Ongoing	Staff time	Developers	Local gov, Developers
Construct a new water tank and well	Drought, Fire, All	High	by 2022	3 million	Impact & Annexation fees	Local gov
Participate in the County Chipping Program	Fire	High	Ongoing	5k	Local gov, volunteer hour match, State fire program	Local gov
Inventory community center for seismic soundness	Earthquake	Mod	2-3 yrs.	1k	Local gov	Local gov
Follow Water Restriction Plan during drought years	Drought	High	Ongoing	Staff time	Local gov	Local gov

Update of 2017 Strategies							
Hazard	**Action**	**Priority**	**Timeline**	**Cost**	**Funding**	**Responsibility**	**Completed?**
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, limited staff
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
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, limited staff and funding

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

Henefer

Hazard	# Buildings	Building value (thousands)	Major Road Miles	Transmission Miles	Railroad Miles
Dam Failure	0	$0	0.00	0.00	0.00
Fire Risk High	19	$5,542	2.26	0.57	1.09
Fire Risk Moderate	41	$9,694	0.31	0.50	0.05
Flood 1% Yearly Probability	17	$3,742	0.13	0.51	0.00
Landslide	0	$0	0.00	0.00	0.00
Liquefaction Moderate to High	0	$0	0.00	0.00	0.00

Statement of Vulnerabilities: Henefer is in the middle of a moratorium on new connections to the city water system due to the lack of water metering and secondary water system. Out most pressing concern is installing a secondary water system, reliably monitoring and metering the current system, and developing water resources for future needs. Henefer lies atop a high-pressure gas line that serves Salt Lake City. We work with Dominion Energy, who employs several of our citizens, to accurately map those lines, respond quickly to accidents, and share evacuation routes should a line be damaged. There is development pressure in the recently-annexed south part of town, which only has one narrow road leading in and out. If development is to occur here, we will need a bridge to bring a road over the Weber River and onto the frontage road.

Mitigation Strategy	Hazard	Priority	Timeline	Cost	Funding	Responsibility
Trim trees and clear ditches	Flood, Fire	Mod	Ongoing	5-10k	Local gov	Local gov
Add a second collection box for main water line in Franklin's Canyon, correct leaks, meter culinary water, and install automatic monitoring system on tanks.	Drought, Flood	High	1 yr.	184k	CDBG grant, Local gov	Local gov
Install secondary water system	Drought, Flood	High	1 yr.	3 mil	Utah State, Water Smart program, Board of Water Resources	Local gov, Utah State
Consider retrofitting city hall when it is remodeled include a community meeting room and other city amenities	Earthquake	High	1-2 yrs.	TBD	Local gov, grants	Local gov
Consider a sensitive lands ordinance to prohibit new buildings in the 100 yr. floodplain	Flood	Mod	1-2 yrs.	Staff time	Local gov	Local gov
Coordinate with UDOT and Union Pacific on plans for rerouting traffic should a flood or earthquake damage I-84 at the narrows/Morgan County line	Flood, Earthquake, Gas incident	Mod	1-2 yrs.	Staff time	Local gov	Local gov
Run test wells to find best location for additional water sources	Drought, Flood	High	1-2 yrs.	25k/well	Local gov	Local gov
Educate residents on low-cost retrofit options	Earthquake	Mod	1 yr.	Staff time	Local gov	Local gov

Build bridge over Weber River to provide a second route out of South Henefer, where there is development pressure	Earthquake, Fire, Flood	Mod	4 yrs.	TBD	Local gov, grants	Local gov
Visit yearly with North Summit Fire Marshall	Fire	Mod	Ongoing	Staff time	Local gov	Local gov
Promote Summit County's early warning system	All	Mod	Ongoing	Staff time	Local gov	Local gov
Conduct monthly ham radio tests among citizens	All	Mod	Ongoing	Minimal	Local gov	Local gov

2017 Strategy Update

Protecting Current Residents and Structures (Henefer)

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?
Flooding	Timely notification system, organized equipment and aid	Med	1 year	Minimal	Local Cash	Local Government	Yes, Summit Co notification and Henefer HAM radios
Drought	Monitor Spring flows, reservoir storage and usage	Moderate	Ongoing	Minimal	Local Cash, private owners	Local Government, private owners	In progress
Earthquake	Inspect structures and utilities. Facilitate repairs and clean up	High	4 years	High	Local Cash, Grants, Insurance	Local Government, FEMA, Insurance	No, fire station is new enough and city center will be renovated soon
Hazardous Materials spill	Notification system for citizens and education	Moderate	1 year	Minimal	Local Government	Local Government	Yes
Infectious Disease	Notification system	Moderate	1 year	Minimal	Local Government	Local Government	Yes

Wildfire	Provide water for fire suppression	Moderate	Ongoing	Moderate	Local Government	Local Government	In Progress

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	Yes
Wildfire	Provide water for fire suppression	Moderate		Moderate	Local Government	Local Government	In Progress

Kamas

Hazard	# Buildings	Building value (thousands)	Major Road Miles	Transmission Miles	Railroad Miles
Dam Failure	0	$0	0.00	0.00	0.00
Fire Risk High	27	$9,861	0.01	0.00	0.00
Fire Risk Moderate	250	$47,563	0.37	0.00	0.00
Flood 1% Yearly Probability	3	$1,227	0.00	0.00	0.00
Landslide	3	$1,136	0.00	0.00	0.00
Liquefaction Moderate to High	0	$0	0.00	0.00	0.00

Statement of Vulnerabilities: A faultline runs through Kamas and several older buildings, including City Hall and schools, would be at risk if an earthquake occurred. Making these buildings safer is a top priority. Also, with updated floodplain maps several homes are now within the 100-yr floodplain, which runs along Beaver Creek through the center of town.

There is gradual development throughout the town and within or close to the wildfire interface zone.

Mitigation Strategy	Hazard	Priority	Timeline	Cost	Funding	Responsibility
Require geotechnical report for proposed development on problem soils or slopes	Landslide	Mod	Ongoing	Minimal	Developer, Local gov	Developers, Local gov
Examine City Hall for seismic soundness	Earthquake	Mod	2-3 yrs.	1k	Local gov	Local gov
Follow Water Restriction Plan during drought years	Drought	High	Ongoing	Staff time	Local gov	Local gov
Any proposed subdivisions in the Wildland Urban Interface must have defensible space and fire-resistant materials	Fire	High	Ongoing	Staff time	Developers	Local gov, Developers

2017 Strategies Update

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	Yes
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No, limited resources
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

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	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, not a lot of fire-prone area
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

Oakley

Hazard	# Buildings	Building value (thousands)	Major Road Miles	Transmission Miles	Railroad Miles
Dam Failure	129	$30,304	0.56	0.49	0.00
Fire Risk High	7	$817	0.00	0.00	0.00
Fire Risk Moderate	69	$18,182	0.64	0.02	0.00
Flood 1% Yearly Probability	153	$36,984	0.76	0.60	0.00
Landslide	13	$20,339	0.00	0.00	0.00
Liquefaction Moderate to High	0	$0	0.00	0.00	0.00

Statement of Vulnerabilities: Oakley's greatest concerns are with water; having enough culinary water to support existing and future residents and caring for the homes already in the 100 yr. floodplain. Oakley is drilling a new culinary well and provides incentives to reduce watering areas. New subdivisions are encouraged to provide and maintain private secondary water systems. Regarding floods, no structures area allowed within 100' of the river and any proposals for building within the flood plain must conform to FEMA standards i.e., building above base-flood elevation. Mild development is occurring South of Maple Ridge toward the city center and few homes are planned in the wildland urban interface.

Mitigation Strategy	Action	Priority	Timeline	Cost	Funding	Responsibility
Any new development with more than ~8 lots requires dual access and Fire Marshall approval	Fire	Mod	Ongoing	Staff time	Local gov	Local gov
Prohibit building within 100' of river, any proposed buildings within 100 yr. floodplain must meet FEMA standards	Flood	High	Ongoing	None	Local gov	Local gov
Drill a new culinary well	Drought	High	1 yr.	$1.5 million	USDA grant, ARPA grant, Local gov	Local gov
Replace turf at recreation complex with xeriscaping where possible, swap fields for courts	Drought	High	2-3 yrs.	$1 million	RAP, Local gov	Local gov
Drill "wet well"/use irrigation water for recreation complex instead of using culinary water	Drought	High	2-3 yrs.	$250k	Local gov	Local gov
Provide incentives to reduce watering area	Drought	Mod	Ongoing	Minimal	Local gov	Local gov
Provide density bonuses for developers that preserve riparian areas	Flood	High	Ongoing	Staff time	Local gov	Local gov

Increase water rates for higher tiers	Drought	High	1 yr.	Staff time	Local gov	Local gov
Encourage development to install secondary water systems that are privately maintained	Drought	High	Ongoing	Staff time	Local gov	Local gov
Prohibit building on slopes >30%, require Geotech studies for other at-risk sites	Earth movement	Mod	Ongoing	Staff time	Local gov	Local gov
Perform engineering study of City Hall to determine cost and benefits of retrofits	Earthquake	Mod	2-3 yrs.	TBD	Local gov	Local gov
Improve 3 bridges determined to be deficient by the State	All	Mod	2-3 yrs.	$50k	ARPA, Local gov	Local gov
Educate homeowners with shallow pipes on how to protect them from damage in the winter	Winter Weather	Mod	Ongoing	Minimal	Local gov	Local gov
Complete a Capital Improvements Plan for utilities and infrastructure	All	High	1-2 yrs.	$50k	Local gov	Local gov
Educate homeowners on disaster preparedness through website, social media, and water bill	All	Mod	Ongoing	Staff time	Local gov	Local gov

2017 Strategy Update

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	Yes
Earthquake	Inventory current critical facilities for Seismic standards	High	3 years	TBD	Local Cash, Grants	Local Government FEMA, USGS	No, only City Hall is post-2000 construction
Wildfire	Educate homeowners on FIREWISE practices	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Yes, ongoing

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	Yes
Earthquake	Promote earthquake awareness	High	Ongoing	Minimal	Local Cash	Local Government	No, new staff not familiar with educational programs.

Park City

Hazard	# Buildings	Building value (thousands)	Major Road Miles	Transmission Miles	Railroad Miles
Flood 1% Yearly Probability	866	$316,526	0.87	**1.25**	0.00
Dam Failure	275	$52,716	1.65	0.24	0.00
Liquefaction Moderate to High	0	$0	0.00	0.00	0.00
Landslide	192	$173,412	0.46	0.00	0.00

Fire Risk Moderate	1,649	$1,371,572	1.49	2.87	0.00
Fire Risk High	236	$227,312	0.37	1.00	0.00
Earthquake (Pre-1990 Buildings)	NA	$7,084,012	NA	NA	NA

Statement of Vulnerabilities: Park City is 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.

Mitigation Strategy	Hazard	Priority	Timeline	Estimated Cost	Potential Funding	Responsible Party
Patrol storm water facilities during runoff season, clear blockages	Flood	High	Ongoing	150k/year	Local Gov	Streets Dept and Code Enforcement
Implement and maintain community wildfire preparedness plan	Fire	High	Ongoing	Staff time	Local gov	Local gov
Collaborate with Western Summit County Fuels committee (private landowners, HOA, other agencies)	Fire	High	Ongoing	Staff time	Local gov, Summit County	Park City, Summit County, HOAs
Wildfire fuels clearing	Fire	High	2-3 years/ ongoing	1 million	BRIC grants	Local Gov, HOA, Fuels Committee members
Enforcing new WUI and land management code	Fire	High	Ongoing	Staff time	Local gov	Local gov
Expand WUI code for existing homes including open space component	Fire	High	1 year	Staff time	Local gov	Local gov
Update forestry plan	Wildfire	High	1 year	50k	Park City	Park City, FFSL
Maintain cooperative agreement with FFSL; Park City pays for prevention, protection, initial response, recovery, and outreach (with Park City Fire District) with FFSL to cover the rest if a large fire occurs	Wildfire	High	Ongoing	100k	Local gov, FFSL	Local gov, FFSL

Maintaining Firewise certification	Wildfire	High	Ongoing	Staff time	Local gov	Local gov
Notify homeowners of leaks and use Waterwise program for resident outreach	Drought	High	Ongoing	Staff time	Local gov	Local gov
Irrigation restrictions from Weber Water Conservancy District	Drought	High	Ongoing	Staff time	Weber Water	Weber Water
Maintain emergency supplies/warehouse for supplies during an event	Earthquake	Moderate	3+ years	3 million	Local gov, grants	Local gov
Continued outreach, share evacuation routes through city Open Houses and annual mailer	All	Moderate	Ongoing	Minimal, staff time	Local gov	Local gov
Full-scale exercise	All	High	1 year	Staff time	Local gov	Local gov
Consider incentives for reducing grass	Drought	High	1-2 years/ ongoing	TBD	Local gov	Local gov
Alternative traffic routes for closed roads	Winter Weather	Moderate	2-3 years	TBD	Local gov	Local gov
Sustainability Department, reducing single-occupant vehicle travel, improving transit and active transportation	Climate Change	Moderate	Ongoing	Staff time	Local gov	Local gov

2017 Strategy Update

Hazard	Action	Priority	Timeline	Cost	Potential Funding	Responsibility	Completed?
Flooding	New Storm Water Utility	High	3-5 years	3 million	Local Cash	Local Government	Partly, clearing blockages and removing brush. Ongoing patrols during runoff season.
Flooding	Update FIRM	Med	Ongoing, see City Engineer	Minimal	Local Cash, FEMA	Local Government, State, FEMA	Yes, 2019/20
Fire	Create Community Wildfire Protection Plan with PCFD	High	Completed 2014, now implementing	2-50 thousand	Local Cash, Grants	Local Government, Fire Department	Yes, 2021

Earthquake	Upgrade City Buildings	Medium	Ongoing	Significant	Local Cash, Grants	Local Government	City Hall, Library EQ retrofits completed.
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk	Medium	1 year	Minimal	Local Cash, Grants	Local Government	Yes, 2020

South Summit School District

Vulnerabilities: South Summit's schools are located on or near the East Kamas Fault and a recent roofing project found deficient grout in the original building. All were built pre-seismic code and should be retrofitted to some degree until the school district can pass a bond to rebuilt them. The location for a new school serving the Promontory community might contain mine tailings from old Park City metal works. The EPA has yet to determine whether or not they are present, but if they are significant work will have to be done to remediate the soil.

Mitigation Strategy	Hazard	Priority	Timeline	Cost	Funding	Responsibility
Conduct a seismic study of schools in Kamas, which are close to the East Kamas Fault Line, to determine necessary retrofits and/or rebuilds	Earthquake	High	4 yrs.	65k	South Summit School District, grants	South Summit School District
Irrigate sports fields with a new retaining pond and pumps utilizing South Summit's shared in the ditch company instead of culinary water	Drought	Mod	3-4 yrs.	1 million	South Summit School District, grants	South Summit School District
Replace baseball field with artificial turf	Drought	Mod	3-4 yrs.	1 million	South Summit School District, grants	South Summit School District
Work with the EPA to study possible mine tailings on the site of the future	Soil Contamination	High	4 yrs.	TBD	EPA, South Summit School	EPA, South Summit School District, Summit County

Elementary school near the Promontory community and remediate if necessary					District, Summit County	
Tree trimming	Winter weather, Fire	Mod	Ongoing	2k/yr.	South Summit School District	South Summit School District
Determine need for backup generators at schools designated as evacuation centers	All	Mod	1-2 yrs.	TBD	South Summit School District	South Summit School District
Wildlife awareness education and considerations for building in migration corridors	Wildlife	Mod	Ongoing	Staff time	South Summit School District	South Summit School District

Contacts and Participation

See Part III: Process for a complete accounting of participation

Position	Name	Phone	Email	Small Meeting	Group Meeting
Emergency Manager	Kathryn McMullin	801-718-4628	kmcmullin@summitcounty.org		Yes
Summit County Planner	Ray Milliner	435-336-3118	rmilliner@summitcounty.org	18 August	
Summit Co Fire Marshall	Mike Owens	435-940-2520	mowens@pcfd.org		
Summit Co Public Works	Derrick Radke	435-336-3970	dradke@summitcounty.org		Yes
Summit Co Manager's Office	Janna Young				Yes
Summit Co	Glenn Wright				Yes
Summit Co Environmental Health	Spencer Smith				Yes
Henefer Planner	Robert Richins	435-336-5365	henefertown@allwest.net		
Henefer Mayor	Kay Richins	801.599.8003	henefermayor@gmail.com	Aug 11	
Park City Emergency Manager	Kathryn McMullin	435-615-5185	kmcmullin@summitcounty.org		
Park City Planner					
Coalville Mayor	Trevor Johnson	435-336-5981	mayor@coalvillecity.org		
Coalville	Niki Sargent	435.659.6941	niki.sargent@coalvillecity.org		
Coalville Public Works	Zane Deweese	435-336-5980	zane.deweese@coalvillecity.org		
Coalville Public Works	Kyle Clark			Oct 28	Yes
Coalville Wastewater Treatment	Sam Adams			Oct 28	Yes
Oakley		435-783-5734	oakley@oakleycity.com		

Oakley Planner	Stephanie		stephanie@oakleycity.com		
Oakley	Amy Rydalch		amy@oakleycity.com	Aug 16?	
Oakley City	Kelly Kimber		kelly@oakleycity.com		Yes
Francis/Kamas	Scott Kettle	435-654-2226	skettle@horrocks.com	June 14	Yes
		cell: 801-360-9735			
Francis Public Works		435-783-6236	lthomas@francisutah.org	June 14	
Francis Planner	Katie Henneuse	435-783-6236	khenneuse@francisutah.org	June 14	Yes
WUI Coordinator	Travis Wright	385-505-4030	tdwright@utah.gov		
Park City Fire District	Ashley Lewis				Yes
North Summit Fire District	Ian Nelson				Yes
FFSL /County Fire Warden	Bryce Boyer				Yes
N Summit School District	Kristy		kbraithwaite@nsummit.org		
S Summit School District	Kip Bigelow		kbigelow@ssummit.org	19 July	Yes
S Summit School District	Kathy Carr		kathy.carr@ssummit.org	19 July	Yes
S Summit School District Superintendent	Greg Maughan		greg.maughan@ssummit.org		

Part 6 Utah County Profiles and Mitigation

Background

Area: 2,014 square miles; *county seat*: Provo; *origin of county name*: after the Ute Indians

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.

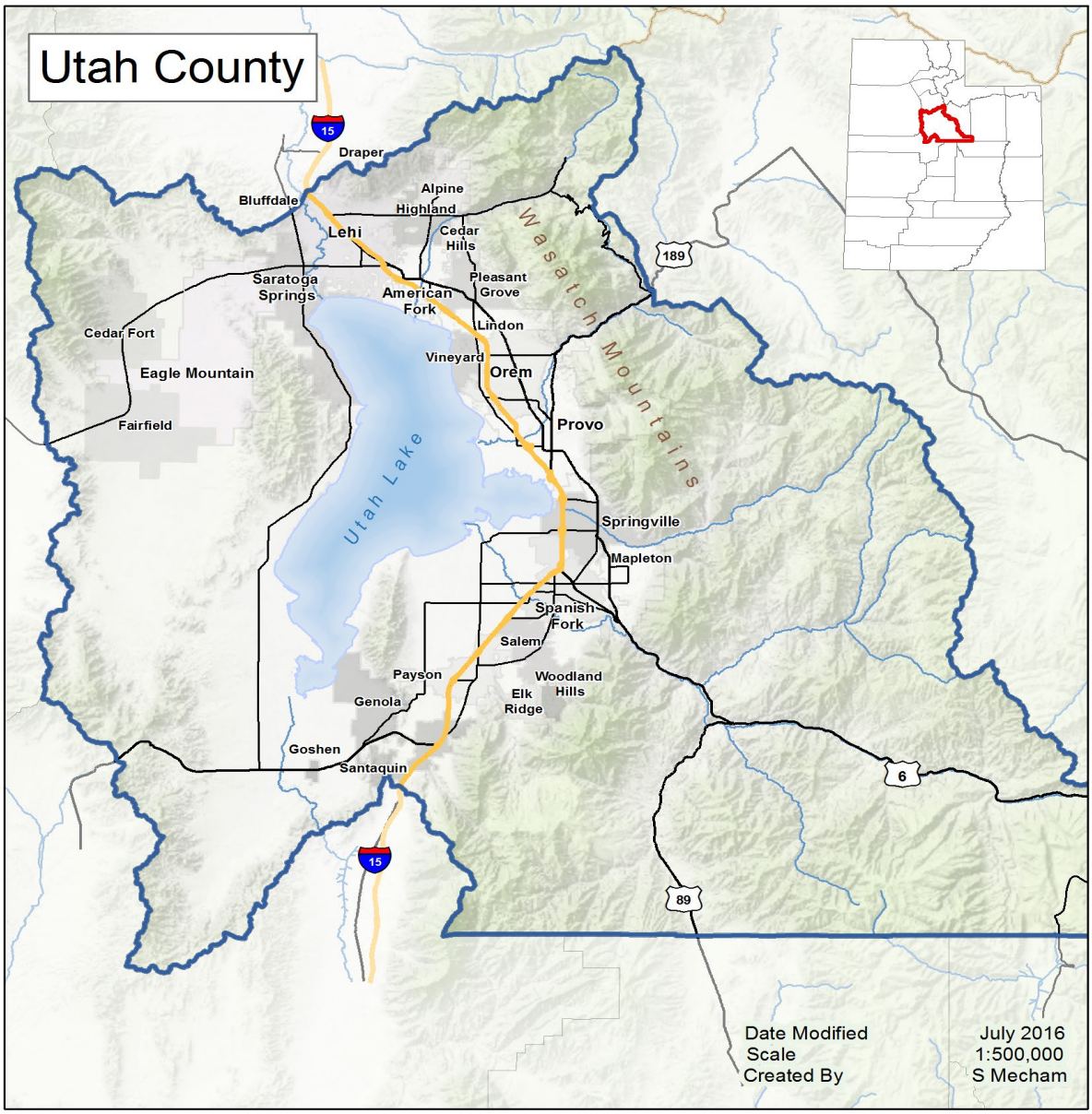
Mormon pioneers began settling Utah Valley in 1849. Like the Indians before them, they chose to settle on the fertile, well-watered strip of land between the mountains and Utah Lake. More than a dozen towns were established between Lehi on the north and Santaquin on the south. Provo, named for the French 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 and establish communities in Lehi, Alpine, American Fork, Pleasant Grove, Springville, Spanish Fork, Salem, and Payson.

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 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 over 36,000 students in 2021. The Utah Valley University in Orem has

grown rapidly to over 41,000 students as well. Other major Utah County employers include Vivint, Doterra and Young Living Essential Oils. 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 most other communities have their own celebrations.

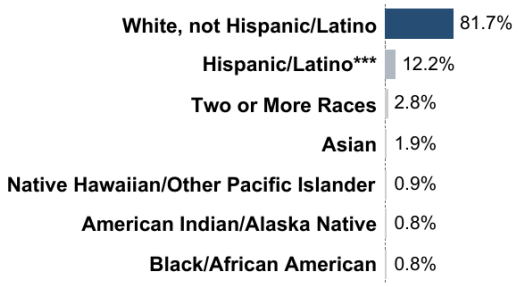


Population

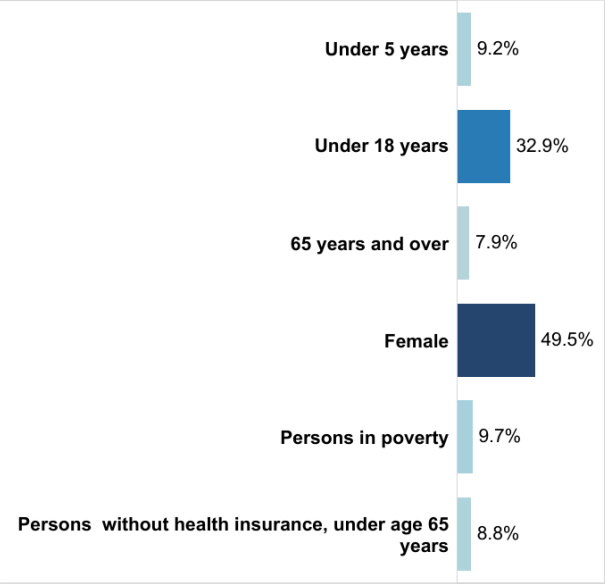
Demographics Utah County

In Utah County, more than a third of residents are children under the age of 18, with less than 8% of the population over the age of 64. The average travel time to work is 22 minutes due in large part to those commuting to Salt Lake County for jobs.

2019 Race and Ethnicity



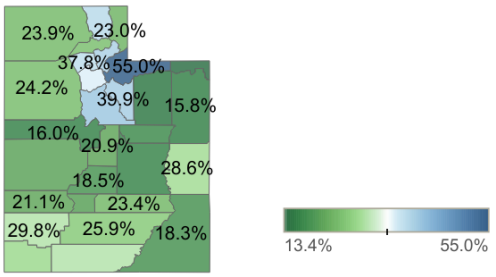
Population Shares, 2015-2019



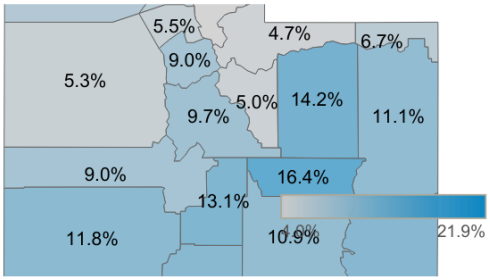
Other Facts

Households, 2015-2019	165,991
Housing units, July 1, 2019	186,554
Median value of owner-occupied housing units, 2015-2019	305,500
Persons per household, 2015-2019	4
Mean travel time to work (minutes), workers age 16 years+, 2015-2019	22
Veterans, 2015-2019	14,296
Veteran-owned firms, 2012	3,003
Women-owned firms, 2012	13,891

Bachelor's Degree or Higher, 2015-2019*



Persons Below Poverty, 2019



Updated 7/13/2021 8:10:38 PM

* Population 25 years and older. ** Population 5 years and older. *** Hispanics/Latinos may be of any race; also included in applicable race category. ****Civilian Population 16 years and older.

Source: U.S. Census Bureau. For more information: http://www.census.gov

Hazards Compared

Hazard Matrix

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

Severity

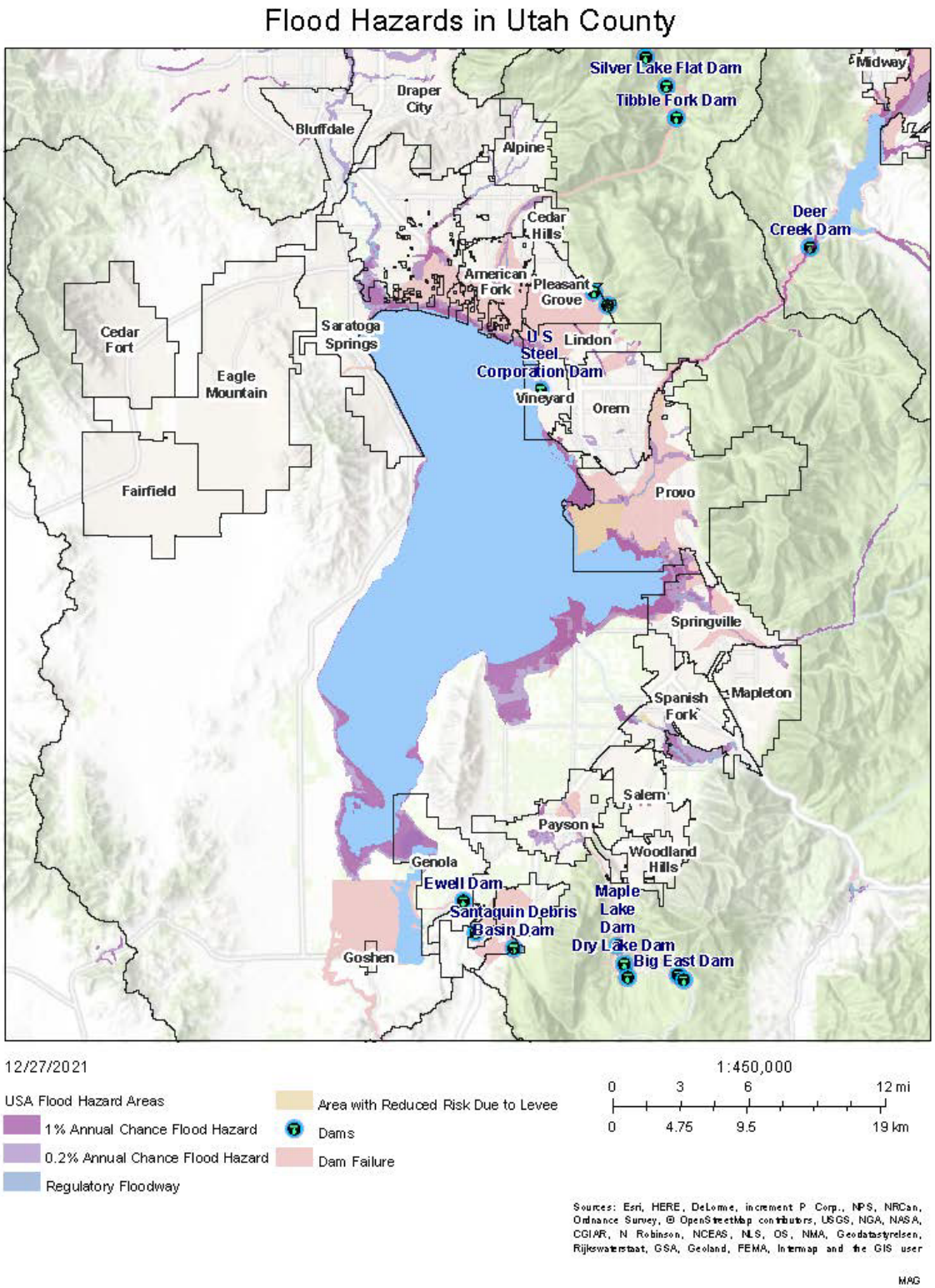
Standards from FEMA IS 235: Emergency Planning Course
Potential Magnitude
Catastrophic: More than 50% of community affected
Critical: 25 to 50%
Limited: 10 to 25%
Negligible: Less than 10%

Probability Calculated using # of event/years in record
Highly likely: Near 100% probability in next year
Likely: 10 -100% probability in next year, or at least one chance in next 10 years.
Possible: 1-10% 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 per incident
Catastrophic: Many lives, a great deal of property
Critical: Multiple lives lost and/or multiple properties affected
Limited: Some property loss, less than 3 lives lost
Negligible: Some property, no life lost

Hazard	Years in Record	Yearly Probability	Deaths Annualized	Injuries Annualized	$ Losses Annualized	Source
Air Quality Unhealthy for all	12	75%	n/a	n/a	n/a	DEQ Monitoring Archive, days in exceedance of PM2.5 standard
Avalanche	25	128%	1.3	0.6	$2,800	NOAA
Debris Flow	16	44%	0	0	$23,000	NOAA
Drought, Moderate	2018	10%	0	0	n/a	National Integrated Drought Information System
Earthquake		1%	2.4	32	$24,000,000	HAZUS Salt Lake City 7.0 & Provo Scenarios
Floods & Flash Floods	23	139%	0	0	$283,000	NOAA, HAZUZ, State Hazard Mitigation Plan
Hail	71	58%	2.7	32.7	$17,208	NOAA/SHELDUS
Landslides	51	25%	0	0	NA	SHELDUS, skewed by Thistle slide
Lightning	25	32%	0.04	0.16	$6,660	NOAA
Tornadoes	71	10%	0	0	$2,582	NOAA
Volcanoes	5,000,000	0%				
Wildfires	6	1,167%			$8,742,000	Utah FFSL and BLM with cost of fighting fire
Wind	71	97%	0.4	0.7	$844,000	NOAA (High Wind, Strong Wind and Thunderstorm Wind)
Winter Weather	25	160%	0.56	2.36	$65,636	NOAA (Blizzards/Heavy Snow/Winter Storm/Winter Weather)

Flooding


Flood Hazards in Utah County
Silver Lake Flat Dam
Tibble Fork Dam
Midway
Draper City
Bluffdale
Alpine
Cedar Hills
Deer Creek Dam
American Fork
Pleasant Grove
Cedar Fort
Saratoga Springs
U S Steel Corporation Dam
Lindon
Eagle Mountain
Vineyard
Orem
Fairfield
Provo
Springville
Spanish Fork
Mapleton
Salem
Payson
Woodland Hills
Genola
Ewell Dam
Santaquin Debris Basin Dam
Maple Lake Dam
Dry Lake Dam
Big East Dam
Goshen
12/27/2021
1:450,000
0 3 6 12 mi
0 4.75 9.5 19 km
USA Flood Hazard Areas
1% Annual Chance Flood Hazard
0.2% Annual Chance Flood Hazard
Regulatory Floodway
Area with Reduced Risk Due to Levee
Dams
Dam Failure
Sources: Esri, HERE, DeLorme, increment P Corp., NPS, NRCan, Ordnance Survey, © OpenStreetMap contributors, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user
MAG

Overview

Although Utah is considered a dry state, flooding does occur. Most floods occur either from snow melt or severe thunderstorms. Oftentimes 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	Moderate - 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

Jurisdiction	Floodplain	Map Date	Floodplain Admin
Alpine	Alpine participates in the NFIP. Though a few homes are located in the floodplain, it is very narrow and no new buildings are expected. Alpine has a Floodplain Damage Prevention Ordinance and well-organized Floodplain Permit. Alpine spent $400k in 2013 to construct a wall which effectively protected its repetitive loss property from a debris flow that year.	June 2020	Jed Muhlestein, City Engineer
American Fork	Participating in NFIP. City code 15.16 Addresses Floodplain Management, including floodplain administrator, building & subdivision requirements, etc.	June 2020	Rebecca Andrus, City Engineer
Cedar Fort	No Special Flood Hazard Area		Mayor Gustin
Cedar Hills	Not participating in NFIP. Cedar Hills does have a very small portion of 0.2% annual chance floodplain in the northernmost part of town, but none of it is developable; either on a golf course or in the Pleasant Grove Ditch. Code 11.7.10 addresses zoning for environmental hazards, including floods.	June 2020	Chandler Goodwin, City Manager
Eagle Mountain	No Special Flood Hazard Area		Ifo Pili, City Administrator
Elk Ridge	No Special Flood Hazard Area		Royce Swensen, City Recorder
Fairfield	No Special Flood Hazard Area		n/a
Genola	Participating in NFIP. Genola adopted a Flood Damage Prevention Ordinance in 2020. Floodplain is directly on or close enough to White Lake that development is not likely.	June 2020	Lucinda Thomas, City Clerk
Goshen	Not participating in NFIP. Goshen doesn't currently have any floodplain in city boundaries.		Mayor Staheli
Highland	Participating, incorporated 2021 NFIP updates, has projects for both rivers in city. Highland has a Flood Damage Prevention Ordinance as well as Provisions for Flood Damage Prevention.		Nathan Crane, City Administrator
Lehi	Participating in NFIP, has code sections for Flood Damage Prevention and Provisions for Flood Hazard Reduction as well as additional requirements for the Utah Lake Shoreline and Jordan River Protection zones.	June 2020	Ross Dinsdale
Lindon	Participating in NFIP, has code for Flood Damage Prevention, Storm Drainage and Flood plans, and Methods of Reducing Flood Losses.	June 2020	Michael Florence, Planning Director

Mapleton	Participating in NFIP. Mapleton has a Flood Damage Prevention Ordinance and has several small projects and development standards designed to capture the first inch of water as it cannot discharge water to Springville.	June 2020	Cory Branch, City Administrator
Midway City	Participating in NFIP, has a Flood Damage Prevention Ordinance as well as Midway City Floodplain Overlay zones and a Sensitive Lands Overlay Zone that provides additional protection for streambeds and other flood-prone areas (Chapter 16.14) Any residential construction within 50 feet of a delineated flood zone shall have the lowest floor elevated 18 inches above the base flood elevation as shown on the FIRM and no construction is allowed within 50 feet of a floodplain in large-scale subdivisions.	2012	Michael Henke, City Planning Administrator
Orem	Participating in NFIP. City code sections 7, 10, and 17 address development standards in the floodplain, a Flood Damage Prevention Ordinance, and Supplementary Design Standards for high-risk areas.	June 2020	Planning Manager Jason Bench
Payson	Participating in NFIP, has a Flood Damage Prevention and Sensitive Lands Ordinance with additional requirements for lands near streambeds.	June 2020	City Engineer Travis Jockumsen
Pleasant Grove	Participating in NFIP, has Flood Damage Prevention and Sensitive Lands ordinances.	June 2020	Engineer Marty Beaumont
Provo	Participating in NFIP and CRS, adopted 2020 FIRMs, study of Provo River levees and Utah Lake underway. The General Plan has a Flood Hazard & Control and Environmental Hazards section, as well as sections of code for Floodplain Management and Development Standards.	June 2020	Robert Mills
Salem	Participating in NFIP and has adopted most recent FIRMs. Has a Flood Damage Prevention section of code, but there is more flooding risk at the base of canyons and from canals than in the 100-yr floodplain. Development code reads, "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."	June 2020	Ryan Steeley
Santaquin	Participating in NFIP, has a section of code for development in Floodplain Areas	June 2020	Community Development

			Director Jason Bond
Saratoga Springs	Participating in the NFIP, though there are no Special Flood Hazard Areas. The City recently completed a storm drainage study of the entire geographic area of the City. This study indicates areas more susceptible to flood damage and makes recommendations concerning the correct locations of detention ponds, storm channels and culvert facilities. The city will be installing these improvements over the next 10 years, as needed, to accommodate growth in existing and future neighborhoods. The City has also had the practice of trying to raise awareness of issues like flooding so that you can take whatever steps you need to ensure maximum protection. The City has already made or required developers to make improvements to install storm drain ponds, underground drain systems, and open storm channels leading to Utah Lake. The City also has several regional park facilities planned of over twenty (20) acres in size that will collect storm water during large storms. These facilities are all designed to divert and collect water away from residential areas. The City also requires Floodplain Development Permits (FDPs) any time that fill or structural improvements are proposed in the regulatory floodplain. The regulatory floodplain is that area shown on the approved FEMA Flood Insurance Rate Maps (FIRMs). These maps are available on the city website (see quick links) or at FEMA's Website. More complete and detailed information on floodplain management regulations and procedures can be found in Section 18.02 of the City Code." 4.4.3 Goals to reduce/avoid long-term vulnerabilities to the identified hazards (Requirement §201.6(c)(3)(i)) Mitigation of vulnerabilities in the long-term will be done in the following four ways: a) Mitigation options for currently known hazards are listed in Table 4.1 provides a summary of currently identified hazard mitigation actions over the next ten years (2017 to 2026). This is the same table as in the MAG plan (since the City provided this table to MAG). b) Mitigation measures may be incorporated into capital improvement plans. Hazard mitigation is achieved over the long term by incorporation of hazard mitigation into capital improvement projects, as previously described in Section 4.3. c) Mitigation measures will be accomplished by participating in other mitigation regional actions in the MAG plan (not relisted here).	No Special Flood Hazard Area	City Engineer Jeremy Lapin

	d) Mitigation measures will be accomplished by incorporating mitigation actions in the State of Utah Plan, as described in Attachment E (not relisted here). As recommended by FEMA (in comments dated August 17, 2017) future plan updates may incorporate master planning updates and other updated plans, such as transportation corridor and storm water plans. Future plan updates to the City's Plan (done every five years) may also incorporate future MAG and State of Utah Plan updates, as appropriate.		
Spanish Fork	Participating in NFIP, Section 8.32 of City Code deals with Flood Control.	June 2020	Surveyor Travis Warren
Springville	Participating in NFIP, has a Flood Damage Prevention Ordinance and Floodplain Overlay Zone, and has projects underway to move homes out of the 100 yr. floodplain.	June 2020	Engineer Jeff Anderson
Utah County	Utah County participates in the NFIP and uses the latest FIRMs. It is involved in multiple flood mitigation studies and projects and has Flood Protection and Critical Environmental Zone ordinances.	June 2020	Zoning Director Bryce Armstrong
Vineyard	Participating in NFIP, section 15 of the zoning code is a Flood Damage Prevention ordinance. There are no structures in the floodplain.	June 2020	Building Official George Reid
Woodland Hills	Participating in NFIP, City Code chapter 10 is the Flood Damage Prevention Ordinance and chapter 9 is a Flood Hazard and Natural Hazard Study requirement for new development in hazard-prone areas.	June 2020	Public Works Director Corbett Stephens

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

Assessing Vulnerability: Addressing Repetitive Loss Properties

There are 2 repetitive loss facilities, one each in Alpine and Provo. Alpine has done extensive work around their facility.

History

Following are the narratives from a few of the more damaging floods/flash floods in Utah County. Flooding following fire is a common theme.

Santaquin, 9/12/2002

$3,200,000

Heavy rains over several days caused flash flooding and mudslides below a burn area in Santaquin. The rain also caused a canal to overflow its banks in the same area, making conditions even worse. An estimated 3 million dollars damage was done to city about 40 homes and several vehicles as mudslides up to 7 feet deep moved down the hillside. No injuries were reported.

Utah County, 9/7/2013

$2,943,600

Heavy rain caused flash flooding across much of urban Utah County, with multiple locations recording 0.6-0.8 inches of rain in only 15 minutes. The most significant damage from flooding was reported in Provo, Orem, Payson, and Santaquin. Street flooding was widespread and some roads incurred major damage, with the worst damage occurring at 900 North and Grand Avenue in Provo, where water undercut and washed out a large portion of the asphalt road. Debris from the storm was scattered across most local roadways, taking several days to clean up, and even closed some roads for a period of time. Flowing water caused also caused significant damage to large concrete stairs at Lions Park in Provo. At University Mall in Orem, water quickly filled the parking lot, submerging many cars in more than a foot of water.

Residential areas also received significant flood damage. In Provo, at least 25 homes had major damage, with more than 50 receiving minor damage. In Orem, approximately 30 homes received flood damage. In Santaquin, about 30 homes had flooding a foot deep or more, while about 30 other homes had flooding with less than a foot of water. Water wasn't the only problem in Santaquin, as the storm drainage system became overwhelmed, and raw sewage flowed into many homes.

Finally, the flooding also impacted Timpanogos Cave National Monument, where heavy rain and associated debris stranded 150 hikers for several hours, before rangers were able to clear a path and rescue them. The Monument was closed for two full days while debris was cleaned up from both the hiking trails and nearby State Route 92.

Bald Mountain and Pole Creek, 10/7/2018

The Bald Mountain and Pole Creek Fires started on August 24, 2018 and September 6, 2018, about 15 miles south of Provo, Utah in the Uinta-Wasatch-Cache National Forest. The relative risk of both fires was determined to be low and they were monitored until September 10 when weather changes brought strong winds and a series of Red Flag Warnings. The two fires soon merged and burned together until they were fully contained on October 7, 2018. The Bald Mountain Fire caused mandatory evacuations of Elk Ridge

and Woodland Hills. The Pole Creek Fire triggered mandatory evacuations for the Covered Bridge and Birds Eye communities, along with Diamond Fork and Right Fork Hobble Creek Canyon. The two fires combined resulted in a total of 120,851 acres burned.

As a result of the burn severity, the potential for flash flooding and debris flow was high in some areas; threatening critical infrastructure, watershed, and the safety of residents. Utah County utilized the Emergency Watershed Protection Program to fund mitigation projects in multiple locations across the County. The project was broken up into 7 separate Damage Survey Reports and 6 different project areas including Utah County, Payson, Salem, Elk Ridge, Spanish Fork, and Woodland Hills. Major areas of concern included Diamond Fork, Lake Fork, Bennie Creek, Nebo Creek, Santaquin Canyon, and drainages near Spring Creek. The following projects were included in the application, sponsored by Utah County:

DSR 1 – Santaquin City/Utah County

1. Summit Creek - stream rehabilitation and debris removal
2. Santaquin Eastside Park - debris removal and installation of various types of silt fence 3. Crooked Canyon/Picayune Canyon – drainage and channel rehabilitation, earthen berm and rock riprap as well as installation of various types of silt fence
4. Santaquin Debris Basin - sediment removal

DSR 2 – Payson City/Utah County

1. Peteetneet Creek – stream rehab items including rock riprap, gabion baskets, earthen berm, culvert rehabilitation, channel cleaning and debris removal, and various types of silt fence
2. Payson Debris Basin – sediment removal

DSR 3 – Elkridge City

1. Loafer Canyon – earthen berm construction, installation of various types of silt fence, channel cleaning and debris removal

DSR 5 – Spanish Fork City

1. Crab Creek Spring – collection protection including installation of various types of silt fence and stream rehab including re-channelization, rock riprap, earthen berm, and culvert rehabilitation

DSR 6 – Woodland Hills City

1. Drainage rehabilitation including various types of silt fence installation, debris removal, rock riprap, channel cleaning and debris removal, and earthen berm

DSR 7 – Utah County

1. Nebo Creek - stream rehab items including rock riprap, gabion baskets, earthen berm, culvert rehabilitation, channel cleaning and debris removal, and various types of silt fence
2. Nebo Bridge – inlet and outlet protection control utilizing various types of silt fence and rock riprap, removal of debris
3. Eagles Landing - drainage and channel rehabilitation, earthen berm and rock riprap as well as installation of various types of silt fence
4. Diamond Fork - drainage and channel rehabilitation, earthen berm and rock riprap as well as installation of various types of silt fence
5. Thistle Debris Basin – sediment removal

Utah County is currently working toward additional mitigation projects through the Watershed Operations Program by conducting environmental studies to determine more permanent and long-term solutions to reduce flooding and debris flows affecting various communities.

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

Dam Failure

Although there are no recorded dam failures in Utah County, there are several high-risk dams. Each has its own emergency action plan and is regularly inspected. See waterrights.utah.gov DamView for more information or the Regional Hazards section of this plan for an assessment of Deer Creek and Jordanelle dams.

Name	Miles to first downstream town	First downstream town	County
Battle Creek	0.2	Pleasant Grove	Utah
Big East	10	Payson	Utah
Box Lake	11	Payson	Utah
Dry Creek	3	Lehi	Utah
Grove Creek	0.1	Pleasant Grove	Utah
Highland Northwest Irrigation	0	Highland City	Utah
Highland Pressure Pond	0	Highland City	Utah
Hobble Creek Debris Basin	2	Springville	Utah

Israel Canyon	0	Saratoga Springs	Utah
Lehi Sandpit	0	Lehi	Utah
Lindon Dry Canyon Debris Basin	1	Orem	Utah
Lindon Irrigation Project I	0.1	Lindon City	Utah
Lindon Irrigation Project II	0.1	Lindon City	Utah
Maple Lake	8	Payson	Utah
Rock Canyon Debris Basin	0.1	Provo	Utah
Santaquin Debris	1	Santaquin	Utah
Santaquin Pressure Irrigation Reservoir	0	Santaquin	Utah
Saratoga Springs Secondary Water Pond	0	Saratoga Springs	Utah
Silver Lake Flat	12	American Fork	Utah
Slate Canyon Debris Basin I	0.1	Provo	Utah
Slate Canyon Debris Basin II	0.1	Provo	Utah
Spanish Fork Pressure Irrigation Pond	1	Spanish Fork	Utah
Tibble Fork	1	American Fork	Utah
Winward	8	Payson	Utah

Mitigation

Strategies include:

Incorporate flood mitigation into local planning by developing a floodplain management plan, mitigating hazards during planning, establishing a “green infrastructure” program to link greenways, and obtaining easements for water retention and drainage

Form partnerships to support floodplain management such as a regional watershed council or citizen committee to discuss issues and recommend projects.

Limit or restrict development in floodplain areas by providing incentives to develop elsewhere, protecting buffers around water resources, limiting impervious surfaced within developed parcels, or prohibiting development in the floodplain.

Adopt and enforce building codes and development standards such as the International Building Code and increasing "freeboard" requirements aka the number feet above base flood elevation that new building must have.

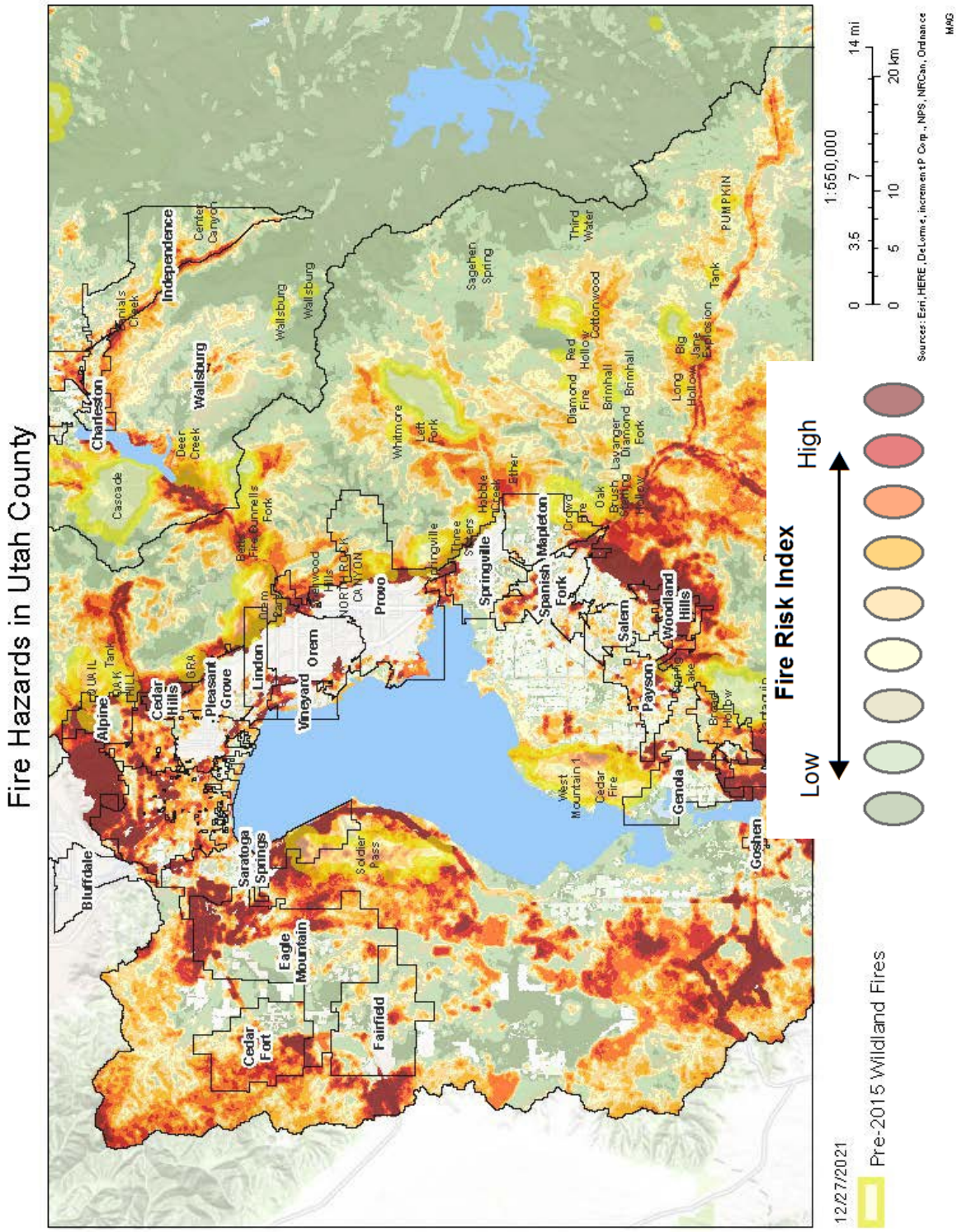
Improve stormwater management planning by completing stormwater drainage studies and master plans, regulating development in upland areas to reduce runoff, and encouraging low impact development techniques.

Adopt policies to reduce runoff such as more trees, on-site retention for stormwater and firefighting, and encouraging porous pavement and vegetation in parking areas.

Use natural systems such as preserving wetlands and riverbanks, restoring vegetation, acquire open space in targeted areas, and offer density bonuses to developers for leaving flood-prone areas vacant.

Protect and enhance infrastructure and critical facilities by elevating roads and bridges, floodproofing water treatment facilities, stabilizing shoulders and embankments, installing backup generators, expanding culverts, and require new critical facilities be built outside the floodplain.

Wildland Fire



Overview

Fire is a natural part of every ecosystem, but decades of wildland fire suppression during a historically cooler time period resulted in a buildup of fuels (vegetation) and development in wildfire-prone areas. With the 2010's megadrought, increased outdoor recreation, development pressure, and climate change the likelihood of damaging fire is increasing.

Though we have more assets in high-risk areas, the technology for early warning and fire-hardened homes has also advanced. This combined with better planning and enforcement can improve protection of assets already in place.

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. Burn scars near populated are particularly difficult to manage, contributing to landslides and floods during rain events.

Profile

Frequency	Multiple wildland fires occur in Utah County Every year.
Severity	Moderate/Limited
Location	Hillsides and mountainous areas, vegetated areas near rivers, open grass and rangelands.
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	Highly Likely 70 fires required management in the past 6 years alone

Development Trends

As development occurs on the bench areas of Utah Valley more homes will be in danger of wildfire. Utah County has one of the greatest percentages of developable lands in the

wildland-urban interface in the state. 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 losses.

History

Following are a few of the most significant since 2016. More than half of fires are human caused and even relatively small fires, if near critical facilities, can be quite costly. Fortunately, no lives have been lost and few structures destroyed in the past decade.

Incident Name	Start Date	$ Spent Fighting Fire	Acres	Fire Cause	Specific Cause
Coal Hollow	August 4, 2018	$14,832,358	24,571	Natural	Lightning
Bald Mountain	August 24, 2018	$9,397,458	18,603	Natural	null
Bennion Creek	June 4, 2021	$6,175,979	8,298	Natural	Lightning
William	September 6, 2020	$5,733,509	5,832	Human	Fireworks (Consumer or Personal Use)
Range	October 17, 2020	$2,728,834	3,379	Human	Fire Arms Use
Tank Hollow	August 11, 2017	$1,235,985	1,200	Natural	Lightning
Knolls	June 28, 2020	$1,081,424	12,584	Human	null
Ether Hollow	September 7, 2020	$1,051,368	848	Human	Fire Arms Use
Round Peak	July 15, 2019	$1,026,916	236	Human	Campfire
Pole Canyon	July 15, 2020	$767,634	487	Human	Other, Unknown
Battle Creek 2	September 12, 2020	$745,886	188	Human	Default
Goose Point	August 21, 2019	$696,485	8,908	Unknown	Other Small Equipment
Goshen	September 13, 2020	$691,557	372	Human	null

Battle Creek	August 16, 2020	$621,704	40	Human	Default
Alaska	July 30, 2019	$584,122	489	Unknown	Default

The Coal Hollow in 2018 began with a lightning strike in southeast Utah County and quickly grew to thousands of acres in hot, dry conditions. The fire prompted evacuations in Utah, Sanpete, and Carbon counties and required hundreds of firefighters to contain. It threatened hundreds of homes, rail lines, and I-6, a major trucking route. The fire also contributed to unhealthy air quality in adjacent counties, stifling summertime recreational activity. The fire was eventually suppressed as winds died down, consuming a total of 25,000 acres and costing over $14 million to fight, not to mention lost productivity due to the closure of I-6 and evacuations. About a year after the fire, the Utah National Guard flew over the burn scar with the director of the Department of Air Quality, Congressmen Curtis and Ellertson, Utah National Guard Generals, Engineers and others.

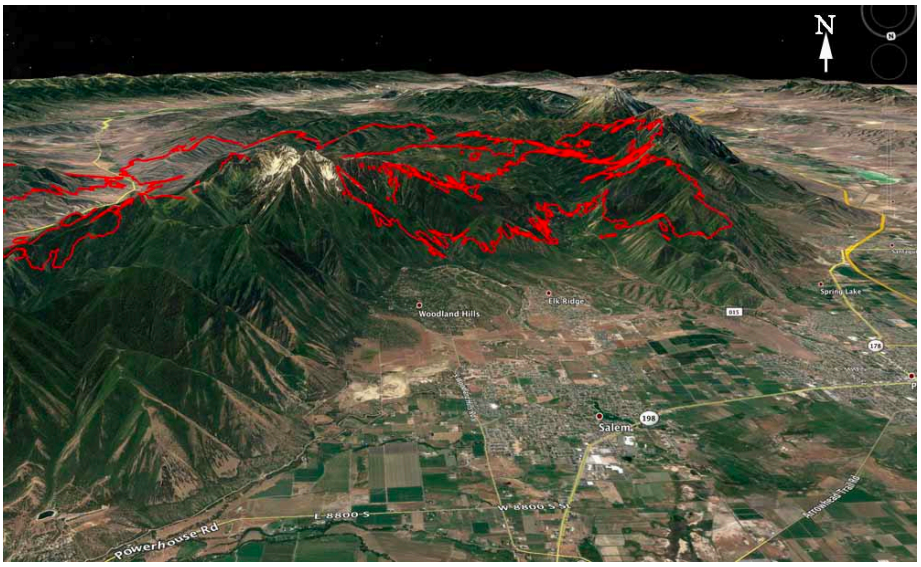
Worries about secondary hazards (flood, debris flow, and mudslides) had the National Guard and residents staging equipment such as jersey barriers and sandbags along high-risk areas. A mudslide did close Diamond Fork Road temporarily.

(Deseret News, Daily Herald, and Utah National Guard)

“The Bald Mountain and Pole Creek Fires started last year on August 24 and September 6 respectively about 15 miles south of Provo, Utah in the Uinta-Wasatch-Cache National Forest. Both fires were initially managed in a less than full suppression mode — allowed to spread within lines drawn on a map. Rainfall amounts ranging from 1.3" to 2.3" on August 25 put a damper on the fire activity, but within days the Energy Release Component had returned to the 90+ percentile range. Meanwhile the area had been classified as in Severe Drought by the Drought Monitor.

“The weather changed on September 10, bringing strong winds and a series of Red Flag Warnings causing the two fires to burn together. The final size was 120,851 acres.

“The Bald Mountain Fire caused mandatory evacuation of two cities: Elk Ridge and Woodland Hills. The Pole Creek Fire triggered mandatory evacuations for the Covered Bridge Community of the Spanish Fork Canyon along with the Diamond Fork Canyon and the Right Fork Hobble Creek Canyon areas.” -Wildfire Today



Communities At Risk

The following list consists of communities throughout Utah that have been determined by wildland fire officials to be at risk from wildland fire. The "Overall Score" represents the sum of multiple risk factors analyzed for each community. Examples of some risk factors are fire history, local vegetation, and firefighting capabilities. The Overall Score can range from 0 (No risk) to 12 (Extreme risk). This score allows Utah's fire prevention program officials to assess relative risk and create opportunities for communications with those communities on the list. Bolded communities are those with a Community Wildfire Preparedness Plan.

Community Name	Overall Score	Community Name	Overall Score
Payson Canyon	10	Soldiers Summit Development	8
Cedar Fort	9	Spanish Fork Canyon	8
Dream Mine	9	Springdell	8
Elk Ridge	9	Tibble Fork	8
Silver Lake	9	Alpine Cove	7
Vivian Park	9	Elberta	7
Woodland Hills	9	Fairfield	7
Alpine	8	Genola	7
Cedar Hills	8	Goshen	7
Covered Bridge	8	Lindon	7
Diamond Fork Canyon	8	Mapleton	7
Eagle Mountain	8	Payson	7
Highland	8	Pleasant Grove	7
Hobble Creek	8	Salem	7

Lehi	8	**Santaquin**	7
Loafer Canyon	8	Spanish Fork City	7
Orem	8	Spring Lake	7
Provo	8	**Sundance**	7
Sheep Creek	8	Vineyard	7
Soldiers Summit Development	8	American Fork Canyon	6
		Saratoga Springs	6
		Springville	6
		Wanrhodes Basin	6
*Bolded Communities have developed a Community Wildfire Preparedness Plan with FFSL			

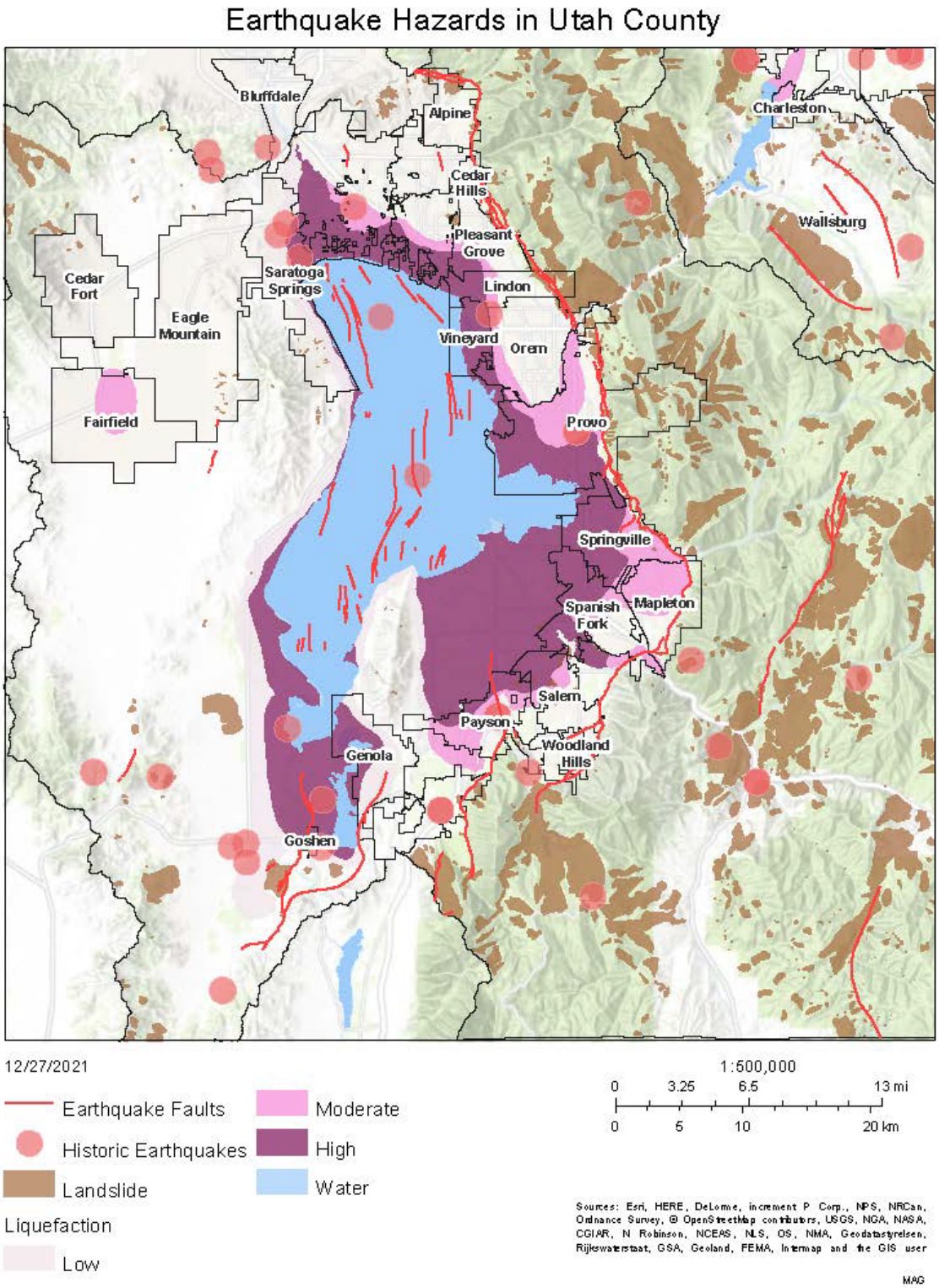
Mitigation

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

Other strategies include limiting development in the Wildland Urban Interface, fuel management, prescribed burns, hardening buildings against fire with appropriate shingles, vent covers to prevent embers entering home, maintaining an emergency water supply and appropriate water pressures, using appropriate plantings around homes, and much more. See **wildfirerisk.org** or FEMA's **Strategies handbook** for a more complete list.

Landslide


Earthquake Hazards in Utah County
Bluffdale
Alpine
Charleston
Cedar Hills
Pleasant Grove
Wallsburg
Cedar Fort
Saratoga Springs
Lindon
Eagle Mountain
Vineyard
Orem
Fairfield
Provo
Springville
Spanish Fork
Mapleton
Salem
Payson
Woodland Hills
Genola
Goshen
12/27/2021
Earthquake Faults
Historic Earthquakes
Landslide
Liquefaction
Low
Moderate
High
Water
1:500,000
0 3.25 6.5 13 mi
0 5 10 20 km
Sources: Esri, HERE, DeLorme, increment P Corp., NPS, NRCan, Ordnance Survey, © OpenStreetMap contributors, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user
MAG

Overview

Landslides are common natural hazards in Utah that occur when the pull of gravity becomes greater than the cohesion of soil. Land movement can occur without warning and can result in destructive, costly outcomes. Various types of landslides in Utah are debris flows, slides, and rockfalls.

Steep slopes, mountainous terrain, rock types, and narrow, debris-choked canyons all contribute to our region's susceptibility to landslide hazards. Wildfire can remove stabilizing vegetation and increase landslide risk. Many hillslopes are prone to mass movement, particularly where development has taken place on existing landslides or where grading has modified a slope and reduced its stability. Therefore, historical landslides, prehistoric landslides, and steep slopes prone to mass movement must be thoroughly investigated prior to development activities, along with regional groundwater and landscape and other irrigation activities. Excessive irrigation can easily cause a neighbor near or on a slope to lose their home from a landslide by elevating the groundwater table.

The foothills and alluvial fans on the bench areas of Utah County are quickly developing. Landslides and debris flow 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	Critical, several structures have been condemned and major transportation routes temporarily closed
Location	Along most benches and hillsides, especially near burn scars.
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: 25%

Development Trends

Development along the foothills and bench areas is very desirable and as more development occurs, more homes will be at risk for landslide damage. As more of the county land is developed, marginal areas with problematic 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 landslides, including Thistle
Utah	1/1/1983	$8,603,666.52	SHELDUS	
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 landslides, 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	
Utah County, Tank Hollow & Birdseye	9/8/2019	$149,000	NOAA	Heavy rain over the Tank Hollow & Pole Creek Fire burn scars produced a debris flow across U.S. Highway 6 at milepost 202.

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 impassable 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 costliest 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 shipments 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 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.

Mitigation

In Utah County, most recent mass movement is the result of rain on burn scars, and the strategies to for fire will also apply to this secondary hazard.

Nearly all recent landslides have occurred as reactivations of pre-existing landslides. Some strategies include:

Prohibit building on steep slopes, require thorough investigations and geotechnical studies for buildings in areas prone to landslides, and prevent over-irrigating. The use of very-low water xeriscape landscaping and/or smart irrigation controllers that adjust the amount of water applied to landscapes based on weather, plant/turf, and soil data, can significantly reduce the amount of excess water that percolates through the soil as groundwater and save money.

- Creating a plan to implement reinforcement measures in high-risk areas.
- Defining steep slope/high-risk areas in land use and comprehensive plans and creating guidelines or restricting new development in those areas.
- Creating or increasing setback limits on parcels near high-risk areas.
- Locating utilities outside of landslide areas to decrease the risk of service disruption.
- Restricting or limiting industrial activity that would strip slopes of essential top soil.
- Incorporating economic development activity restrictions in high-risk areas.

See FEMA's **Strategies handbook** for a more complete list.

Earthquake

Overview

Earthquakes occur when tectonic plates suddenly release tension built up over decades of strain. The Wasatch Fault has a strong earthquake about every 300 years and we are "due" for another. While some scenic homes are built directly on a fault, the way a building is constructed and the stability of soils underneath are a large factor in its resilience. Pre-1990's brick homes are usually unreinforced and very brittle, posing a great risk to occupants during a quake.

Liquefaction occurs when loose soils such as those at the mouth of a canyon or near a lake begin to act like a liquid when subject to prolonged shaking.

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

Losses	2.4 deaths annualized; 32 injuries annualized $24,000,000 losses annualized

Development Trends

Although Utah County faces rapid development, new buildings are designed to withstand earthquakes much better than pre-1990s structures. Many of the older multi-story unreinforced masonry structures, where immediate deaths often occur, are city buildings and schools that are being rebuilt to seismic standards.

Envision Utah recently looked at different growth scenarios and what percentage of Utah County would be affected by a seismic event. Their analysis found that focusing development west of the lake will result in greater losses than working toward infill development.

As people move to Utah from areas without disasters, they will need to be educated on the simple things that homeowners can do to reduce the impacts of an earthquake in their homes, such as securing heavy furniture and having flexible piping.

History

There have been few events of note in recorded history within Utah County, but a 2020 event in Magna, Salt Lake County, gave the state a glimpse of what could happen. The State of Utah has also put a few earthquake scenarios through its HAZUS software, yielding loss estimates and maps of potential damages on the Wasatch Front.

Magna Earthquake: Days after the US shutdown to slow the COVID 19 pandemic, a 5.7 earthquake struck Magna township in Salt Lake County. The most noticeable damages occurred in multi-story building such as the brick façade of a large commercial building, but several mobile homes were condemned and the Utah Department of Public Safety estimates $70-100 million in public structure and infrastructure damage. Fortunately, no one was injured or killed and the public facilities were insured.

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
Bluffdale	3.2	11/25/2016
Bluffdale	3.7	2/15/2019

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

Mitigation

Strategies include restricting building on known fault lines or steep slopes, requiring geotechnical studies for buildings on problem soils, retrofitting critical infrastructure, educating homeowners on retrofitting options and securing items to the wall, requiring large/reinforced foundations or piers in liquefaction areas, and many more. See **Utah Earthquake Safety** or FEMA's **Strategies Handbook** for more details.

Severe Weather

Overview

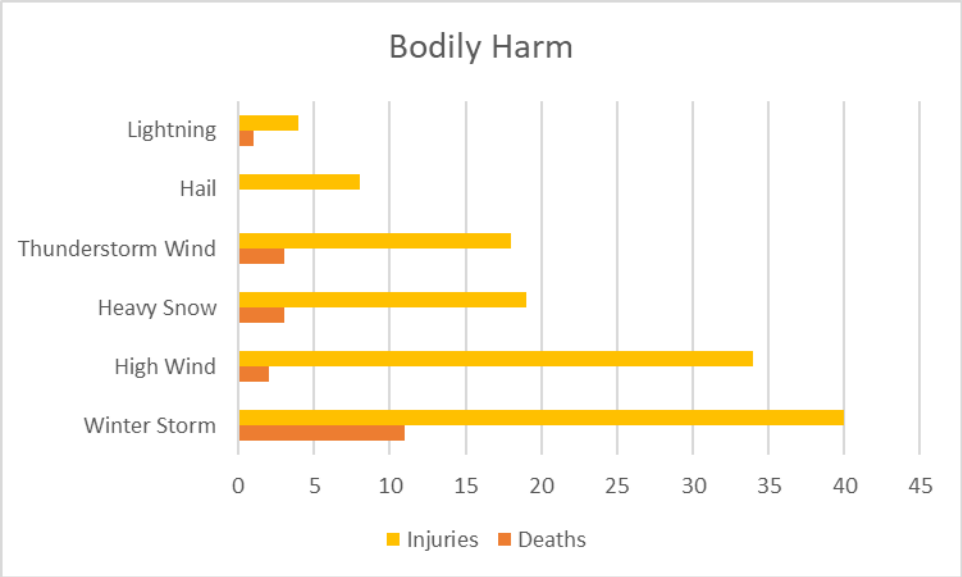
Utah County's mountainous terrain makes it particularly susceptible to Severe Weather, especially Winter Weather. Add to the topography those who seek snowy slopes for recreation and disaster can ensue, as seen in the table below. Avalanches, typically a voluntary risk, have caused the most deaths in 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 converted to urban.

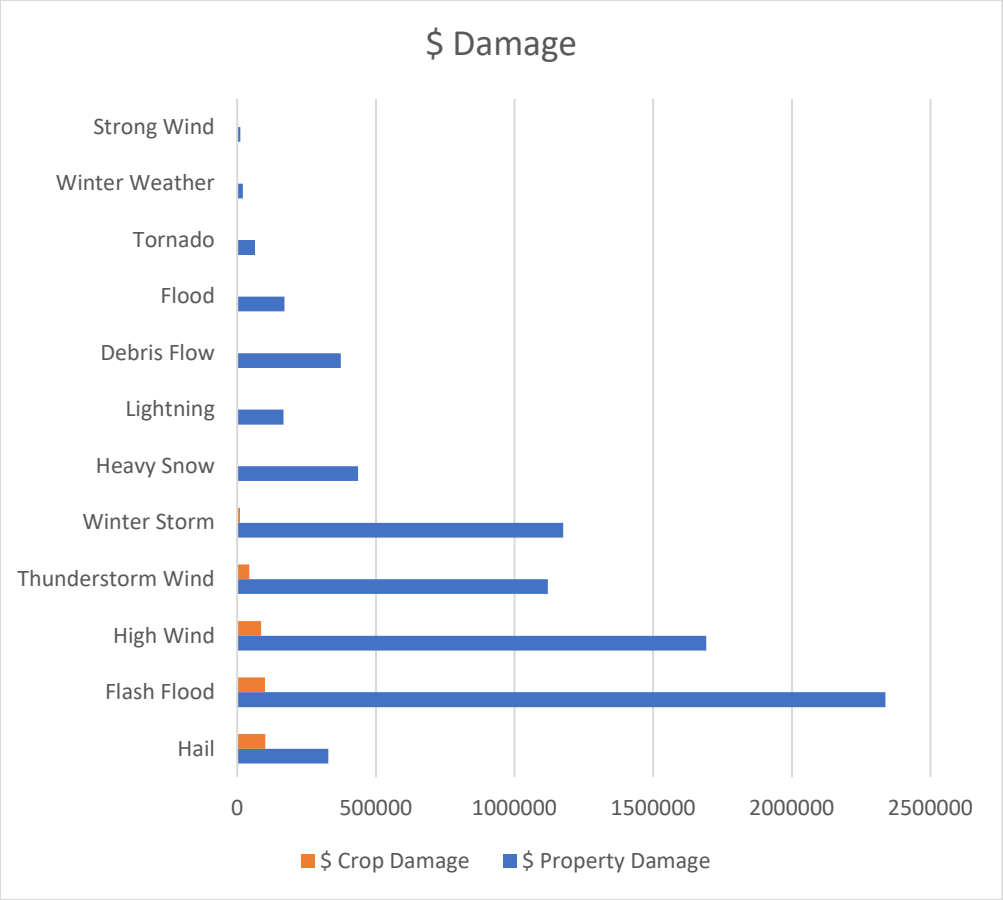
Profile

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

Row Labels	Deaths	Injuries	$ Property Damage	$ Crop Damage
Blizzard	0	0	0	0
Cold/wind Chill	0	0	0	0
Debris Flow	0	0	374000	0
Flash Flood	0	0	2338000	100000
Flood	0	0	170000	0
Hail	0	8	329000	101200
Heavy Snow	3	19	435500	400
High Wind	2	34	1691100	85800
Ice Storm	0	0	0	0
Lake-effect Snow	0	0	0	0
Lightning	1	4	166500	0
Strong Wind	0	0	11000	0
Thunderstorm Wind	3	18	1119600	44000
Tornado	0	0	64530	0
Winter Storm	11	40	1175000	10000
Winter Weather	0	0	20000	0
Grand Total	**20**	**123**	**7894230**	**341400**





Mitigation

For buildings: Adopt and enforce building codes related to roof snow loads and wind speeds. Require CO monitors.
For Infrastructure: Install redundancies in power lines, lightning protection and surge protection on critical infrastructure, and snow sheds over roadways.
For everyone: Educate homeowners on protecting water pipes during cold weather and travelling safely. Encourage participation in emergency alerts.

See FEMA's **Strategies handbook** for a more complete list.

Community 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 jurisdictions followed by an update of the community's mitigation strategies from the 2017 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. 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

The guiding factor in prioritizing mitigation strategies for local communities was the principle that mitigation should provide the ***greatest amount of good to the greatest number of people, after considering resources, staffing, and other constraints.*** Probability of occurrence, past events, and damage estimates compiled during the risk assessment in this plan were heavily considered. Overall, each community individually considered their own capabilities, staffing, and resources as they prioritized their own mitigation strategies.

Utah County

Loss Estimates

Hazard	# Buildings	Building value (thousands)	Major Road Miles	Transmission Miles	Railroad Miles
Dam Failure	42,431	$12,287,233	123.53	154.17	72.92
Fire Risk High	27,140	$9,154,898	90.42	335.63	70.75
Fire Risk Moderate	18,775	$5,605,592	75.31	285.05	78.31
Flood 1% Yearly Probability	910	$229,828	5.72	30.92	1.73
Landslide	1,377	$473,143	36.29	59.68	9.07
Liquefaction Moderate to High	70,362	$20,556,665	272.45	409.51	180.53
Earthquake (Pre-1990 buildings)	2,459	$597,467			

Utah County spends a great deal of time and money on wildland fire mitigation. It protects critical infrastructure such as waterways (Provo Canyon), airports, and evacuation routes. Wildfire has threatened water resources recently and triggered debris flows on de-vegetated slopes. We are also aware of the need to protect our resources from terrorism and have plans for doing so. The County Health Department is crucial for educating residents about preparing for natural disasters and improving the health of citizens at large so they are individually more resilient. We know that a large earthquake is likely in the next few decades and are building to code, gradually retrofitting and constantly educating to mitigate its damage. Utah County is one of the fastest-growing counties in the nation and we reduce the risk of fire to new buildings and infrastructure in an ever-expanding area with codes and guidelines for fire-hardened homes, seismic soundness, and adequate evacuation routes.

Hazard	Action	Priority	Timeline	Cost	Funding	Responsibility

Participation in FFSL's Cooperative Wildfire System program, including brush removal, education, and a host of other prevention measures	Fire	High	Ongoing	55k/yr	Utah County, cities/towns	Utah County and participating cities
Replace roofs and targeted chipping program in Sundance	Fire	High	1-3 yrs	30k for chipping	Utah County, homeowners	Utah County
Perscribed burns in Hobble Creek	Fire	High	Ongoing	TBD	Utah County	Utah County
Install/improve the exit out the east end of Springdell in cooperation with UDOT on the Upper Dell dirt road across USFS property in both directions i.e. up Provo Canyon to the east or west to Squaw Peak Road) or the Lower Dell road that would exit onto Provo Canyon Road.	Fire	Mod	2-4 yrs	TBD	Utah County, UDOT	Utah County, UDOT, Springdell residents
Create and improve dipping sites near Covered Bridge	Fire	High	1-3 yrs	TBD	Utah County, DNR	Utah County, DNR
Educate on water conservation and good watering practices	Drought	Mod	Ongoing	TBD	Utah County	Utah County, Utah State
Evacuation planning, especially for inhabited canyons	Fire, All	Mod	Ongoing	MInimal	Utah County	Utah County, community
Construct an additional detention basin at the southeast end of Mapleton	Flood, debris flow	High	1-2 yrs	300k	Utah County, Grants, Mapleton	Utah County

Avalanche controls, including snow sheds and fences, in Provo Canyon	Avalanche, winter weather	High	Ongoing	TBD	UDOT, Utah State	UDOT
Purchase more chipping machines	Fire	Mod	1-2 yrs	$65k each	Utah County	Utah County
Retrofit Historic Courthouse	Earthquake	Mod	5-10 yrs	10 million	Utah County, BRIC, other grants	Utah County
Update community wildfire protection plan	Fire	Mod	1 yr	Staff time	Utah County	Utah County
Participate in updating FIRMs for Utah Lake	Flood	Mod	1-3 yrs	Staff time	FEMA	FEMA

2017 Strategies Update							
Hazard	**Action**	**Priority**	**Timeline**	**Cost**	**Funding Sources**	**Estimated Cost**	**Completed?**
Wildfire	Fuel Mitigation plan with AF canyon	High	1 year	Minimal	Local Cash	Local Government	Yes
Flooding/ Drought	Highline Canal Retrofit	High	3 years	TBD	Local Cash, Water Conservancy District	Local Government, Water Conservancy District	In Progress
Flooding	Canal assessment with Provo City	High	2 years	TBD	Local Cash	Local government, Provo City	In progress
Terrorism	Natural Resource Protection	High	Ongoing	TBD	Local Cash, grants	Local government	Yes

All Hazards	Implement Early Notification System	High	1 year	TBD	Local Cash	Local Government	Yes

Alpine

Loss Estimates

Hazard	# Buildings	Building value (thousands)	Major Road Miles	Transmission Miles	Railroad Miles
Dam Failure	0	$0	0.00	0.00	0.00
Fire Risk High	789	$429,868	0.00	0.08	0.00
Fire Risk Moderate	552	$241,710	0.09	0.55	0.00
Flood 1% Yearly Probability	8	$4,805	0.00	0.02	0.00
Landslide	5	$2,433	0.00	0.00	0.00
Liquefaction Moderate to High	0	$0	0.00	0.00	0.00
Earthquake (Pre-1990 buildings)	829	$201,953			

Statement of Vulnerabilities: Alpine's chief concern is the increased probability of post-fire debris flows on de-vegetated hills alone its east side. There is very little land left to develop and no new buildings planned in high-risk fire areas with the hillside ordinance.

Action	Hazard	Priority	Timeline	Cost	Potential Funding	Responsible Party
Require geotechnical reports for any proposed development on problem soils or steep slopes	Landslide	Mod	Ongoing	Minimal	Developer	Local gov, Developer

Restructure water rates	Drought	High	1 yr.	Staff time	Local gov	Local gov
Educate residents on disaster preparedness and promote the Great Utah Shake Out	Earthquake, All	Mod	Ongoing	Staff time	Local gov	Local gov
Maintain foothill trails as access roads for vegetation maintenance and fire response	Fire	High	Ongoing	10k	Local gov	Local gov
Improve drought restrictions plan	Drought	Mod	1-2 yrs.	Staff time	Local gov	Local gov
Educate homeowners on firewise practices, especially defensible space	Fire	Mod	Ongoing	Staff time	Local gov	Local gov

2017 Strategy Update

Hazard	Action	Priority	Timeline	Cost	Funding	Responsibility	Completed?
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	Not necessary, none built before 2000
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.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS	Yes, ongoing
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	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.	Ongoing	1 year	Minimal	Local Cash, Grants	Local Government	Yes
Drought	Identify drought assessment criteria. Notify residents of drought conditions.	Medium	2 years	TBD	Local Cash	Local Government	Yes

American Fork

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	5,777	$1,711,775	18.75	9.52	6.99
Fire Risk High	418	$277,078	3.61	0.58	0.39
Fire Risk Moderate	707	$299,228	2.20	1.43	1.94
Flood 1% Yearly Probability	19	$2,923	0.39	0.01	0.00
Landslide	180	$55,588	0.49	0.00	0.00
Liquefaction Moderate to High	2,973	$1,091,471	17.28	8.59	6.39
Earthquake (Pre-1990 buildings)	4,584	$1,213,659			

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 are studying with the Army Corps of Engineers.

Action	Hazard	Priority	Timeline	Cost	Potential Funding	Responsibility

Install secondary water metering	Drought	High	2 yrs.	9 million	Bureau of Reclamation, Local Cash	Local Gov
Improve outflow and grades for the debris basin	Flood	High	1-2 yrs.	250k	Debris Basin board (American Fork, Highland, and Cedar Hills)	Debris Basin board (American Fork, Highland, and Cedar Hills)
Repair and expand culverts on American Fork River	Flood	High	Ongoing	TBD	Local gov	Local gov
Adopt 2021 NFIP maps and update ordinances	Flood	Mod	1 yr.	Staff time	Local gov	Local Gov
Inventory historic City Hall for possibility of earthquake retrofits	Earthquake	Mod	2-5 yrs.	TBD	Local gov	Local gov
Complete an environmental assessment for the watershed and a plan to better assess the vulnerabilities and determine a procedure to mitigate flooding issues.	Flood	High	2-3 yrs.	400k	Local gov, NRCS	Local gov, NRCS

2017 Strategy Update							
Hazard	**Action**	**Priority**	**Timeline**	**Cost**	**Potential Funding**	**Responsibility**	**Completed?**
Flood	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, most buildings are new. City Hall should be checked.

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

Cedar Fort

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	0	$0	0.00	0.00	0.00
Fire Risk High	45	$9,671	0.85	0.00	0.00
Fire Risk Moderate	83	$14,398	0.23	0.00	0.00
Flood 1% Yearly Probability	0	$0	0.00	0.00	0.00
Landslide	0	$0	0.00	0.00	0.00
Liquefaction Moderate to High	0	$0	0.00	0.00	0.00
Earthquake (Pre-1990 buildings)	90	$11,672			

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. The only real development pressure comes from land on the east side that property owners request be annexed into Eagle Mountain.

Action	Hazard	Priority	Timeline	Estimated Cost	Potential Funding	Responsibility
Participate in Utah County Chipping program to reduce fuels	Fire	High	Ongoing	Volunteer hours	Local gov, Utah County	Local gov
Educate firewise principles such as defensible space during the 24th of July celebration and in the water bill.	Fire	Mod	Ongoing	Staff time	Local gov	Local gov
Encourage participation in CERT.	All	Mod	Once every 4 years	Minimal	Local gov	Local gov

2017 Strategy Update							
Hazard	**Action**	**Priority**	**Timeline**	**Cost**	**Potential Funding**	**Responsibility**	**Completed?**
Earthquake	Provide CERT classes	High	1 year	Minimal	Local Cash	Fire Department, Local Government	No
Wildfire	Fuel Thinning	High	2 years	Minimal	BLM, DNR, SITLA	BLM, DNR, SITLA	Yes, as needed
Wildfire	Education (Pamphlets at 24 July Celebration, notices in Water Bill)	High	Yearly	Minimal	Local Cash, Forest Service	Local Government, Forest Service	Yes, with Fire Department

Cedar Hills

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	0	$0	0.22	0.13	0.00
Fire Risk High	1,156	$363,034	0.18	3.34	0.00
Fire Risk Moderate	164	$51,781	0.00	0.08	0.00
Flood 1% Yearly Probability	0	$0	0.14	0.00	0.00
Landslide	100	$29,644	0.00	0.77	0.00
Liquefaction Moderate to High	0	$0	0.00	0.00	0.00
Earthquake (Pre-1990 buildings)	208	$59,572	NA	NA	NA

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 and modified piping to include an upgraded supply line with locked joint pipe. Regarding wildland fire, many homes are in the Wildland Urban Interface. Cedar Hills is improving the access road that serves as a fire break and improving the codes for any development in the WUI.

Action	**Hazard**	**Priority**	**Timeline**	**Estimated Cost**	**Potential Funding**	**Responsibility**
Install secondary water metering	Drought	High	2 yrs.	2.5 million	Bureau of Reclamation, Local Cash	Local Gov
Improve Wildland Urban Interface development standards with defensible space, roofing materials, etc.	Fire	High	1yr	Staff time	Local Gov	Local Gov

Encourage xeriscaping and Central Utah Water Conservancy District's localscapes	Drought/Fire	High	1 yr.	Staff time	Local Gov	Local Gov
Improve maintenance roads and Bonneville shoreline trail used as a firebreak and access points for fire response vehicles	Fire	High	Ongoing	5k	Local Gov/American Fork Fire Dept	Local Gov
Clear ditches and remove dead vegetation	Flood, Fire	Mod	Ongoing	15k	Local Gov	Local Gov

2017 Strategy Update							
Hazard	**Action**	**Priority**	**Timeline**	**Cost**	**Potential Funding**	**Responsibility**	**Completed?**
Flooding	Storm Water/ Ditch System Cleaning	Medium	2 years	TBD	Local Cash	Local Government	Yes, ongoing
Earthquake	Participate in Great Shakeout	High	1 Year	N/A	Local Cash	Local Government	Yes
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk	Medium	1 year	Minimal	Local Cash, Grants	Local Government	No, in progress
Landslide	Update landslide mapping with UGS and USGS.	Medium	2 years	TBD	Local Cash, Grant	Local Government, USGS, UGS	No, coordination efforts fell through
Drought	Identify drought assessment criteria. Notify residents of drought conditions.	Medium	2 years	TBD	Local Cash	Local Government	Yes

Central Utah Water Conservancy District

Due to the sensitive nature and complexity of CUWCD assets, they performed an independent risk analysis to create and prioritize the following mitigation strategies. Contact Blake Buehler of CUWCD for more information.

Vulnerabilities: The future development of the CUWCD water system will mainly be with a strong emphasis on water conservation, planning of needed additional regional water supply facilities, and incorporation of natural hazard mitigation. The District will also continue in its current efforts to address and incorporate natural hazard mitigation (i.e., seismic upgrades/standards, lightning protection, backup power, wildfire – both direct and indirect effects, etc.) into future design and

construction projects whether they are for new facilities or for capital replacement projects. The following proposal is to help fulfill said efforts.

Priority	Mitigation Package: Facilities	BCR	Mitigation Description	Outside Contractor	In-House	CUWCD O&M	CUWCD CRP	CUWCD CIP	FEMA Grant	Timeline	Package Subtotal
1	Alpine Aqueduct Reach 1 Resiliency Project (Earthquake & Landslide): *Alpine Reach 1*	-	New Construction	X			X		X	1-3 Years	$39.4 million
2	DACRWTP Pkg #1 (Tornado): *LOX & Vaporizers, Ozone Transformers, Substation*	>100	Nonstructural Retrofit	X			X		X	1-3 Years	$248,649
3	DACRWTP Pkg #2 (Lightning): *Operations Bldg., Filter Bldg., FW & WWW Bldg., Rec Bldg., Pump Bldg.*	>100	Nonstructural Retrofit	X			X		X	1-3 Years	$159,564
4	DACRWTP Proj #3 (Earthquake): *15 MG Reservoir*	14.8	Structural Retrofit	X			X		X	1-3 Years	$3,304,211
5	Olmsted Proj #2 (Avalanche): *Olmsted Diversion*	>100	Structural Retrofit	X			X		X	1-3 Years	$231,088

6	CWP Pkg #1 (Earthquake): *Geneva Wells & Pony Express PS*	22.9	Nonstructural Retrofit	X	X	X	X		X	3-5 Years	$2,210
7	Alpine Pkg #1 (Earthquake): *Alpine Reach 3, North Branch Pipeline*	3.3	Nonstructural Retrofit	X	X	X	X		X	3-5 Years	$21,329
9	CWP Pkg #2 (Lightning): *Geneva Wells*	>100	Nonstructural Retrofit	X			X	X	X	3-5 Years	$359,974
10	CWP Pkg #3 (Lightning): *Pony Express PS*	37.9	Nonstructural Retrofit	X			X	X	X	3-5 Years	$716,408
14	Olmsted Pkg #6 (Earthquake & Landslide): *Olmsted Diversion, Olmsted Bifurcation Reservoir*	-	Geological Investigation	X			X			6-10 Years	$80,212
15	Diamond Fork Pkg #1 (Landslide): *Spanish Fork & Sixth Water Flow Control Structures, Sixth Water Aqueduct, Diamond Fork Pipeline*	-	Geological Investigation	X			X			6-10 Years	$505,952

17	General Pipeline #1 - Stockpile Materials	-	Material Stockpiling		X	X	X			6-10 Years	$755,950
18	General Pipeline #2 - Training	-	Training	X	X	X				6-10 Years	$19,538

Eagle Mountain

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	0	$0	0.00	0.00	0.00
Fire Risk High	3,679	$919,235	4.10	7.22	0.00
Fire Risk Moderate	1,774	$388,039	2.54	9.57	0.00
Flood 1% Yearly Probability	0	$0	0.00	0.00	0.00
Landslide	0	$0	0.00	0.00	0.00
Liquefaction Moderate to High	0	$0	0.00	0.69	0.00
Earthquake (Pre-1990 buildings)	94	$54,568	na	na	na

Statement of Vulnerabilities: Eagle Mountain's primary concern is wildland fire and the large-scale evacuations it might trigger. The Kiowa Valley subdivision is particularly at risk due to single-lane roads leaving the subdivision and main thoroughfares (SR73, Pioneer Crossing, and Porter's Crossing) would be overwhelmed. More people recreating in the hills also increases fire likelihood. Eagle Mountain works with the Kern River Pipeline and others to maintain firebreak trails. Eagle Mountain is attracting a great deal of development throughout. Because most development is recent, buildings and infrastructure are largely up to seismic and fire code, but new residents require education on water conservation, firewise practices, and

evacuation plans. The city would like to attract businesses and a hospital, in particular, to become less dependent on other commercial areas of the county.

Action	Hazard	Priority	Timeline	Cost	Funding	Responsibility
Install backup generator at well house	All	High	2-3 yrs.	300k	Local gov	Local gov
Upgrade backup generator at City Hall	All	High	2 yrs.	200k	Local gov, grants	Local gov
Educate homeowners in WUI about firewise principles and notify at-risk residents	Fire	High	Ongoing	Minimal	Local gov	Local gov
Educate homeowners on good watering practices, how to reduce water use, and encourage xeriscaping	Drought	Mod	Ongoing	Staff time	Local gov	Local gov
Educate on earthquake preparedness, including Be Ready, CERT, yearly Shakeout drill, and monthly emergency meetings	Earthquake, All	Moderate	Ongoing	Staff time	Local gov	Local gov
Require multiple ways in/out of all new subdivisions	Fire, all	High	Ongoing	Minimal	Developer	Developer, Local gov
Maintain fire access roads that serve as Bike and OHV trails	Fire	Mod	Ongoing	Minimal	Local gov, OHV and Mountain Biking groups	Local gov, OHV and Mountain Biking groups
Maintain Kern River Pipeline firebreak and tree trimming	Fire, flood	Mod	Ongoing	None	Kern River Pipeline Co	Kern River Pipeline Co

Achieve Firewise Community Status	Fire	Mod	1-2 yrs.	Staff time	Local gov	Local gov
Encourage hospital to be built in city limits	All	Mod	5-10 yrs.	Unknown	Intermountian Healthcare, MountainStar Healthcare	Private Healthcare organization, Local gov encouragement
Update Emergency Operations Plan with a focus on evacuation routes and inform citizens	Fire, Earthquake	High	1 yr.	Staff time	Local gov	Local gov

2017 Strategy Update

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	No, no special flood hazard area
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No, all built after 1990
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.	Medium	1 year	TBD	Local Cash, Grants	Local Government, UGS	Yes, ongoing for drought
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes, through CERT

							teams, Shakeout, Be Ready program, and monthly training meetings
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	Efforts fell through

Elk Ridge

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	0	$0	0.00	0.00	0.00
Fire Risk High	582	$175,465	1.64	0.00	0.00
Fire Risk Moderate	167	$46,436	0.17	0.14	0.00
Flood 1% Yearly Probability	0	$0	0.00	0.00	0.00
Landslide	0	$0	0.00	0.00	0.00
Liquefaction Moderate to High	0	$0	0.00	0.00	0.00
Earthquake (Pre-1990 buildings)	199	$44,625	na	na	na

Statement of Vulnerabilities: Though a second evacuation road has been constructed since 2016, infrastructure is insufficient to handle a major disaster. As growth occurs developers will be required to install proper infrastructure, which should improve the overall situation. Loafer Canyon is a particular concern with its older roads and continual maintenance of debris basins.

Mitigation Strategy	Hazard	Priority	Timeline	Cost	Funding	Responsibility
Encourage water conservation through education & tiered water rates	Drought	Mod	Ongoing	Minimal	Local gov	Local gov
Complete seismic evaluation of City Hall and Pump Houses, get estimates for retrofitting	Earthquake	Mod	1-2 yrs.	TBD	Local gov	Local gov
Conduct yearly disaster drills	All	Mod	Ongoing	Staff time	Local gov	Local gov, Fire Dept
Construct new Canyon View Road to provide another evacuation route	All	High	1-2 yrs.	TBD	Developers, Local gov	Developers, Local gov
Chipping program in Wildland Urban Interface	Fire	High	Ongoing	Volunteer-hour match	Local gov, citizens, Utah County	Local gov, Utah County
New Firetruck	Fire	Mod	2-3 yrs.	1 million	Local gov	Local gov
Well-maintained trail on S side serving as firebreak road to be installed as development occurs	Fire, Debris Flow	Mod	5-10 yrs.	TBD	Developers, Local gov	Developers, Local gov
Fire Chief must sign off on all plans in WUI, including requirements for fire hydrant proximity, defensible space, and building materials	Fire	High	Ongoing	Staff time	Local gov	Local gov

Geotechnical study required for all new development in hazard areas	All	High	Ongoing	Staff time	Developers	Developers, Local gov
Bury power lines, especially those that may cause fires	All	Mod	Ongoing	$700k/mile	Local gov, developers	Local gov

2017 Goals Strategies Update

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?
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	No SFHA
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No, not enough staff time
Wildfire	Educate homeowners on FIREWISE practices. seek assistance for upgraded fire suppressing equipment	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA	Yes - education Upgraded equipment still needed
Landslide	Create infrastructure that will eliminate/prevent future erosion of the dugway.	Extremely high	1 year	TBD	Local Cash, Grants	Local Government, UGS, FEMA	Yes, ongoing
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	No SFHA
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

Fairfield

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	0	$0	0.00	0.00	0.00
Fire Risk High	2	$728	0.69	0.00	0.00
Fire Risk Moderate	10	$1,217	1.28	0.00	0.00
Flood 1% Yearly Probability	0	$0	0.00	0.00	0.00
Landslide	0	$0	0.00	0.00	0.00
Liquefaction Moderate to High	55	$11,249	3.25	0.00	0.00
Earthquake (Pre-1990 buildings)	36	$5,607	na	na	na

Statement of Vulnerabilities: Fairfield has only moderate liquefaction and fire risk and only a small handful of new buildings each year. The Utah County fire marshal approves any permits for new construction. There are no city buildings and neighbors look out for each other. The biggest problem is probably winter weather. The only real development pressure comes from land on the east side that property owners request be annexed into Eagle Mountain.

Mitigation Strategy	Hazard	Priority	Timeline	Cost	Funding	Responsibility

Encourage residents to participate in Utah County's Emergency Notification System	All	Mod	Ongoing	Minimal	Local gov, Utah County	Local gov, Residents
Make sure neighbors know who has backup generators and trucks sufficient for snow removal	Winter weather, all	Mod	Ongoing	None	Local gov	Local gov

2017 Strategy Update							
Hazard	**Action**	**Priority**	**Timeline**	**Cost**	**Potential Funding**	**Responsibility**	**Completed?**
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No critical buildings
All Hazards	Add texting to Emergency Notification System	Med	1 year	Minimal	Local Cash	Local Government	Yes
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes

Genola

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	1	$118	0.19	0.00	0.00
Fire Risk High	31	$6,571	0.74	0.05	0.06
Fire Risk Moderate	39	$7,973	0.41	0.00	0.00
Flood 1% Yearly Probability	0	$0	0.00	0.00	0.00
Landslide	0	$0	0.00	0.00	0.00
Liquefaction Moderate to High	408	$92,407	7.11	0.00	0.00
Earthquake (Pre-1990 buildings)	214	$32,681	na	na	na

Statement of Vulnerabilities: Genola needs a second source of water to provide redundancy for drought and fire. Fires burn Goshen Hill on the East side of town almost every year, resulting in lower fuel loads and less intense fires. Since the town uses septic and propane, development pressure is limited.

Mitigation Strategies	Hazard	Priority	Timeline	Cost	Funding	Responsibility
Fire Marshall must approve new development, including 1 hr. fire resistant construction, appropriate landscaping & defensible space, sprinklers, and 2 ingress/egress routes	Fire	High	Ongoing	Staff time	Local gov	Local Fire Dept
New buildings must submit a geotechnical/soil feasibility study to the County to account for liquefaction and problem soils	Liquefaction	Mod	Ongoing	Staff time	Local gov, Developers	Local gov, Developers
Build a second well and water tank on north end of town	Drought, Fire	High	2 yrs.	1 million	Local gov	Local gov
Educate homeowners in debris flow areas about risk during permitting process	Debris flow	Mod	Ongoing	Staff time	Local gov	Local gov
Bring gas lines to town so propane isn't the only source of heating	All	Mod	5-10 yrs.	TBD	Local gov, gas company, grants	Local gov
Work with Utah County to manage vegetation in high fire risk areas	Fire	Mod	Ongoing	5k	Utah County, local gov	Utah County, local gov

2017 Strategy Update

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?

Earthquake	Upgrade City Office Building	High	4 years	TBD	Local Cash, Grants	Local Government	Yes
Landslide	Educate homes in Landslide/ Debris Flow areas on risk	Med	Ongoing	Minimal	Local Cash	Local Government	Yes, ongoing
Flood	Adopt new FEMA flood plains, participate in NFIP	Med	3 years	Minimal	Local Cash, FEMA	Local Government, FEMA	Yes
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk	Medium	3 years	Minimal	Local Cash, Grants	Local Government	No, not many houses in fire risk
Flood	Adopt new FEMA flood plains, participate in NFIP	Med	3 years	Minimal	Local Cash, FEMA	Local Government, FEMA	Yes

Goshen

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	63	$9,070	0.28	0.00	0.00
Fire Risk High	26	$3,816	0.02	0.04	0.00
Fire Risk Moderate	206	$28,384	0.07	0.11	0.00
Flood 1% Yearly Probability	0	$0	0.00	0.00	0.00
Landslide	0	$0	0.00	0.00	0.00
Liquefaction Moderate to High	253	$33,989	1.19	0.00	0.00
Earthquake (Pre-1990 buildings)	241	$28,614	na	na	na

Statement of Vulnerabilities: Though the Fire Department was built post-1990 and the church was retrofitted in about 2010, many older homes are in the liquefaction area. We only build 2-3 homes a year, so we don't have development pressure on those problem soils. Reliance on septic tanks keep lot sizes large and limits potential growth.

Mitigation Action	Hazard	Priority	Timeline	Cost	Funding	Responsibility
Support Fix-the-Bricks	Earthquake	Moderate		0	FEMA	Utah County
Collect spring water and measure output	Drought	High	1 year	350k	CDBG	Local Gov
Bring natural gas to city	All	High	2 years	11 mil	State	State/Dominion Energy
New Water Tank and replace most distribution lines	Drought	High	2 years	4 million	USDA	USDA/Local Gov
Display hazard maps in city hall	All	Moderate	1 year	0	NA	MAG/Local Gov

2017 Strategy Update

Hazard	Action	Priority	Timeline	Cost	Potential Funding	Responsibility	Completed?
Flooding/ Dam Failure	Promote NFIP participation.	High	3 years	TBD	Local Cash, Grants	Local Government, FEMA, UDHS	No Special Flood Hazard Area
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	Minimal	Local Cash, Grants	Local Government	Not necessary, no critical facilities build pre-1990
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	No, very little fire risk in or immediately near Goshen.
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 SFHA
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government	Yes

Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	2 years	Minimal	Local Cash, Grants	Local Government	No, very little fire risk in or immediately near Goshen.

Highland

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	215	$97,681	0.99	0.42	0.00
Fire Risk High	2,028	$804,729	3.16	3.95	0.00
Fire Risk Moderate	1,361	$483,444	1.48	1.19	0.00
Flood 1% Yearly Probability	32	$14,448	0.37	0.43	0.00
Landslide	0	$0	0.00	0.00	0.00
Liquefaction Moderate to High	0	$0	0.00	0.00	0.00
Earthquake (Pre-1990 buildings)	1,012	$266,520	na	na	na

Statement of Vulnerabilities: Highland is particularly concerned about flooding and debris flow following fires. With more land developed, there are more impervious surfaces and increased runoff. This will continue with development pressure on Highland's agricultural and open space. The American Fork River and debris basin also need attention to mitigate flooding and fire.

Mitigation Strategy	Hazard	Priority	Timeline	Cost	Funding	Responsibility

Complete installation of secondary water meters	Drought	High	4-5 yrs.	Several million	Local gov, grants	Local gov
Upgrade debris basin structure	Flood	Mod	1-2 yrs.	200k	Highland, American Fork & Alpine	Highland, American Fork & Alpine
Educate residents on disaster preparedness, in particular earthquakes and winter weather	All	Mod	Ongoing	Staff time	Local gov	Local gov
Cut native grasses in fire hazard areas of City owned property by July of each year.	Fire	Mod	Ongoing	10k	Local gov	Local gov

2017 Strategy Update

Hazard	Action	Priority	Timeline	Cost	Potential Funding	Responsibility	Completed?
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Yes, ongoing
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	Yes
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Med	Ongoing	Minimal	Local Cash, Grants	Local Government, UGS	Yes
Earthquake	Promote earthquake awareness and preparation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, UGS, USGS	No, most development is post-1990 and relatively safe.
Drought	Educate Residents on water conservation practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Yes

Extreme Temperatures	Educate property owners about freezing pipes.	Med	Ongoing	Minimal	Local Cash	Local Government	Yes
Severe Winter Weather	Educate residents on winter weather preparedness.	Med	Ongoing	Minimal	Local Cash, Grants	Local Government	Yes
Multiple Hazards	Update Emergency Operations Plan	High	2 years	Minimal	Local Cash, Grants	Local Government, Public Safety District	Yes
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	Yes
Flooding/ Dam Failure	Maintain drainage ways.	Med	Ongoing	TBD	Local Cash	Local Government	Yes
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 years	TBD	Local Cash, Grants	Local Government, UGS, USGS	No, coordination efforts fell through
Landslide	Review Development standards for issues with hillside development.	Med	2 years	Minimal	Local Cash	Local Government	No, deemed unnecessary

Lehi

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	3,778	$934,606	5.94	12.15	6.09
Fire Risk High	6,245	$2,357,674	11.83	11.36	9.70
Fire Risk Moderate	3,830	$1,189,356	3.61	8.20	1.75
Flood 1% Yearly Probability	157	$35,459	1.01	1.39	0.71
Landslide	0	$0	0.00	0.06	0.08
Liquefaction Moderate to High	8,795	$2,177,717	11.70	35.31	7.28
Earthquake (Pre-1990 buildings)	2,867	$1,730,698	na	na	na

Statement of Vulnerabilities: Lehi faces development pressure along the northern the Wildland Urban Interface and near Jordan River. Flood Insurance Rate Maps around Utah Lake and Dry Creek are being updated, which will clarify where development can and shouldn't occur. Drought has strained Lehi's water resources, necessitating restrictions.

Mitigation Action	Hazard	Priority	Timeline	Cost	Funding	Responsibility
Winter preparedness bulletins	Winter weather	Mod	Ongoing	Minimal	Local gov	Local gov
Repair and replace water distribution systems to control leakage and pressure problems, especially downtown	Drought	High	Ongoing	Moderate	Local gov	Local gov, Public Works Water
Reduce water consumption, offer rebate programs for fixtures and equipment	Drought	Mod	Ongoing	Minimal	CUWCD, Local Gov	CUWCD, Local gov
Install secondary meters on 1/4 acre or greater properties	Drought	High	1-3 yrs.	2k/installation	Local gov, Water Division grants	Local gov
Clear ditches and remove dead vegetation	Flood, Fire	Mod	Ongoing	Minimal	Local gov	Local gov
Require developers to provide site-specific environmental information to identify possible on and off-site methods for mitigating impacts	Liquefaction, Flood, Fire	High	Ongoing	Minimal	Developers	Developers, Local gov
Work with FEMA and the Army Corps of Engineers to update FIRMs on Utah Lake and study choke points on Dry Creek	Flood	High	1-2	Staff time	FEMA	FEMA, Army Corps of Engineers

Consider a Critical Lands Overlay in the Wildland Urban Interface and some waterways	Fire, Flood	Mod	1-2 yrs.	Staff time	Local gov	Local gov
Encourage maintenance of existing vegetation and retain natural drainage, i.e., debris flow basins	Debris flow	Mod	Ongoing	Minimal	Local gov	Local gov
Bury power lines to prevent damage	Severe weather	High	Ongoing	Staff time	Developers, Local gov	Developers, Local gov
Provide inspections and maintenance operations to prune trees throughout the city to prevent damage to homes, power, and other cables	Severe weather, Earthquake, Fire	Mod	Ongoing	Minimal	Local gov	Local gov, Public Works
Improve outflow of Dry Creek and rehab Dry Creek dam	Flood, Fire	High	2 yrs.	Complete in 2022	NRCS, BRIC, Local gov	NRCS, Local gov
Expand pipes under Lehi Elementary	Flood	Mod	TBD	Staff time	Local gov	Local gov
Build a new city hall and library to seismic standards	Earthquake	Mod	5-10 yrs.	TBD	Local gov	Local gov
Develop trails along Traverse Mountain to connect to Draper, providing fire access and limiting development in WUI	Fire	Mod	2-3 yrs.	Public works	Local gov	Local gov
Consider a "Flip the Strip" program to reduce water use in parking strips	Drought	Mod	2-3 yrs.	TBD	Local gov, CUWCD	Local gov
Participate in the Utah Shakeout, provide community preparedness classes and maintain a Community Emergency Response Team	Earthquake, all	Mod	Ongoing	Minimal	Local gov	Local gov

2017 Strategies Update

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Result
Winter Weather	Winter preparedness bulletins	Med	Ongoing	Minimal	Local Government	Fire Department, Local Government	Yes
Drought	Repair water distribution systems to control leakage and pressure problems	High	Ongoing	Mod	Local Government	Local Government	Yes
Drought	Reduce water consumption, offer rebate programs for fixtures and equipment	Med	Ongoing	Minimal	Local Government, Water Conservation Program	Water Conservation Program	Yes, rebates through CUWCD
Drought	Retrofit showers and toilets, increase mete efficiency and maintenance, promote leak detection and repair programs	Med	4 years	Mod	Local Government	Local Government	Yes, ongoing
Earthquake	Seismic Building Retrofitting Program	High	4 years	TBD	FEMA's Project Impact	FEMA, Local Government	No, too difficult for city to administer
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	Yes, upgrading and maintaining ditches
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	Yes
Flood	Implement strategies for flood mitigation outlined in the City's Critical Areas Regulations	Med	Ongoing	TBD	Local Government	Local Government	Yes, flood ordinances were updated

Landslide	Control development in sensitive areas through Hillside and Grading ordinance	High	Ongoing	Minimal	Local Government	Local Government	Yes
Landslide	Encourage maintenance of existing vegetation and retain natural drainage	Med	Ongoing	Minimal	Local Government	Local Government	Yes
Snow Storms	Bury power lines to prevent damage	High	4 years	Moderate	Local Government	Local Government	Yes
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	Yes

Lindon

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	1,512	$676,801	12.08	8.38	4.39
Fire Risk High	290	$206,955	0.81	5.28	2.26
Fire Risk Moderate	399	$145,370	1.10	2.54	0.12
Flood 1% Yearly Probability	27	$7,215	0.00	2.45	0.00
Landslide	8	$5,684	0.00	0.48	0.00
Liquefaction Moderate to High	869	$534,599	14.00	10.02	5.60
Earthquake (Pre-1990 buildings)	1,196	$568,465	na	na	na

Statement of Vulnerabilities: Lindon's chief concerns are wildland fire in the foothills and having adequate water infrastructure that could survive and earthquake. Lindon works with Utah County to educate residents, manage fuels, and maintain firebreak trails. There are a few homes that would benefit from seismic retrofits as well as the Canberra water tank. Development pressure is mostly toward the lake and every new building must mitigation for liquefaction.

Mitigation Action	Hazard	Priority	Timeline	Cost	Funding	Responsibility
Adopt new 2021 NFIP maps and update city code	Flood	Mod	1 yr.	Staff time	Local gov	Local Gov
Educate pre-1980 URMs of low-cost retrofits, like strapping water tanks, flexible pipes, etc.	Earthquake	Mod	Ongoing	Staff time	Local gov	Local Gov
Support bringing the Fix-the-Bricks program to Utah County	Earthquake	Mod	1-2 yrs.	Staff time	Local gov	Local Gov
Install secondary water meters on 2400 unmetered connections	Drought	Mod	5-10 yrs.	4 million	Local gov	Local gov
Update stormwater management plan with PG to address PG discharge	Flood	Mod	1-2 yrs.	Staff time	Local gov	Lindon, Pleasant Grove cities
Educate homeowners in WUI about firewise principles	Fire	High	Ongoing	Staff time	Local gov	Local gov
Improve fire breaks adjacent for Forest Service land	Fire	Mod	Ongoing	7.5k	Local gov	Local gov
Maintain ponds for Pleasant Grove to use in fire emergencies	Fire	Mod	Ongoing	10k	Local gov	Local gov
Construct more debris flow basins	Flood	Low	20 yrs.	TBD	Local gov	Local gov
Study Canberra water tank for seismic soundness	Earthquake	Mod	5-10 yrs.	TBD	Local gov	Local gov
Install generators for booster station & wells	All, earthquake	High	2 yrs.	430k	BRIC grant, local gov	Local gov

Construct additional well	Drought	Mod	2 yrs.	1.5 million	Local gov	Local gov
Provide dumpsters for spring and fall yard waste	Fire	Mod	Ongoing	500k	Local gov	Local gov
Encourage teleworking on poor air quality days	Air quality, Climate change	Mod	Ongoing	Staff time	Local gov	Local gov

2017 Strategy Update

Hazard	Action	Priority	Timeline	Cost	Potential Funding	Responsibility	Completed?
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	Yes
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
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
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	2 years	Minimal	Local Cash, Grants	Local Government	Yes
Debris Flow	Maintain debris flow basins. Monitor wildfire and landslide areas.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes

Mapleton

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	5	$1,546	0.00	0.02	0.00
Fire Risk High	12	$4,766	0.81	8.30	0.00
Fire Risk Moderate	247	$243,027	0.79	9.48	0.00
Flood 1% Yearly Probability	6	$765	0.00	0.01	0.00
Landslide	0	$0	0.00	0.04	0.00
Liquefaction Moderate to High	2,901	$1,101,786	5.37	9.20	0.46
Earthquake (Pre-1990 buildings)	1,063	$424,672	na	na	na

Statement of Vulnerabilities: Mapleton lacks a stormwater outfall and cannot obtain a discharge permit for Hobble Creek due to Springville's high water table. The city relies on detention ponds and stormwater storage vaults, but high water accumulation events could result in flooding. The city is implementing innovating design and technology to better capture rain on-site, such as bioswales, rain gardens, and improved storage vaults. Maple Mountain has a high likelihood of catching fire, which could move into the WUI and cause secondary hazards such as flooding and mudslides.

Action	**Hazard**	**Priority**	**Timeline**	**Cost**	**Funding**	**Responsibility**
Educate residents on good watering practices and how to conserve during a drought	Drought	High	Ongoing	Minimal	Local gov	Local gov
Educate residents on wildfire mitigation, such as defensible space and roof materials	Fire	High	Ongoing	Minimal	Local gov	Local gov

Participate in the yearly Shakeout drill	Earthquake	Mod	Ongoing	Minimal	Local gov	Local gov
Create a mountain biking trail alone the fire break road to improve maintenance and access	Fire, Mudslide	Mod	2-3 yrs.	Included in new development	Developers	Local gov, Developers
Exchange density in other areas for development on hillside	Fire, Mudslide	High	Ongoing	0	Local gov	Local gov
Strengthen city code to require more fire-mitigating principles in WUI	Fire	Mod	1-2 yrs.	Staff time	Local gov	Local gov
Require development in the floodplain elevate homes	Flood	High	Ongoing	Minimal	Developers	Local gov, Developers
Create localscapes/xeriscape demonstration garden	Drought	Low	2-4 yrs.	TBD	Local gov	Local gov
Support bringing the Fix-the-Bricks program to Utah County	Earthquake	Mod	2-5 yrs.	Unknown	BRIC grants	Utah State or Utah County

2017 Strategies Update

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding	Responsible Party	Completed?
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

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, Ether Hollow

Nebo School District

Vulnerabilities: Nebo has a handful of older elementary schools that could be retrofitted or rebuilt to current seismic code. Nebo has already bonded to rebuild some of the larger schools. It is important that schools are prepared to serve as evacuation centers. Also, Turf fields are increasingly expensive and the quality of artificial grass makes a transition attractive. A great deal of development is occurring in Nebo School District and new schools are being built to accommodate it.

Action	Hazard	Priority	Timeline	Cost	Funding	Responsibility
Look for opportunities to retrofit or rebuild schools built before seismic code, including Spanish Fork and Payson Jr High, Santaquin, Goshen, Sage Creek, Cherry Creek, and Park Elementaries.	Earthquake	High	Ongoing	TBD	Nebo School District, BRIC grants	Nebo School District
Replace grass on sports fields with artificial turf in all 5 high schools	Drought	High	2 yrs.	1 mil/field	Nebo School District	Nebo School District
Replace or build Spanish Fork, Payson, and Springville high schools up to current building code	Earthquake	High	2024, 2025, and 2026	Tens of millions	Nebo School District	Nebo School District

Ensure high schools have the capability to serve as evacuation centers, including emergency power and water	All	High	Ongoing	A few thousand	Nebo	Nebo School District
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 fires and mudslides.	Flood	Mod	1-2 yrs.	Staff time	Local gov	Local gov

Orem

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	1,492	$404,918	2.43	4.42	0.00
Fire Risk High	597	$291,838	4.35	12.34	4.34
Fire Risk Moderate	254	$74,252	0.27	0.05	2.10
Flood 1% Yearly Probability	11	$2,781	1.12	0.72	0.00
Landslide	21	$8,331	0.09	3.16	0.00
Liquefaction Moderate to High	3,019	$1,046,381	17.25	11.47	17.97
Earthquake (Pre-1990 buildings)	15,720	$3,947,009	na	na	na

Statement of Vulnerabilities: Orem's most pressing hazard is the potential for wildland fire along the east bench with associated secondary hazards such as mudslides. Though the gun range fire in 2020 cost 4 million, it could have done much more damage had circumstances been different. An earthquake would cause widespread damage to Orem. Orem is considering rebuilding the City Center, which does not meet current seismic requirements, in addition to ongoing citizen education and yearly drills. There are also critical facilities on the East Bench fault lines that would be disrupted in an earthquake, such as the Salt Lake Aqueduct and Central Utah Water lines. Orem is working with Central Utah to relocate their pipes to a safer location.

Mitigation Action	Hazard	Priority	Timeline	Cost	Funding	Responsibility
Relocating CUWCD's 10' water pipes on the east bench to avoid fault lines	Earthquake	Mod		millions	CUWCD	CUWCD
Retrofit wastewater facilities on Carterville and Geneva to meet current building code	Flood	Mod	2-5 yrs.	4 million	Local gov	Local gov
Require geotechnical studies for new construction in the foothills and in the Southwest annexation area	Landslide, Liquefaction	Mod	Ongoing	Minimal	Developer	Developer
Citywide yearly emergency drill, CERT team, staff participation in Shakeout drill	Earthquake	High	Ongoing	Minimal	Local gov	Local gov
Rebuild City Center to withstand major earthquake	Earthquake	Mod	5-10 yrs.	23 million	Local Gov, grants	Local Gov
Encourage Fix-the-Bricks program serving Utah County	Earthquake	Mod	1-2 yrs.	TBD	BRIC grants	Utah State or Utah County
Firewise Education	Fire	High	Ongoing	Minimal	Local gov	Local gov/Fire Dept
Maintain fire break and remove vegetation along the east bench with a focus near the gun range	Fire	High	Ongoing	2-3k	Local gov	Local gov

Participate in County-led chipping program	Fire	Mod	1-2 yrs.	TBD	Local gov, Utah County	Local gov, Utah County
Exemplify good water use on city facilities during drought, i.e., xeriscaping, focus on trees and shrubs, watering turf grass at night	Drought	Mod	Ongoing	Minimal	Local gov	Local gov
Install water re-use facility for Sleepy Ridge golf course and Lakeside Sports Park	Drought	High	3 yrs.	5 million	Local gov	Local gov

2017 Strategy Update

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?
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
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Yes, ongoing
Landslide	Public education on correct watering practices and retaining measures in susceptible areas.	Med	1 year	TBD	Local Cash, Grants	Local Government, UGS	Yes, in Hillside Ordinance
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	Yes
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes, Ongoing

Wildfire	Promote FIREWISE landscaping to resident's living in vulnerable areas of the city	High	1 year	Minimal	Local Cash, Grants	Local Government	Yes, 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, efforts fell through

Payson

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	1,057	$178,637	1.65	0.61	0.00
Fire Risk High	1,199	$275,117	2.68	2.47	0.95
Fire Risk Moderate	1,339	$246,738	1.94	1.43	2.23
Flood 1% Yearly Probability	330	$83,145	0.79	0.02	0.48
Landslide	0	$0	0.00	0.09	0.00
Liquefaction Moderate to High	2,487	$560,660	15.44	7.54	8.51
Earthquake (Pre-1990 buildings)	2,694	$562,128	na	na	na

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. 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. Also concerning is a high-pressure gas line that crosses the fault.

Mitigation Action	Hazard	Priority	Timeline	Cost	Funding	Responsibility
Continue monthly preparedness meetings	All	Mod	Ongoing	Minimal	Local gov	Local gov
Promote the Utah Shakeout and share family preparedness booklet	Earthquake, All	Mod	Ongoing	1k	Local gov	Local gov
Support Fix-the-Bricks expanding to Utah County	Earthquake	Mod	4 yrs.	TBD	Grants	TBD
Upgrade Water Treatment Plant and oxidation ditch	Drought, all	High	by 2024	23 million	Local gov	Local gov
Hire more personnel for Fire Marshall	Fire, all	High	1-2 yrs.	80k	Local gov	Local gov
Protect water sources with regular channel cleaning, silt fence	Fire, Flood	High	Ongoing	10-15k	EWP/NRCS	NRCS, Local gov
Complete design phase for upsizing culverts in Dry Creek	Flood	Mod	2 yrs. design, 4 yrs. to construct	TBD	NRCS, Local gov	NRCS, Local gov
Culvert cleaning in high snowpack years	Flood	Mod	Ongoing	Volunteer hours	Local gov, Volunteers	Local gov
Tiered water rate program	Drought	High	1-2 yrs.	Staff time	Local gov	Local gov
Install pressure irrigation pond	Drought, Flood	Mod	5-10 yrs.	TBD	Local gov, grants	Local gov
Install water tank	Drought, Fire	Mod	3 yrs.	500k	Local gov	Local gov
Drill a new well	Drought	High	1 yr.	1.5 million	Local gov	Local gov
Install water metering	Drought	High	1 yr.	5.3 million	Local gov	Local gov

Any development in Wildland Urban Interface must have defensible space, clustered homes, etc.	Fire	High	Ongoing	Staff time	Local gov	Local gov
Highline Canal Retrofit	Earthquake	High	5-10 yrs.	150 million	Pipeline Company	Pipeline Company
Participate in County Chipping Program	Fire	High	Ongoing	30k	Local gov, Volunteers, State Fire program, Utah County	Local gov, Utah County
Participate in Utah County Emergency Notification System	All	Mod	Ongoing	6k	Local gov	Local gov, Utah County

2017 Strategy Update							
Hazard	**Action**	**Priority**	**Timeline**	**Cost**	**Potential Funding**	**Responsibility**	**Completed?**
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	High	1 year	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

Pleasant Grove

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**

Dam Failure	5,915	$1,504,596	6.36	0.70	2.59
Fire Risk High	637	$170,120	0.19	2.54	0.01
Fire Risk Moderate	1,185	$389,306	0.49	0.31	0.03
Flood 1% Yearly Probability	0	$0	0.00	0.00	0.00
Landslide	24	$7,557	0.00	1.00	0.00
Liquefaction Moderate to High	3,437	$1,026,021	6.04	0.92	2.86
Earthquake (Pre-1990 buildings)	3,902	$904,610	na	na	na

Statement of Vulnerabilities: Pleasant Grove's main concerns are fire and drought. An uptick of recreational activity in the foothills makes fires more likely and an increasing population requires new sources/better use of water. Pleasant Grove has a varied stock of homes and some older properties could use earthquake retrofitting. There is development pressure in formerly agricultural land toward the lake. Slope requirements prohibit much more development in the foothills.

Mitigation Strategy	Hazard	Priority	Timeline	Cost	Funding	Responsibility
Adopt new 2021 NFIP maps and update city code	Flood	Mod	1 yr.	Staff time	Local gov	Local Gov
Support bringing the Fix-the-Bricks program to Utah County	Earthquake	Mod	2 yrs.	Staff time	Local gov	Local gov
Install generator for well pump	All, earthquake	Mod	2-3 yrs.	300k	Local gov	Local gov
Require metering on all new development	Drought	Mod	Ongoing	None	Local gov, developers	Local gov, developers
Install water meter on all buildings	Drought	Mod	5-10 yrs.	millions	Local gov	Local gov
Update Stormwater Master Plan with Lindon	Flood	Mod	1 yr.	Staff time	Local gov	Lindon, Pleasant Grove cities

Implement chipping program	Fire	Mod	1-2 yrs.	8k	Local gov, Utah County	Pleasant Grove
Maintain fire access roads	Fire	Mod	Ongoing	10k	Local gov	PG Fire department, hillside property owners
Include firewise principles in WUI code	Fire	Mod	1-2 yrs.	Staff time	Local gov	Local gov
Construct new well	Drought	High	2 yrs.	4.5 million	Local gov	Local gov
Provide dumpsters for spring and fall yard waste	Fire	Mod	Ongoing	30k	Local gov	Local gov

2017 Strategy Update

Hazard	Action	Priority	Timeline	Cost	Potential Funding	Responsibility	Completed?
Earthquake	Study on vulnerabilities of Critical Facilities	High	3 years	$20,000	FEMA, Local Government	Local Government	No, mostly newer critical buildings
Fire	Install emergency generator to pump water for fire prevention.	High	5 years	1 million	FEMA, Local Government	Local Government	Not yet, limited resources
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	Upgraded Battle Creek, Grove Creek yet to come.
Drought	Public education on correct watering practices	High	Ongoing	Minimal	Local Government	Local Government	Yes
Earthquake	Promote earthquake awareness and preparation	High	Ongoing	Minimal	Local Government	Local Government	Yes
Landslide	Require geotechnical reports for proposed structures in landslide-prone areas, conform to Hillside ordinance	High	3 years	Minimal	Local Government	Local Government	Yes
Flooding	Update storm water master plans to reduce flooding in developing areas	High	3 years	Minimal	Local Government	Local Government	No, limited resources

Provo

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	16,883	$5,531,865	36.42	41.71	32.05
Fire Risk High	652	$364,479	0.94	29.04	0.20
Fire Risk Moderate	227	$76,906	0.60	4.20	0.69
Flood 1% Yearly Probability	48	$23,058	0.47	9.80	0.25
Landslide	290	$108,752	0.00	4.46	0.00
Liquefaction Moderate to High	19,338	$6,140,581	40.33	48.54	49.49
Earthquake (Pre-1990 buildings)	15,358	$4,386,424	na	na	na

Statement of Vulnerabilities: Regarding drought, Provo's water distribution division utilizes dozens of local springs to supplement wells, such as Provo Canyon springs supplying 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 those lines for access. Provo needs enhanced water storage capacity for long-term droughts. Provo's position between Utah Lake and the Wasatch Mountain range creates a challenge for large-scale evacuations, as does Provo River, the Union Pacific Rail Line, and Interstate 15. West of I-15, residents have limited routes for evacuation. There are 2 exits with underpasses and 3 other underpasses to the east side, all of which would bottleneck during a large evacuation. The Wasatch Fault is located on Provo's east bench. There are slow moving landslides occurring in neighborhoods that impact residents and infrastructure. These slides are being monitored by the Utah Geological Survey and there are considerations for planning. Provo Airport is a Part 139 FAA Certified airport. It is growing and will increase traffic and the need for emergency response. Vegetation between the airport and Utah Lake is difficult to manage.

Mitigation Strategy	Hazard	Priority	Timeline	Cost	Funding	Responsibility
Adopt a Conservation and Resilience section of the general plan that addresses emissions, wildland preservation and resiliency to disasters.	All, Climate Change	Mod	1 yr.		Local gov	Local gov
Complete design for and construct/rehab levees around the Provo River and Provo Airport	Flood	High	2-5 yrs.	50 million	Local Gov, BRIC and other grants	Local Gov, FEMA
Implement *Ready Set Go* program, including education on defensible space and a chipping program	Fire	High	Ongoing	50k	Local Gov	Local Gov
WUI Program? See Chris email	Fire					
Encourage a statewide Fix-the-Bricks program	Earthquake	High	1-2 yrs.	minimal	FEMA, Utah State	FEMA, Utah State Gov
Continue with Aquifer Storage and Recovery, including a water treatment plant and infiltration in Rock Canyon	Drought	High	1-2 yrs.	80 million	Local Gov, WIFIA, ARAP, BRIC, Water Smart program, Water Resources Board and Drinking Water Board State revolving loans	Local Gov
Deepen wells	Drought	High	1-2 yrs.	300k	Local Gov	Local Gov
Tree Trimming	Severe weather,	High	Ongoing	??	Provo Power	Provo Power

	wind, earthquake					
Provo Delta Restoration Project	Flood	Mod	3 yrs.	51 million	State of Utah, Western Area Power Administration, Central Utah Water Conservancy District, and federal appropriations.	CUWCD, US Dept of Interior, Utah Reclamation, Mitigation, and conservation commission, June Sucker Recovery Program
Hillside Management in Carterville, Grandview, and Slate Canyon areas	Fire	Mod	1yr	??	Local Gov	Local Gov
Participate in the Provo River Levee Analysis and Mapping Process (LAMP) to identify potential improvements to levee system	Flood	High	1 yr.	Staff time	Local Gov, Grants	Local Gov
Replace vulnerable areas of large diameter pipe	Flood/Dam Failure	High	Ongoing	CIP	Local Cash	Local Gov
Replace city buildings to meet seismic code	Earthquake	High	1 yr.	69 million	Local Cash, Grants	Local gov

2017 Strategies Update

Hazard	Action	Priority	Timeline	Cost	Potential Funds	Responsible Party	Completed?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes/recertify every 5 years

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	Yes
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?	Ongoing, almost complete
Flooding/ Dam Failure	Replace vulnerable areas of large diameter pipe.	High	5 years	CIP	Local Cash	Local Government	Ongoing
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	Yes
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.	Mediu m	1 year	TBD	Local Cash, Grants	Local Government, UGS	Yes, through new Hillside Ordinance
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	Yes, through new Hillside Ordinance
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	Yes
Flooding/ Dam Failure	Replace vulnerable areas of large diameter pipe.	High	5 years	Identifie d in CIP	Local	Local Government	Yes/Ongoing
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes, with CERT, Shakeout drill
Wildfire	Incorporate Ready Set Go landscaping requirements into local ordinances within areas at risk.	High	1 year	Minimal	Local Cash, Grants	Local Government	Yes
Wildfire	Restrict use of fireworks at highly vulnerable areas.	High	1 year	Minimal	Local Cash	Local Government	Yes
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	Yes, with new Hillside Ordinance

Drought	Promote water saving programs.	High	1 year	Minimal	Local Cash, Grants	Local Government	Yes

Salem

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	0	$0	0.00	0.00	0.00
Fire Risk High	188	$41,205	0.04	1.02	0.00
Fire Risk Moderate	990	$255,991	0.58	0.78	0.00
Flood 1% Yearly Probability	17	$3,452	0.02	0.00	0.00
Landslide	27	$7,392	0.00	0.00	0.00
Liquefaction Moderate to High	639	$167,356	2.61	2.06	0.00
Earthquake (Pre-1990 buildings)	886	$188,562	na	na	na

Statement of Vulnerabilities: Salem City has two canals that run through our city limits. We are concerned about breaches and the issues associated with that, especially post-earthquake flooding. We are keenly aware of the fire risk with resulting debris flow damage since the Bald Mountain fire. Many people are moving to and building in Salem. New homes are expected on the East side of town and we need codes that address hazards in the area and for developers to participate in mitigation projects such as water retention basins.

Mitigation Strategy	Hazard	Priority	Timeline	Cost	Funding	Responsibility

Pipe Salem Canal and build trail on top	Flood	High	1-3 yrs.	60 million	CUWCD, Local Gov, MAG, Salem Canal Irrigation Company, Division of Water Resources	CUWCD, Salem City, Salem Canal Company
Build detention basin coming out of Loafer Canyon	Flood, Debris Flow	High	3-4 yrs.	500k land, TBD construction	Salem, Elk Ridge, Woodland Hills, NRCS	Salem, Elk Ridge, Woodland Hills
Update codes and ordinances to guide development in hazard-prone areas	All	High	1-2 yrs.	Staff time	Local gov	Local gov
Build water retention basin at the base of Maple Canyon	Flood, Debris Flow	Mod	3-4 yrs.	TBD	Local gov, Developers	Local gov, Developers
Hire code enforcement officer	All	Mod	1 yr.	50k/yr.	Local gov	Local gov
Participate in Great Utah Shakeout and educate citizens on earthquake safety	Earthquake	Mod	Ongoing	Staff time	Local gov	Local gov
Green Waste dumpsters for Spring-Fall	Fire	Mod	Ongoing	5k	Local gov	Local gov
Incentives for water-use reduction such as Flip-the-Strip, Localscapes, Smart Meters, etc.	Drought	Mod	Ongoing	Unknown	CUWCD	CUWCD, Local gov
Build independent Public Safety Building	Earthquake, All	High	3-4 yrs.	TBD	Local gov	Local gov
Construct new water tanks as development occurs	Drought, Fire	Mod	5-10 yrs.	TBD	Local gov, Developers	Local gov, Developers

Pipe Highline Canal	Flood, Drought	Mod	10-15 yrs.	TBD	Local gov, Highline Canal Company, grants	Local gov, Highline Canal Company
Require any new water retention basins to be entirely xeriscaped	Drought, Flood	Mod	Ongoing	Minimal	Developers	Developers
Educate citizens on emergency preparedness through City Calendar printed and shared with all homes	All	Mod	Ongoing	A few thousand	Local gov	Local gov

2017 Strategy Update

Hazard	Action	Priority	Timeline	Cost	Potential Funding	Responsibility	Completed?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes
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	Ongoing
Earthquake	Inventory current critical facilities for seismic standards.	High	Ongoing	TBD	Local Cash, Grants	Local Government	In Progress, getting cost estimate for separate Public Safety building
Wildfire	Educate homeowners on FIREWISE practices.	Med	Ongoing	Minimal	Local Cash, Grants	Local Government	Yes, Ongoing
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Med	Ongoing	TBD	Local Cash, Grants	Local Government, UGS	Yes, Ongoing
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	Yes

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	Ongoing
Earthquake	Promote earthquake awareness and preparation.	High	Ongoing	TBD	Local Cash, Grants	Local Government	Yes
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	Med	Ongoing	Minimal	Local Cash, Grants	Local Government	In progress
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	Med	Ongoing	TBD	Local Cash, Grants	Local Government, UGS	In progress

Santaquin

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	1,718	$321,873	4.85	0.76	0.88
Fire Risk High	930	$208,811	1.85	4.62	1.16
Fire Risk Moderate	1,243	$257,246	2.27	2.25	1.08
Flood 1% Yearly Probability	0	$0	0.00	0.00	0.00
Landslide	57	$10,546	0.00	0.08	0.00
Liquefaction Moderate to High	0	$0	0.20	0.00	0.00
Earthquake (Pre-1990 buildings)	848	$143,262	na	na	na

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 has adopted hillside development standards to address future development in these areas. There is also a large quantity of hazardous materials that pass through Santaquin on the railroad and State Routes.

Mitigation Strategy	Hazard	Priority	Timeline	Cost	Funding	Responsibility
Work with Utah County and NRCS to rebuild Santaquin Debris Flow Basin	Flood	High	4 yrs.	20 million	NRCS, Utah County, Santaquin	NRCS, Utah County, Santaquin
Complete final design of 6 debris basins on the east bench currently threatening homes and a charter school	Debris flow, flood	Mod	3-5 yrs.	9.1 million	NRCS	NRCS, Santaquin responsible for land acquisition
Install backup generators for Public Safety/Admin building	All	High	2 yrs.	250k/generator	BRIC grants, Local gov	Local gov
Build new City Hall with Emergency Ops Center	All	High	2-4 yrs.	6 million	Local gov	Local gov
Perform seismic study of pre-1990 water tanks and drinking-water wells	Earthquake	Mod	2-4 yrs.	$25k	Local gov, BRIC grants	Local gov
Retrofit historic 1900s museum	Earthquake	Low	TBD	6 million	Local gov	Local gov
Conduct yearly chipping program	Fire	Mod	Ongoing	$15k	Utah County, Local gov, Forest Service	Utah County, Local gov, Forest Service
Review and adopt new IBC code for the WUI, including specification of WUI zones	Fire	High	1 yr.	Staff time	Local gov	Local gov
Fire Marshall must approve new development, including 1 hr. fire resistant construction, appropriate	Fire	High	Ongoing	Staff time	Local gov	Local Fire Dept

landscaping & defensible space, sprinklers, and 2 ingress/egress routes						
Allow and encourage xeriscaping	Drought	Mod	Ongoing	Staff time	Local gov	Local gov
Drill another drinking well	Drought	Mod	20 yrs.	$1.5 million	Local gov	Local gov
Construct a second fire station with a ladder truck	Fire	Mod	5-10 yrs.	$8 million	Local gov	Local gov
Educate homeowners on wildfire risk and home hardening by sharing literature	Fire	Mod	Ongoing	Minimal	Local gov	Local Fire Dept
Participate in the Shakeout Drill	Earthquake	Mod	Ongoing	Minimal	Local gov	Local gov
Continue to work with Summit Creek Management Group to construct runoff capture and recharge areas	Flood	High	Ongoing	$15k/yr.	Local gov & Developers	Local gov & Developers

2017 Strategies Update

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	No Special Flood Hazard Area
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	No, few critical facilities build pre-2000
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.	Med	1 year	TBD	Local Cash, Grants	Local Government, UGS	Yes, Ongoing

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	Yes, Ongoing
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 Special Flood Hazard Area
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, with Hillside Ordinance
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, with NRCS

Saratoga Springs

HAS THEIR OWN PLAN, INDEPENDENTLY CREATED AND ADOPTED

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	237	$47,094	0.12	1.19	0.00
Fire Risk High	4,797	$1,259,118	3.81	13.19	0.00
Fire Risk Moderate	937	$235,667	2.28	6.90	0.00
Flood 1% Yearly Probability	10	$1,195	0.05	1.06	0.00
Landslide	7	$1,521	0.00	0.03	0.00
Liquefaction Moderate to High	6,283	$1,633,749	19.98	7.81	0.00

Earthquake (Pre-1990 buildings)	127	$103,907	na	na	na

Statement of Vulnerabilities: Saratoga Springs' highest priority hazards are 1) Wildfire 2) Debris Flow and 3) Severe Storms. The recent Dump Fire and subsequent evacuations underscored the importance of fuel reduction and fire breaks to avoid large-scale evacuations on the few routes in and out of the city. There are several master-planned developments in progress throughout the city. These new developments will follow the most recent code and zoning requirements, making them relatively safe. The city works extensively to ensure adequate drainage and retention basins in new development.

Mitigation Strategy	Hazard	Priority	Timeline	Cost	Funding	Responsibility
Conduct fuel reduction projects on undeveloped lands adjacent to City boundaries, where such lands pose a wildfire hazard to the city. This will be done cooperatively with the BLM, DNR, and private land owners.	Fire	Mod	1-2 yrs.	100,000	BRIC, HMGP, FMA, DNR	Local gov
Construct fire breaks along or near certain boundaries of the city. This may be done in cooperation with trail development projects,	Fire	High	4 yrs.	300000		
Reduce fuels on undeveloped lands that are in close proximity to City owned infrastructure, such as wells and pump stations.	Fire	High	4 yrs.	100000	BRIC, HMGP, DNR	Local gov
Conduct public education programs, in cooperation with other agencies, such as BLM and DNR to promote fire safe practices on public lands.	Fire	Mod	Ongoing	TBD		
Perform a detailed hazard assessment of other potential debris flow areas	Debris Flow	High	1 yr.	100,000		

Implement other debris flow hazard mitigation projects, if warranted by the hazard assessment	Debris Flow	Mod	4 yrs.	1000000		
Consider further zoning restrictions as an alternative to debris flow mitigation projects	Debris Flow	Mod	2 yrs.	Minimal	Local gov	Local gov
Consider purchasing and installing additional emergency generators. These generators would serve critical facilities.	All, Flood	Mod	1-2 yrs.	400,000	PDN, HMGP	Local gov
Consider the installation of gravel drains at buried vaults, use of flexible piping (such as HDPE piping), SCDA upgrades, and earthquake-triggered shut-off valves around certain infrastructure	Earthquake, Flood	Mod	4 yrs.	Minimal	TBD	Local gov
Coordination of Water Savings Projects Occurs with Local and Regional Water Management Entities, including CUWCD and Local Canal Companies	Drought	Mod	Ongoing	Minimal	Local gov, CUWCD	Local gov
Installations of berms around low lying sewer lift stations or well pump houses	Flood	Mod	4 yrs.	500,000	BRIC, HMGP	Local gov
Construction of additional drainage culverts under transportation infrastructure	Flood	Mod	TBD	TBD	Local gov, UDOT	Local gov
As new culinary water storage tanks, pump stations, and well houses are built, the designs may integrate further seismic, fire, and flood protection into the buildings and equipment. • As new sources are developed, more stringent source protection plans can be integrated to protect against specific hazards identified in the multi-hazard mitigation plan for the specific source locations.	All, Flood	High	4 yrs.	TBD	Local gov, developers	Local gov

• As new transmission lines are designed and constructed (in high hazard areas) mitigation measures may be incorporated into the design. An example would be transmission lines that will be servicing areas (that have been identify as high risk for wildfire) could have additional fire protection and flow capacity, and fire hydrants placed more frequently than in low hazard areas.						
System improvements near undeveloped areas of the town and near areas identified as high risk for wildfire can have fire protection uses designed into the system, such as the utilization of green strips and defensible space. • Open channel ditches can be sized for flood control in high hazard flood areas.	Fire	Mod	4 yrs.	TBD	Local gov	Local gov
Sewer Systems: As lift stations, pump stations, and wastewater treatment plants are improved, additional seismic, fire, and flood protections may be integrated to help protect against unforeseen natural disasters. • As waste water systems are inspected and repairs are made in high-risk areas, such as areas identified to have the potential for liquefaction, seismic protection factors may be incorporated as identified by the plan.	All, liquefaction	Mod	5 yrs.	TBD	Local gov	Local gov
Storm Drains: Culverts in areas that are identified as debris flow basins can be sized appropriately to pass debris without clogging, or have protections	Debris flow, flood	Mod	6 yrs.	TBD	Local gov	Local gov

placed on them to prevent damage from debris flow. • Open channel storm drain channels can be sized to help channel flood flows in areas identified as high hazard for floods.						
Transportation: Culverts in areas that are identified as debris flow basins can be sized appropriately to pass debris without clogging, or have protections placed on them to prevent damage from debris flow. • Roads in areas identified as high hazard for wildfire can be designed and laid out as fire breaks.	Debris flow, flood, fire	Mod	7 yrs.	TBD	Local gov	Local gov
Berm construction at Lift Stations	Flood	Mod	4 yrs.	500,000	BRIC, HMGP	Saratoga Springs
Design and construction of seismic retrofit measures for existing facilities	Earthquake	Mod	2 yrs.	100,000	PDN, HMGP	Saratoga Springs
Retrofit design and construction of vulnerable below grade utilities	Earthquake, all	Mod	4 yrs.	1.5 mil	BRIC, HMGP	Saratoga Springs
Cooperation with other entities to construct canal lining or piping projects	Drought	Mod	4 yrs.	TBD	WS	Saratoga Springs

2017 Strategy Update

Hazard	Action	Priority	Timeline	Cost	Potential Funding	Responsibility	Completed?
Flooding	Promote NFIP participation	High	Ongoing	Minimal	Local cash, grants	Local Gov, FEMA, UDHS	Yes
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local cash, grants	Local gov	No, mostly new buildings

Wildfire	Educate homeowners on FIREWISE practices	High	Ongoing	Minimal	Local cash, grants	Local gov	Yes
Landslide	Public education on and correct watering practices and retaining measures in susceptible areas.	Medium	1 yr.	TBD	Local cash, grants	Local gov, UGS	Yes
Flooding	Update Flood and Inundation mapping and incorporate into general plans and ordinances	High	2 yrs.	TBD	Local cash, grants	Local gov, FEMA, UDHS	Partial: 1.5 of 3 detention basins built
Earthquake	Promote earthquake awareness and preparation	High	1 yr.	Minimal	Local cash, grants	Local gov, UGS, USGS	Partial: Info on website and social media, starting CERT
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk	High	1 yr.	Minimal	Local cash, grants	Local gov	Yes
Landslide	Coordinate and update landslide mapping within the area with UGS and USGS.	High	3 yrs.	Minimal	Local cash, grants	Local government, UGS, USGS	Partial: Some hillside stabilized through construction efforts

Spanish Fork

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	0	$0	0.00	0.00	0.00
Fire Risk High	503	$200,435	2.31	6.84	4.39
Fire Risk Moderate	1,304	$348,125	2.81	4.18	1.79
Flood 1% Yearly Probability	3	$380	0.00	0.09	0.01
Landslide	16	$3,669	0.00	0.33	0.00
Liquefaction Moderate to High	5,757	$1,490,565	25.55	26.03	9.25
Earthquake (Pre-1990 buildings)	3,585	$874,641	na	na	na

Statement of Vulnerabilities: We focus on homes surrounding Spanish Fork River. There is pressure to develop in the 100 yr. floodplain where agricultural land is abundant. Our main waterline runs below the Crab Creek Slide, which will eventually move onto the line itself. Many older homes are located in high-liquefaction areas.

Mitigation Strategy	Hazard	Priority	Timeline	Cost	Funding	Responsibility
Chipping Program	Fire	Moderate	3 years	10k	Local Gov, County	Local Gov, County
Identify properties for LeRay McAllister Critical Land Preservation	Flood	Moderate	Ongoing	Staff time	LeRay McAllister Critical Land Conservation Fund	Local Gov
Support Fix-the-Bricks	Earthquake	Moderate		0	FEMA	Utah County
Replace Library	Earthquake	High	1 yr.	TBD, several million	Local Gov	Local Gov
New Fire & EMS Station	All	High	2 yr.	Multiple millions	Tax raise	Local Gov
Stabilize at-risk sections of the riverbank	Flood	Mod	5 yrs.	250k	NRCS Grant, Local Gov	Utah County/Local Gov
Water metering and online portal to view water use	Drought	Mod	Ongoing	Millions	Local Gov	Local Gov
Free Smart Controllers for private landscaping	Drought	Mod	Ongoing	60/unit	Local Gov, CUWCD	Local Gov, CUWCD
Extensive river clearing in high-snowpack years	Flood	High	Ongoing	10-15k	Local Gov	Local Gov

2017 Strategy Update

Hazard	Action	Priority	Timeline	Cost	Potential Funding	Responsibility	Completed?
Flooding	Remove debris from riverine areas	High	Ongoing	Minimal	Local Government	Local Government	Yes
Fire	Yearly Inspections from Fire Marshall, FIREWISE education	High	Yearly	Minimal	Local Government	Local Government	Yes
HAZMAT	Fire dept. HAZMAT certified	High	1 Year	Minimal	Local Government	Local Government	Yes
Landslide	Public education on correct watering practices and retaining measures	Med	Ongoing	Minimal	Local Government	Local Government	Yes
Earthquake	Promote earthquake awareness and preparation through CERT, ShakeOut	Med	Ongoing	Minimal	Local Government	Local Government	Yes, ongoing
Landslide	Public education on correct watering practices and retaining measures	Med	Ongoing	Minimal	Local Government	Local Government	Yes
Flooding/ Dam Failure	Update Flood and Inundation mapping and incorporate them into general plans and ordinances.	Med	2 years	Minimal	Local Government	Local Government	Yes

Springville

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	3,506	$801,793	7.65	10.36	4.58
Fire Risk High	260	$90,150	0.72	4.26	2.25
Fire Risk Moderate	656	$192,114	0.95	4.77	2.85
Flood 1% Yearly Probability	147	$33,075	0.00	5.93	0.05
Landslide	120	$25,047	0.17	0.58	0.00
Liquefaction Moderate to High	5,757	$1,490,565	21.27	39.84	24.15
Earthquake (Pre-1990 buildings)	4,045	$1,013,790	na	na	na

With the promulgation of new FIRMs, 200+ homes now sit in the 100 yr. floodplain due to potential for flooding caused by 2 Union Pacific Railroad bridges. We are pursuing various grants to build levees and dikes to protect those homes. The entire west side of our town (west of 400 west) is designated as a high liquefaction potential area. This is a high growth area and all new buildings are required to submit a geotechnical study and mitigate individual properties with large-spread footings, elevating buildings, and prohibiting basements where necessary.

Mitigation Strategy	Hazard	Priority	Timeline	Cost	Funding	Responsibility
Protect 200+ homes in the newly-designated floodplain by building levees and dikes in the Spring Creek Area	Flood	High	4-5 yrs.	24 million	NRCS and BRIC grants, Local gov	Local Gov
Participate in the Utah Lake FIRM update	Flood	Mod	2-3 yrs.	Staff time	Local gov, FEMA	Local gov
Require development west of the freeway to elevate homes out of the floodplain and submit geotechnical studies	Flood, Liquefaction	High	Ongoing	Minimal	Developers	Local gov, Developers
Rebuild Springville High School to seismic standards	Earthquake	High	5 yrs.	30 million	Nebo School District bonding	Local gov
Train new Emergency Coordinator	All	High	1 yr.	Staff time	Local gov	Local gov
Outfit more staff with short-wave radios	Earthquake	Mod	1-2 yrs.	??	Grants	Local gov
Educate developers and remodelers on low-cost seismic retrofits	Earthquake	Mod	1 yr.	Staff time	Local gov	Local gov
Educate residents on good watering practices and how to conserve during a drought	Drought	High	Ongoing	Minimal	Local gov	Local gov

Educate residents on wildfire mitigation, such as defensible space and proper roof materials	Fire	High	Ongoing	Minimal	Local gov	Local gov
Participate in the yearly Shakeout drill	Earthquake	Mod	Ongoing	Minimal	Local gov	Local gov
Retrofit 60" water pipe coming from Strawberry Reservoir	Earthquake	Mod	??	??	CUWCD, BRIC	CUWCD
Support bringing the Fix-the-Bricks program to Utah County	Earthquake	Mod	2-5 yrs.	Unknown	BRIC grants	Utah State or Utah County
Add joints to 24" penstock that brings water from Hobble Creek where it crosses the fault	Earthquake	Mod	5-10 yrs.	TBD	CUWCD	CUWCD

2017 Strategies Update

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?
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
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.	Medium	2 years	TBD	Local Cash, Grants	Local Government, UGS	Yes, ongoing

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	Yes
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes, Shakeout
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	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

Vineyard

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	0	$0	0.29	2.89	0.00
Fire Risk High	303	$110,191	1.45	3.06	2.02
Fire Risk Moderate	184	$49,068	0.83	2.46	1.10
Flood 1% Yearly Probability	0	$0	0.00	0.00	0.00
Landslide	0	$0	0.00	0.00	0.00
Liquefaction Moderate to High	2,418	$789,322	4.67	9.18	9.98
Earthquake (Pre-1990 buildings)	125	$123,886	na	na	na

Statement of Vulnerabilities: Although 90%+ of buildings were constructed after 2000, liquefaction would affect most of the town, potentially destabilizing the four sections of road that traverse the railroad and making evacuation difficult for residents on the developing west side of town. Critical infrastructure is built on piers that extend down to the bedrock, but homes depend on each builder's geotechnical survey. Previously fire-prone areas have been developed and no homes are located in the floodplain. Vineyard is home to many young families, first-time home buyers, and out-of-state landlords who are less familiar with the area or involved with town issues. Awareness and education, especially of evacuation plans, will need to be continuous.

Mitigation Strategy	Hazard	Priority	Timeline	Cost	Funding	Responsibility
Install grinders in 3 sewer lift stations	Flood	High	3-5 yrs.	150k	NFIP, Local Gov	Local Gov
Develop evacuation plan and share with the public	All	High	1 yr.	Staff time	Local Gov	Local Gov
Bolster fund for replacement and updates of infrastructure via utility bill and impact fees	All	High	1 yr.	Staff time	Local Gov	Local Gov
Seismically retrofit Vineyard Connector bridge	Earthquake	Mod	2-5 yrs.	200k	UDOT, Local Gov, BRIC grant	UDOT, Local Gov
Require geotechnical studies for large buildings and frontrunner station	Earthquake	High	Ongoing	$2,000/lot	Developers, Local Gov	Developers, Local Gov
Construct a 6-million-gallon water tank with pump station and future expansion	Drought	High	2 yrs.	5 million	Local Gov	Local Gov

2017 Strategy Update

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?
Earthquake	Build overpasses to be usable after earthquake. Overpasses	High	5-10 years	$10 million	Local Government, FEMA grants, MAG	Local Government, MAG	Partly, new Center St

	are the main access across railroad.						overpass is earthquake safe
Earthquake	Develop evacuation plan	High	1-3 years	$50,000	Local Government	Local Government	Yes
All Hazards	Share disaster planning via city Social Media platforms	Med	Ongoing	Minimal	Local Government	Local Government	No, messaging for liquefaction is unusual
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	No, but should happen next year
All Hazards	Interactive parcel map including hazard information	Med	1 year	Minimal	Local Government	Local Government	No, doesn't make sense for liquefaction, geotechnical study already required
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	Partly
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	Ongoing, city center buildings are new or not yet built
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	Yes
Earthquake	Develop evacuation plan	High	1-3 years	$50,000	Local Government	Local Government	Yes
All Hazards	Share disaster planning via city Social Media platforms	Med	Ongoing	Minimal	Local Government	Local Government	No

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	No, should happen within a year
All Hazards	Interactive parcel map including hazard information	Med	1 year	Minimal	Local Government	Local Government	Not practical

Woodland Hills

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	0	$0	0.00	0.00	0.00
Fire Risk High	398	$147,917	0.00	0.00	0.00
Fire Risk Moderate	11	$5,431	0.00	0.00	0.00
Flood 1% Yearly Probability	0	$0	0.00	0.00	0.00
Landslide	3	$869	0.00	0.00	0.00
Liquefaction Moderate to High	0	$0	0.00	0.00	0.00
Earthquake (Pre-1990 buildings)	81	$21,256	na	na	na

Statement of Vulnerabilities: Woodland Hills' chief concern is managing wildfire and having enough funding to upkeep current infrastructure. There are many homes in the WUI and limited roads for getting in and out of town. Evacuations in a recent nearby fire brought this reality to a point. Woodland Hills works with Utah County and others to educate homeowners, manage fuels, and plan response. If the city had more money, it would bury powerlines, bring water lines up code, and purchase a firetruck. Lack of local sales tax and a desire to keep property taxes low means there is a limited budget devoted to maintenance. There is some development pressure in the hills and more in the canyon above Woodland Hills. Large lot requirements and wastewater requirements limit how much can be built.

Mitigation Strategy	Hazard	Priority	Timeline	Cost	Funding	Responsibility
Chipping program in Wildland Urban Interface	Fire	High	Ongoing	50k/volunteer labor	Local gov, citizens, Utah County	Local gov, Utah County
New Firetruck	Fire	Mod	2-3 yrs.	500k	Local gov	Local gov
Fire Chief must sign off on all plans in WUI, including requirements for fire hydrant proximity, defensible space, and building materials	Fire	High	Ongoing	Staff time	Local gov	Local gov
Construct avalanche basin above main water tank to reroute and protect tank and downhill homes	Avalanche	Mod	3-5 yrs.	3 million	Local gov, BRIC and other grants	Local gov
Geotechnical study required for all new development in hazard areas	All	High	Ongoing	Staff time	Developers	Developers, Local gov
Replace 30% of water lines, bringing up to current seismic standards	Fire, Flood, Drought	High	5 yrs.	3.2 million	Local bond	Local gov
Participate in Utah Shakeout	Earthquake	Mod	Yearly	Minimal	Local gov	Local gov
Week-long Fire Expo to educate residents on fire safety	Fire	High	Yearly	Minimal	Local gov	Local gov, Utah County
Create dipping ponds for helicopters to use in fire suppression	Fire	Mod	2-3 yrs.	TBD	Local gov, Utah County, grants	Local gov, Utah County
Bury power lines, especially those that may cause fires	All	Mod	Ongoing	$700k/mile	Local gov, developers	Local gov
Create Watershed Operations Program	Flood, Drought, Fire	Mod	2-5 yrs.	TBD	Local gov	Local gov

2017 Strategy Update

Hazard	Action	Priority	Timeline	Cost	Potential Funding	Responsibility	Completed?
Earthquake	Inventory current critical facilities for seismic standards.	High	3 years	TBD	Local Cash, Grants	Local Government	Partly, water lines being replaced.
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.	Med	1 year	TBD	Local Cash, Grants	Local Government, UGS	Yes
Earthquake	Promote earthquake awareness and preparation.	High	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Somewhat
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 efforts fell through

Contacts

See Part III: Process for a complete accounting of participation

Position	Name	Phone	Email	Small Meeting	Group Meeting
Alpine	Shane Sorensen	801-420-2962	ssorensen@alpinecity.org	6/17/2021	Yes
American Fork Engineer	Scott Sensanbaugher	801-763-3060	ssensanbaugher@afcity.net	6/14/2021	Yes
American Fork Public Works/Engineer	Ben Hunter	801.854.5930	bhunter@afcity.net	6/14/2021	
Cedar Hills City Council	Mike Geddes		mgeddes@cedarhills.org		
Cedar Hills City Manager	Chandler Goodwin		cgoodwin@cedarhills.org	6/14/2021	
Cedar Hills Emergency Manager	Laurie Petersen	801-785-9668 x104	lpetersen@cedarhills.org		
Cedar Hills/AF Fire	Aaron Brems	801-763-3045	abrems@americanfork.gov	6/14/2021	
Eagle Mountain	Greg Stone		gstone@emcity.org	6/22/2021	Yes
Eagle Mountain Engineer	Chris Trusty		ctrusty@emcity.org		Yes
Eagle Mountain Fire Chief	Embret Fossum		efossum@UFA-SLCO.org	6/22/2021	

Eagle Mountain Planning	Tayler Jensen	(801) 789-6615	tjensen@emcity.org		
Eagle Mountain Primary	Jeff Weber		JWeber@emcity.org	6/22/2021	Yes
Elk Ridge City Manager	Royce		royce@elkridgecity.org	7/8/2021	
Elk Ridge Fire Chief Primary	Seth Waite		firechief@elkridgecity.org		
Elk Ridge Public Works Director	David Gene	801.423.2300	davidj@elkridgecity.org		
Fairfield	Chianne Barnson	435-231-4027	chybarnson_fairfieldtown@yahoo.com		
Fairfield Mayor	Brad Gurney	801-874-8386	mayor@fairfieldtown.org	12/17/2020	
Genola	Chris Steele	801-754-5300	gcpw@rfburst.com		
Genola Planning & Zoning			genolapz@gmail.com		
Genola Town Clerk	Lucinda Daily	801.754.5300	Genolaclerk@gmail.com	7/29/2021	Yes
Goshen	Steven Staheli		goshentown@gmail.com	6/9/2021	
Highland Finance Director	Tyler Bahr			6/17/2021	
Highland Mayor	Rod Mann				Yes
Highland Planning	Nathan Crane	801-756-5751x3	ncrane@highlandcity.org	6/17/2021	
Highland Planning	Joann		joann@highlandcity.org		
Highland Planning	Erin Wells	801-772-4566	erin@highlandcity.org		
Lehi City Council	Paige Albrecht				Yes
Lehi Emergency Management	Scott DaBell		sdabell@lehi-ut.gov	7/7/2021	Yes

Committee director					
Lehi Emergency Management Committee director	Scott Sampson	385-201-2268	ssampson@lehi-ut.gov	7/7/2021	Yes
Lehi Engineering	Ross Dinsdale		rdinsdale@lehi-ut.gov	7/7/2021	
Lehi Environmental Sustainability	Todd Munger		tmenger@lehi-ut.gov		Yes
Lehi Planning	Kim Struthers	385-201-2521	kstruthers@lehi-ut.gov	7/7/2021	Yes
Lehi Planning	Mike West			7/7/2021	Yes
Lehi Planning				7/26/2021	
Lindon Administration (secondary)	Adam Cowie	801-785-5043	acowie@lindoncity.org	6/15/2021	Yes
Lindon Emergency Manager (primary)	Kelly Johnson		kjohnson@lindoncity.org	6/15/2021	Yes
Mapleton Planner	Brian Tucker	801-806-9108	btucker@mapleton.org	6/30/2021	Yes
Mapleton Public Works	Steven Lord	(801) 489-6253	slord@mapleton.org	6/30/2021	
Mapleton Ready	Derek Haynie	(801) 491-1111	derek@mapletonready.org		
Mayor Cedar Fort	David Gustin	801.768.2147	mayor@cedarfort.town	12/17/2020	
Orem Emergency Manager	Heath Stevenson	801-229-7146	hmstevenson@orem.org	6/22/2021	Yes
Orem Engineer	Sam Kelly	801-229-7328	srkelly@orem.org	6/22/2021	
Payson	Jill Spencer	801-465-5233	jills@payson.org	6/14/2021	Yes
Payson	Travis Jockumsen		travisj@payson.org	6/14/2021	Yes

Payson Facilities Manager	Shane Spencer	801.404.6473		6/14/2021	
Payson Fire Marshall	Scott Spencer	801-465-5252	scotts@payson.org	6/14/2021	
Pleasant Grove Community Development	Daniel Cardenas		dcardenas@pgcity.org		
Pleasant Grove Engineering	Marty Beaumont	801-785-2941	mbeaumont@pgcity.org		Yes
Pleasant Grove Engineering	Aaron Wilson		awilson@pgcity.org	6/15/2021	Yes
Pleasant Grove Fire Chief	Andrew Engermann		aEngemann@pgcity.org		
Provo	Melissa McNalley		MMcNalley@provo.utah.gov	6/10/2021	
Provo Airport	Donavon Cheff				Yes
Provo EM	Chris Blinzinger	801-404-6368	cblinzinger@provo.org	6/10/2021	Yes
Provo Planner	Robert Mills	801-852-6407	rmills@provo.org	6/10/2021	Yes
Provo Stormwater Engineer	Jared Penrod		jpenrod@provo.org	6/10/2021	Yes
Salem	Bruce Ward		brucew@salemcity.org		
Salem	Greg Gurney		ggurney@salemcity.org		Yes
Santaquin	Jason Bond	801-754-1011 ex 223	jbond@santaquin.org	7/26/2021	Yes
Santaquin	Jon Lundell				Yes
Santaquin EM	Chris Lindquist	(801)754-1940	clindquist@santaquin.org	7/26/2021	Yes
Santaquin Engineer	Jason Lidet			7/26/2021	

Santaquin Engineer	Norm Beagley			7/26/2021	Yes
Santaquin Fire Chief	Ryan Lind	(801)754-1940		7/26/2021	
Saratoga Fire	Spencer Kyle	801-766-9793	skyle@saratogaspringscity.com		
Saratoga Planning	David Stroud	801.766.9793x4	dstroud@saratogaspringscity.com		
Saratoga Springs Engineer		801-766-9793x5			
Spanish Fork	Jered Johnson	801-804-4575	jjohnson@spanishfork.org		
Spanish Fork	Travis Warren			6/9/2021	Yes
Spanish Fork Economic Development	Dave Anderson	801-804-4586	danderson@spanishfork.org	6/9/2021	Yes
Spanish Fork Emergency Manager	Trevor Sperry	801.804.4768	tsperry@spanishfork.org	6/9/2021	
Spanish Fork Floodplain Engineer	John Little		jlittle@spanishfork.org		
Spanish Fork Public Works	Chris Thompson	801-804-4556	cthompson@spanishfork.org		
Spanish Fork Public Works	Marlo		msmith@spanishfork.org	6/9/2021	
Springville EM	JoAnna Larsen	801-635-5776	em@springville.org		Yes
Springville emergency prep mtgs			EM@springville.org		

Springville Engineer	Jeff Anderson	801-491-2719	janderson@springville.org	6/30/2021	
Springville Head Building Official-secondary	Jason Van Ausdal	801-491-7832	JVanausdal@springville.org		
Springville Planner	Laura Thompson		lthompson@springville.org		
Vineyard	George Reid		Georger@vineyardutah.org	6/7/2021	Yes
Vineyard Engineer	Nassim			6/7/2021	Yes
Vineyard Planner	Morgan Brimm	385-248-7029	morganb@vineyardutah.org		
Vineyard Planner	Briam Perez	385-329-1730	briamp@vineyardutah.org	6/7/2021	
Vineyard Public Works	McDermott, Kinsli	801-226-1929	kinslim@vineyardutah.org		
Woodland Hills	Corbett Stephens	801-857-0788	works@woodlandhills-ut.gov	7/8/2021	
Woodland Hills	Jodie Stones	801-423-1962	recorder@woodlandhills-ut.gov		
Woodland Hills	Greg Northup		fire@woodlandhills-ut.gov		
Others					
WUI Coordinator	Dax Reid	801-678-1655	daxreid@utah.gov	6/30/2021	Yes
Utah County Fire Warden FFSL	Josh Berg	385-254-8010	jberg@utah.gov	6/30/2021	
County Commissioner	Bill Lee		WilliamL@utahcounty.gov		
	Thomas SAKIEVICH		Thomas@utahcounty.gov		
			AmeliaP@utahcounty.gov		
Health Dept Emergency	Ryan Strabel	801.851.7525	ryanst@utahcounty.gov	6/30/2021	

Response Coordinator					
BOR	Dale		dthamilton@usbr.gov		
Central Utah Water Conservancy District	Mike Whimpey		mwhimpey@cuwcd.com		
CUWCD	Blake Buehler	801.226.7133	blake@cuwcd.com	12/8/2021	
CUWCD	Chris Elison			12/8/2021	
CUWCD	Cort Lambson			12/8/2021	
CUWCD	KC Shaw			12/8/2021	
Alpine School District	Frank Pulley		frankpulleyjr@alpinedistrict.org		
Alpine School District	Kimberly Bird		kbird@alpinedistrict.org		
Alpine School District	Mike Browning		mbrowning@alpinedistrict.org		
Nebo Risk Management	Kathy Carling	801-354-7474	kathy.carling@nebo.edu	7/20/2021	
Utah Co. Emergency Manager	Peter Quittner	801-404-6050	peterq@utahcounty.gov	6/30/2021	
Utah County Emergency management	Allison Jester/Janeen Olson		AllisonJ@utahcounty.gov	6/30/2021	
Provo Airport	Heather	8018526715	hrollins@provo.org		

Utah County Emergency Management			ryanst@utahcounty.gov		
Utah County Temporary employees	Emily, Lindsey, James			6/30/2021	
Provo School District Facilities Director	Mark Wheeler	801-374-4923			
MAG's TAC				Presented 7/26/2021	
Utah County Emergency Manager Monthly Meeting				Presented 10/26/2021	

Part 7 Wasatch County Profiles and Mitigation

Background

Area: 1,191 square miles; *county seat*: Heber City; *origin of county name*: from the Wasatch Mountains

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.

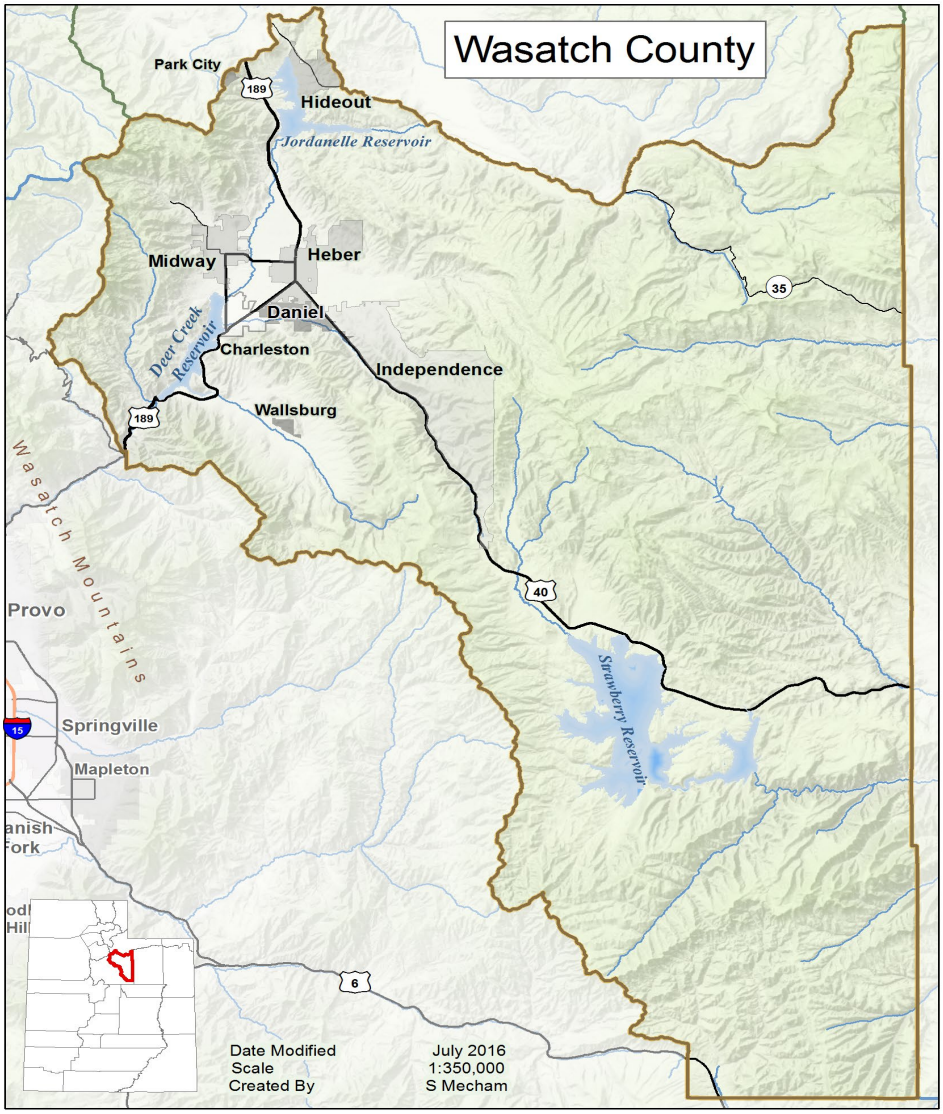
The county is divided into two watersheds--the Colorado and the Great Basin drainage systems. Because of its annual precipitation and its location between the Uinta and Wasatch mountains, Heber Valley has sufficient water. Flowing from the east are Daniels, Lake, and Center creeks. From the north and 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)

Economy

Wasatch County, though still largely rural in nature, has seen its economy grow, particularly as a destination for recreation. Heber City and Midway, the two largest cities in the county, have both seen a number of new developments add vitality and tax base to their communities.

Population

The following table shows historic and future projections for population:

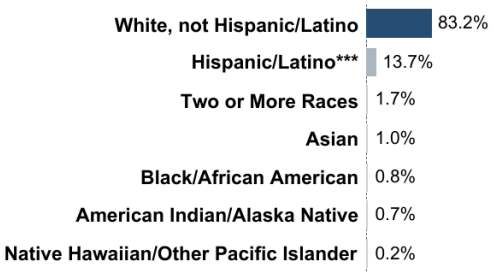
	2020 Census	2030	2040	2050
MAG Total	712,471	960,578	1,197,730	1,429,516
Summit County	42,145	50,558	57,983	63,097
Utah County	636,235	861,852	1,080,082	1,297,515
Wasatch County	34,091	48,168	59,665	68,904

Select Area Wasatch County

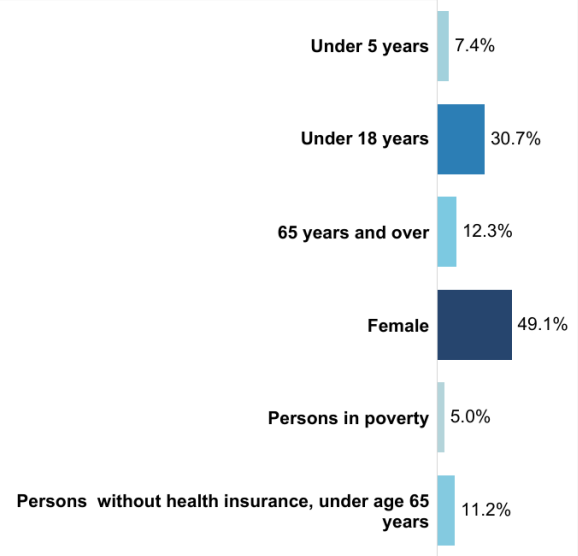
Demographics Wasatch County

In Wasatch County, about a third of residents are children under the age of 18, with 10% of the population over the age of 64. The average travel time to work is 24 minutes as many residents commuting to surrounding counties for jobs.

2019 Race and Ethnicity



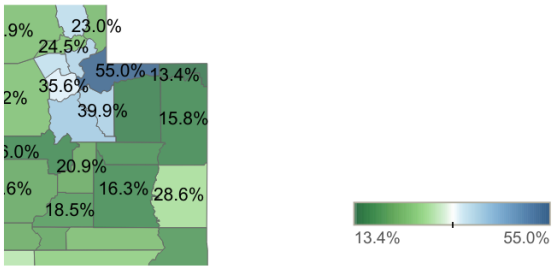
Population Shares, 2015-2019



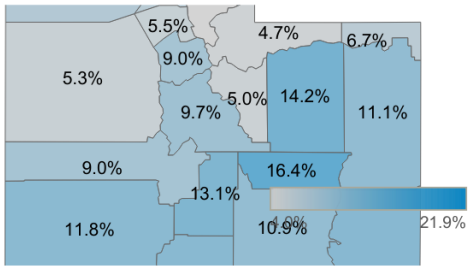
Other Facts

Households, 2015-2019	9,879
Housing units, July 1, 2019	14,322
Median value of owner-occupied housing units, 2015-2019	419,900
Persons per household, 2015-2019	3
Mean travel time to work (minutes), workers age 16 years+, 2015-2019	24
Veterans, 2015-2019	1,019
Veteran-owned firms, 2012	233
Women-owned firms, 2012	940

Bachelor's Degree or Higher, 2015-2019*



Persons Below Poverty, 2019



Updated 7/13/2021 8:10:38 PM

* Population 25 years and older. ** Population 5 years and older. *** Hispanics/Latinos may be of any race; also included in applicable race category. ****Civilian Population 16 years and older.

Source: U.S. Census Bureau. For more information: http://www.census.gov

Hazards Compared

Hazard Matrix

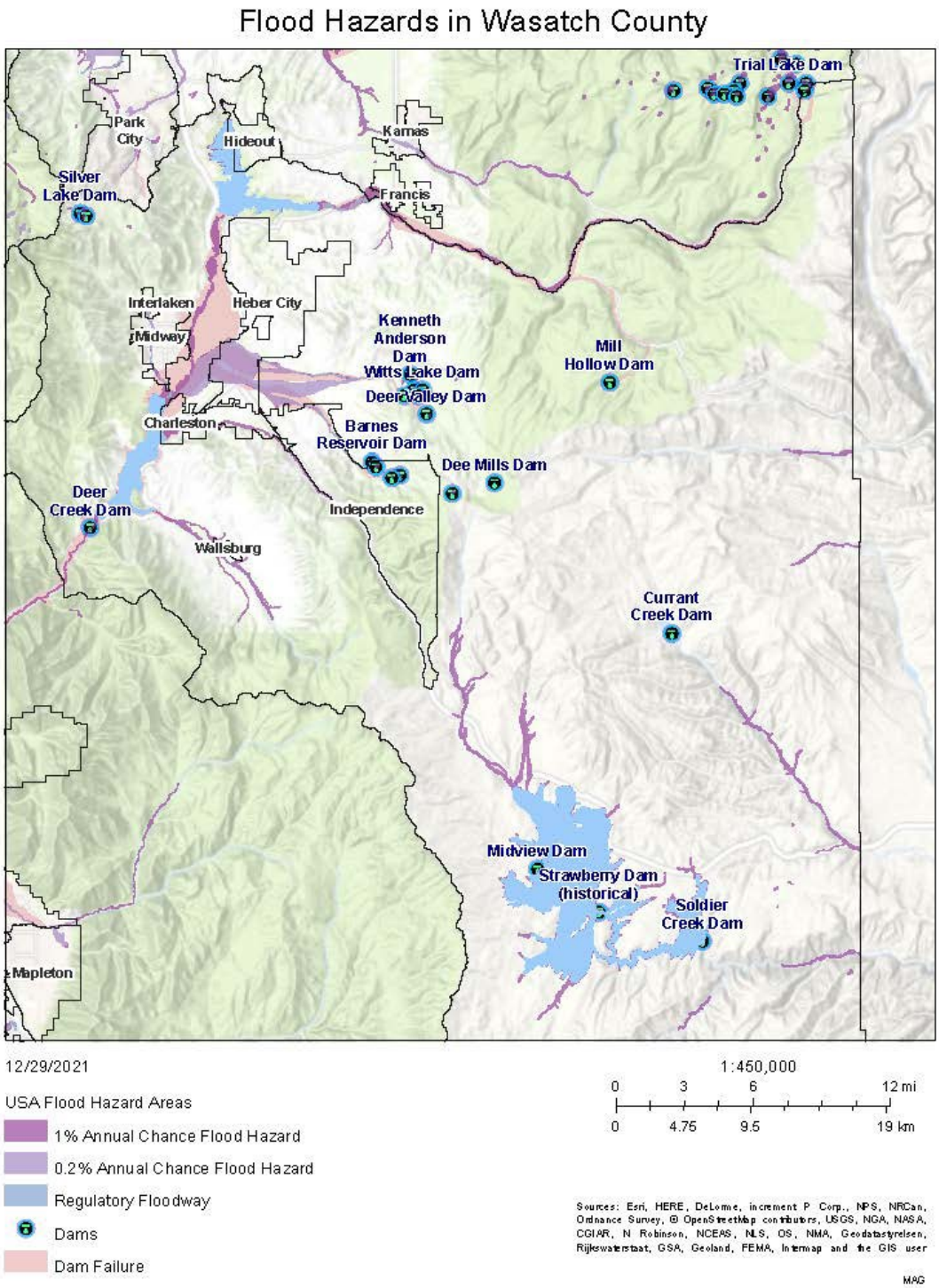
Probability	Negligible	Limited	Critical	Catastrophic
Highly Likely	Hail	Winter Weather, Avalanche		
Likely		Drought, Lightning, Wind		
Possible		Flood, Landslide		
Unlikely		Tornado	Earthquake, Dam Failure	

Severity

Hazard	Years in Record	Yearly Probability	Deaths Annualized	Injuries Annualized	$ Losses Annualized	Source
Avalanche	23	161	1.8	0.7	$2,800	NOAA
Drought, Moderate	2018	10	NA	NA	NA	National Integrated Drought Information System
Earthquake	50	1	NA	NA	$548,000	HAZUS Salt Lake City 7.0 Scenario
Floods	24	25	0	0	$2,080	NOAA/SHELDUS
Hail	24	38	0	0	$274	NOAA/SHELDUS
Landslides	51	6	0	0	$735,211	SHELDUS
Lightning	24	13	0.04	0	$600	NOAA
Wildfires	6	300			$1,163,000	FFSL and BLM with cost of fighting fire
Wind	24	83	0	0.1	$9,200	NOAA (High Wind, Strong Wind and Thunderstorm Wind)

Winter Weather	24	158	0.44	2.16	$41,654	NOAA (Blizzards/ Heavy Snow/Winter Storm/Winter Weather)
Tornadoes	70	1	0	0	$0	NOAA
Air Quality is unhealthy	4	25				PurpleAir monitor, unhealthy for sensitive groups
*Probability: Total events/Years in record						

Flooding/Dam Failure



Overview

Although Utah is considered a dry desert state, flooding does occur. Most floods have occurred either from snow melt or severe thunderstorms. Oftentimes 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 to ensure that it is in compliance with NFIP guidelines.

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

Jurisdiction	Floodplain	Map Date	Floodplain Admin

Charleston	Participating in NFIP See https://charlestontown.utah.gov/charleston-land-use-ordinances/ for flood-related ordinances	2012	Mayor Kozlowski
Hideout	Not participating in NFIP, doesn't have any 100-yr floodplain within city limits. Town Code does require building outside of 100-yr floodplains and floodways, open space requirements, and grading/drainage plans. See https://hideoututah.gov/wp-content/uploads/2018/07/Title-11-Zoning-Regulations.pdf for more information		Mayor Rubin and Jan McCosh, Town Administrator
Midway City	Participating in NFIP, has a Flood Damage Prevention Ordinance as well as Midway City Floodplain Overlay zones and a Sensitive Lands Overlay Zone that provides additional protection for streambeds and other flood-prone areas (Chapter 16.14) Any residential construction within 50 feet of a delineated flood zone shall have the lowest floor elevated 18 inches above the base flood elevation as shown on the FIRM and no construction is allowed within 50 feet of a floodplain in large-scale subdivisions.	2012	Michael Henke, City Planning Administrator
Independence	Not participating in NFIP. Independence has 1 building in the 100-yr floodplain.		n/a
Interlaken Town	No Special Flood Hazard Area		n/a
Wallsburg	NOT participating in NFIP, has 4+ buildings in the floodplain as of 2012. City code acknowledges FEMA's Flood Insurance Study for Wallsburg and prohibits building in the floodway. Wallsburg also has a Floodway Corridor map and requires a permit for building on Sensitive Lands, within 20 feet of a riparian area, or on any land with historic flooding. See https://wallsburg.org/wp-content/uploads/2017/10/Wallsburg-Code-Chap5.pdf for specifics.	2012	n/a
Heber City	Participating in NFIP, has a Flood Damage Prevention Ordinance as well as a Sensitive Lands Ordinance 17.34.010 Sensitive Lands	2012	Russel Funk, City Engineer

	Development Prohibited. New subdivisions and new development shall avoid the following areas: Natural slopes over thirty percent (30%) grade; each lot must have a contiguous building area that is a minimum of five thousand (5,000) square feet at or below thirty percent (30%) natural grade; Avalanche tracks; Fault lines, scarps, landslides, rock-fall and mudflow areas; and Stream beds, canals, ditches, flood channels, areas of springs, seeps and surface water. Development Discouraged. The following hazard areas should be avoided by new subdivisions and new development and developer shall provide mitigation for such hazards when they apply. The city may require a notice of such hazard and required mitigation to future property owners in a development agreement, subdivision plat or other device. Alluvial-fan-flood debris flow, collapsible soils, and shrink-swell soils. Mitigation techniques shall follow the advisement of a qualified Geotechnical Engineer. Shallow ground-water. Mitigation techniques should include the installation of a foundation drain and sump pump, prohibition of basements, or the advisement of a qualified Geotechnical Engineer. 100-year flood zones. Mitigation techniques shall follow the procedures of Chapter 18.109 Flood Damage Prevention Ordinance. Culinary Water Source Protection. Mitigation techniques shall follow the advisement of the source delineation report, current engineering practice, and/or applicable state statutes.		
Daniel	Participating in NFIP and has a Flood Damage Prevention Ordinance specifying the duties of the floodplain administrator, permit procedures, general standards, subdivision standards, etc. See http://danielutah.org/code-and-ordinances/	2012	Ryan Taylor, Town Engineer
Wasatch County	Participating in NFIP, has a Flood Damage Prevention section in its code covering Administration responsibilities, permits, standards for buildings and subdivisions, variances, flood prevention, etc.	2012	Doug Smith

Assessing Vulnerability: Addressing Repetitive Loss Properties

There are no repetitive loss properties in Wasatch County (FEMA, 2021).

History

Significant Flooding Events

Location/Extent	*Date*	*Fatalities*	*Damages*	*Source*	*Details*
Strawberry, upper Price, upper San Rafael, 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	1		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. Little Deer Creek Dam failed due to extensive foundation seepage.

Lower Duchesne and Jordan Rivers and tributaries (including Spanish Fork) ...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.
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
Wallsburg	8/22/2018	0	0	NOAA	Heavy rain caused a large debris flow over the Dollar Ridge Fire burn scar. The nearby Strawberry River saw a peak flow of 2000 cfs.

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

Dams

Although Wasatch County has had only one lethal dam failure event in 1963, it does have some high-risk

dams. Each has its own Emergency Action Plan and is inspected regularly. See waterrights.utah.gov DamView for more information.

Name	Miles to first downstream town	Town name
Center Creek No 1	8	Center Creek
Center Creek No 2	11	Center Creek
Center Creek No 3	5	Center Creek
Deer Valley	10	Heber City
Dutch Canyon Dam	0	Midway
Jones	9	Heber City
Lindsay Lower	8	Heber City
Mill Hollow	15	Woodland
Wasatch County Lake Creek Debris Basin	4	Heber City
Witt Lake	8	Heber City

Mitigation

Strategies include:

Incorporate flood mitigation into local planning by developing a floodplain management plan, mitigating hazards during planning, establishing a “green infrastructure” program to link greenways, and obtaining easements for water retention and drainage

Form partnerships to support floodplain management such as a regional watershed council or citizen committee to discuss issues and recommend projects.

Limit or restrict development in floodplain areas by providing incentives to develop elsewhere, protecting buffers around water resources, limiting impervious surfaced within developed parcels, or prohibiting development in the floodplain.

Adopt and enforce building codes and development standards such as the International Building Code and increasing “freeboard” requirements aka the number feet above base flood elevation that new building must have.

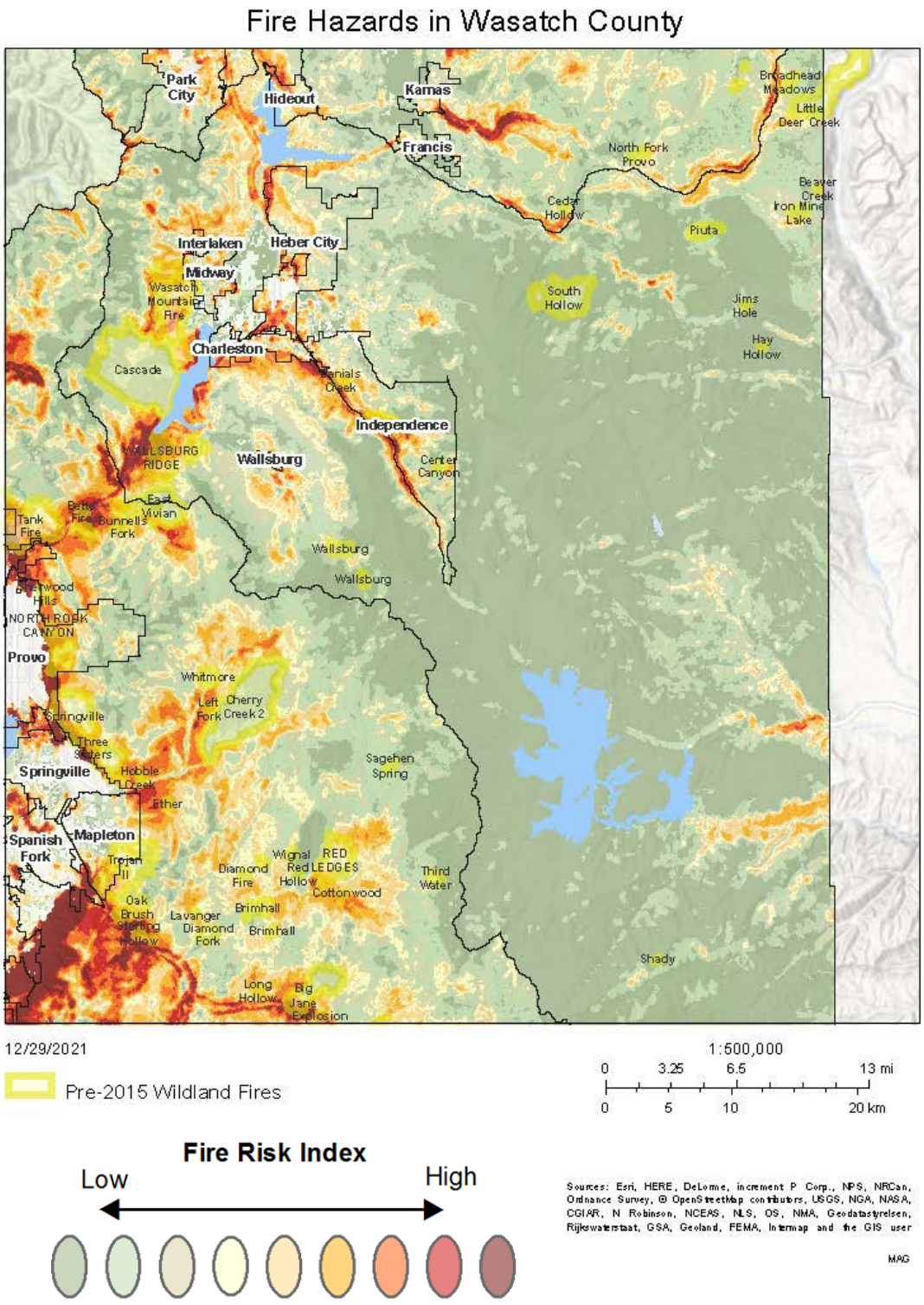
Improve stormwater management planning by completing stormwater drainage studies and master plans, regulating development in upland areas to reduce runoff, and encouraging low impact development techniques.

Adopt policies to reduce runoff such as more trees, on-site retention for stormwater and firefighting, and encouraging porous pavement and vegetation in parking areas.

Use natural systems such as preserving wetlands and riverbanks, restoring vegetation, acquire open space in targeted areas, and offer density bonuses to developers for leaving flood-prone areas vacant.

Protect and enhance infrastructure and critical facilities by elevating roads and bridges, floodproofing water treatment facilities, stabilizing shoulders and embankments, installing backup generators, expanding culverts, and require new critical facilities be built outside the floodplain.

Wildland Fire



Overview

Fire is a natural part of every ecosystem, but decades of wildland fire suppression during a historically cooler time period resulted in a buildup of fuels (vegetation) and development in wildfire-prone areas. With the 2010's megadrought, increased outdoor recreation, development pressure particularly along the Wasatch back (Wasatch and Summit counties), and climate change, the likelihood of damaging fire is increasing.

Though we have more assets in high-risk areas, the technology for early warning and fire-hardened homes has also advanced. This combined with better planning and enforcement can improve protection of assets already in place.

Profile

Frequency	Multiple wildland fires occur in Wasatch County Every year.
Severity	Moderate
Location	Hillsides and mountainous areas, open grass and rangelands.
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
Yearly Probability of Future Occurrences (# past events/years in record)	High Major Fires: 17% (300 acres and larger) Large Fires: 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 losses.

History

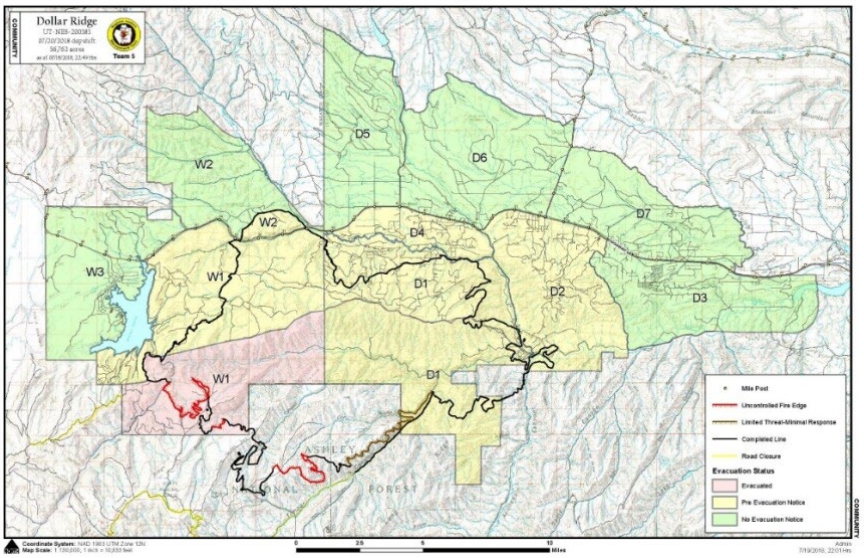
Following are a few of the most significant since 2016. More than half of fires are human caused and even relatively small fires, if near critical facilities, can be quite costly. Fortunately, no lives have been lost and few structures destroyed in the past decade.

Incident Name	Start Date	$ Fighting Fire	Acres	Fire Cause	Specific Cause
Upper Provo	July 31, 2020	$2,798,447	480	Human	Default
Willow Creek	June 6, 2018	$816,531	1,301	Natural	Lightning
Big Hollow	July 16, 2020	$611,385	438	Human	Fire Arms Use
Saddle	May 12, 2020	$535,651	683	Human	null
Red Ledge	July 9, 2016	$412,331	290	Natural	Lightning
Deer Creek	July 11, 2018	$338,426	380	Human	Exhaust/ Carbon Particle
Twin Peak	August 26, 2016	$302,382	40	Natural	Lightning
Badger	June 29, 2016	$238,731	43	Natural	Lightning
Beaver Canyon	June 24, 2017	$206,679	43	Human	No Permit
Dry Hollow	October 5, 2020	$181,644	19	Human	Default
Soldier Hollow	June 23, 2017	$144,541	28	Undetermined	Other Small Equipment
Big Hollow	July 5, 2019	$135,448	77	Human	Fire Arms Use
Deer Creek	Septembe r 14, 2019	$121,032	57	Human	Uncontrolled/ Unattended

The Dollar Ridge Fire

On July 1, 2018 the Dollar Ridge Fire began just east of Strawberry Reservoir, eventually destroying 74 homes, 131 camp trailers and 81 utility trailers, 25 vehicles and 158 sheds or

agricultural buildings. Evacuation orders were in place for multiple days. Over 800 firefighters were involved in the operation, as were 2 Utah National Guard Black Hawk helicopters. The cost of fighting the wildfire was 18+ million dollars.



All told, the fire burned approximately 70,000 acres within the Strawberry River watershed downstream of Soldier Creek Dam. The twenty-mile reach of Strawberry River was severely impacted by erosion, mud and debris flows, and flooding as a result of the fire, diminishing water quality and fish populations downstream. Several severe flash flood events along the Strawberry River damaged the Timber Canyon and Strawberry River roads and rerouted the river channel into and across the roadways in several places. Projects to remediate water quality in the area are 20+ million dollars, partly paid for by FEMA and NRCS. (Utah DWR Regional Advisory Council Meetings July/August 2021)

Communities At Risk

The following list consists of communities throughout Utah that have been determined by wildland fire officials to be at risk from wildland fire. The "Overall Score" represents the sum of multiple risk factors analyzed for each community. Examples of some risk factors are fire history, local vegetation, and firefighting capabilities. The Overall Score can range from 0 (No risk) to 12 (Extreme risk). This score allows Utah's fire prevention program officials to assess relative risk and create opportunities for communications with those communities on the list. Bolded communities are those with a Community Wildfire Preparedness Plan.

Community Name	Overall Score	Community Name	Overall Score
Brighton Estates	11	Currant Creek	9
Cloud Rim	11	Jordanelle State Park Communities	9
Diamond Bar X	11	Pine Hollow	9

Heber Valley Camp	11	**Wolf Creek Ranches**	9
K&J Subdivision	11	40 Dam Acres	8
Oak Haven	11	Bench Creek Ranches	8
Soapstone	11	Camp Piuta	8
Soldier Hollow	11	Daniels Summit	8
Soldier Summit	11	Hideout	8
Timberlakes	11	Independence	8
Tuhaye Subdivision	11	Soldier Creek	8
Big Hollow	10	Square Mtn Estates	8
Big Pole Estates	10	Wallsburg	8
Deer Crest	10	**Bryants Fork**	7
Greenerhills	10	Canyon Meadows	7
Interlaken	10	Strawberry Valley	7
Lake Creek Farms	10	Heber City	6
Storm Haven	10	Midway	6
Swiss Mountain	10	Charleston	4
Alpine Meadows	9		

*Bolded Communities have developed a Community Wildfire Preparedness Plan with FFSL

Mitigation

Strategies include limiting development in the Wildland Urban Interface, fuel management, prescribed burns, hardening buildings against fire with appropriate shingles, vent covers to prevent embers entering home, maintaining an emergency water supply and appropriate water pressures, using appropriate plantings around homes, and much more. See **wildfirerisk.org** or FEMA's **Strategies handbook** for a more complete list.

The FFSL has also 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

Landslide

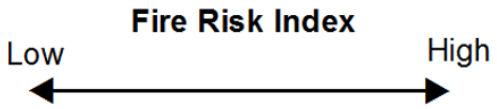
Overview

Landslides are common natural hazards in Utah that often occur when the pull of gravity becomes greater than the cohesion of soil. Land movement can occur without warning and can result in destructive, costly outcomes. Various types of landslides in Utah are debris flows, slides, and rockfalls.

Steep slopes, mountainous terrain, rock types, and narrow, debris-choked canyons all contribute to our region's susceptibility to landslide hazards. Wildfire can remove stabilizing vegetation and increase landslide risk. Many hillslopes are prone to mass movement, particularly where development has taken place on existing landslides or where grading has modified a slope and reduced its stability. Therefore, historical landslides, prehistoric landslides, and steep slopes prone to mass movement must be thoroughly investigated prior to development activities, along with regional groundwater and landscape and other irrigation activities. Excessive irrigation can easily cause a neighbor near or on a slope to lose their home from a landslide by elevating the groundwater table.

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	Specific data is unavailable. However, terrain and topography make



Future Occurrences	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.

Part of Wasatch County's success comes from the tourism sector, especially Wasatch Mountain State Park and surrounding resorts. Multi-million-dollar homes are also located on slopes with picturesque views, with more on the way.

The Utah Interagency Technical Team (IAT) has worked with Wasatch County since 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 "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.

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*

Note that only damaging events of a large magnitude are recorded by most databases

Mitigation

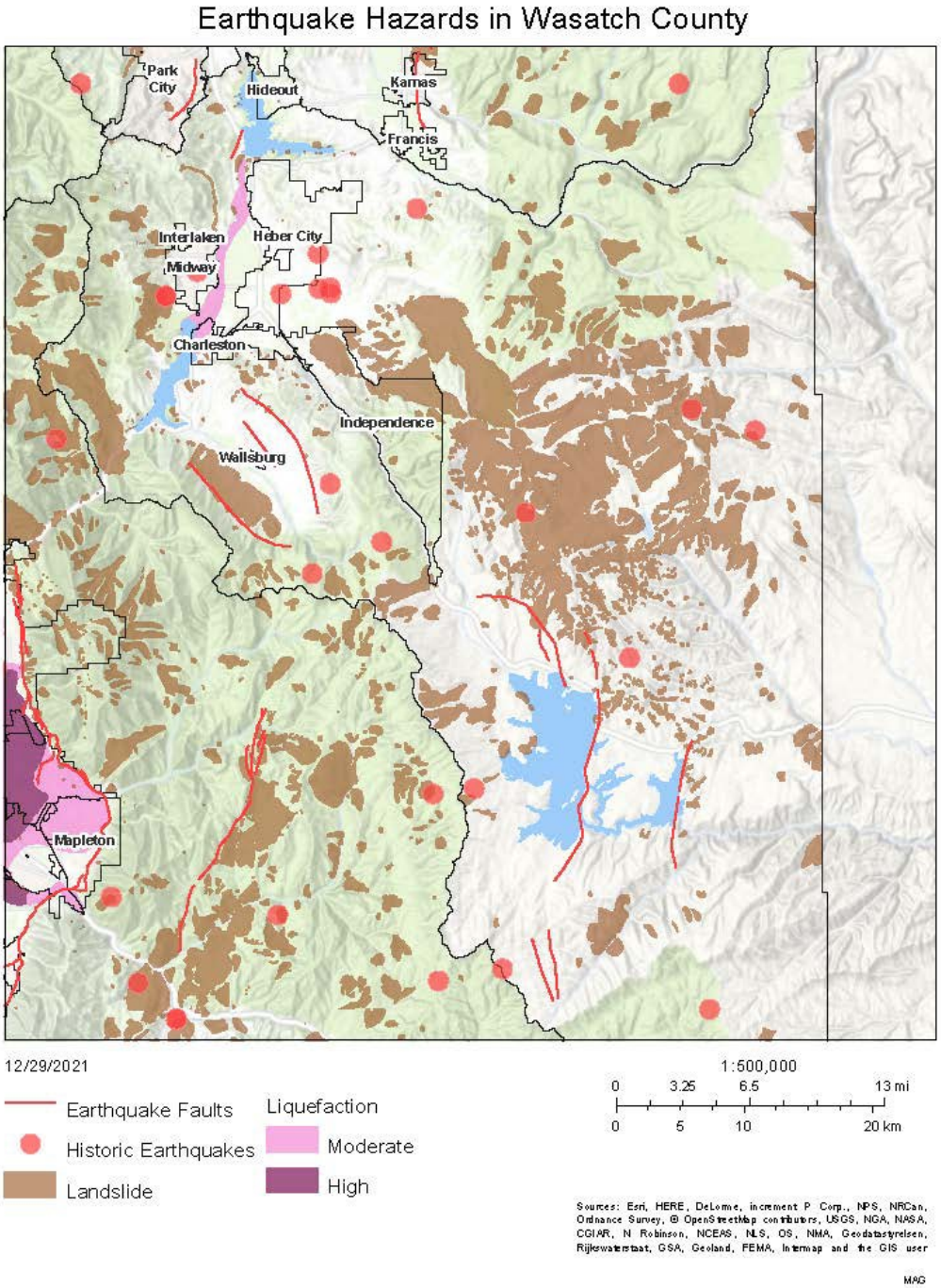
Nearly all recent landslides have occurred as reactivations of pre-existing landslides. Some strategies include:

Prohibit building on steep slopes, require thorough investigations and geotechnical studies for buildings in areas prone to landslides, and prevent over-irrigating. The use of very-low water xeriscape landscaping and/or smart irrigation controllers that adjust the amount of water applied to landscapes based on weather, plant/turf, and soil data, can significantly reduce the amount of excess water that percolates through the soil as groundwater and save money.

- Creating a plan to implement reinforcement measures in high-risk areas.
- Defining steep slope/high-risk areas in land use and comprehensive plans and creating guidelines or restricting new development in those areas.
- Creating or increasing setback limits on parcels near high-risk areas.
- Locating utilities outside of landslide areas to decrease the risk of service disruption.
- Restricting or limiting industrial activity that would strip slopes of essential top soil.
- Incorporating economic development activity restrictions in high-risk areas.

See FEMA's **Strategies handbook** for a more complete list.

Earthquake and Landslide



Overview

Earthquakes occur when tectonic plates suddenly release tension built up over decades of strain. The Wasatch Fault has a strong earthquake about every 300 years and we are "due"

for another. While some scenic homes are built directly on a fault, the way a building is constructed and the stability of soils underneath are a large factor in its resilience. Pre-1990's brick homes are usually unreinforced and very brittle, posing a great risk to occupants during a quake.

Development Trends

Due to Wasatch County's 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.
Losses	$538,000 annualized

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 rate of damage. It is interesting to note that when most residential structures are engineered, out of 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

There have been few events of note in recorded history within Wasatch County, but a 2020 event in Magna, Salt Lake County, gave the state a glimpse of what could happen. The State of Utah has also put a few earthquake scenarios through its HAZUS software, yielding loss estimates and maps of potential damages on the Wasatch Front.

Magna Earthquake: Days after the US shutdown to slow the COVID 19 pandemic, a 5.7 earthquake struck Magna township in Salt Lake County. The most noticeable damages occurred in multi-story building such as the brick façade of a large commercial building, but several mobile homes were condemned and the Utah Department of Public Safety estimates $70-100 million in public structure and infrastructure damage. Fortunately, no one was injured or killed and the public facilities were insured.

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
15 km E of Independence	3.7	6/9/2021

**United States Geologic Survey Earthquake Archives*

Mitigation

Strategies include restricting building on known fault lines or steep slopes, requiring geotechnical studies for buildings on problem soils, retrofitting critical infrastructure, educating homeowners on retrofitting options and securing items to the wall, requiring large/reinforced foundations or piers in liquefaction areas, and many more. See **Utah Earthquake Safety** or FEMA's **Strategies Handbook** for more details.

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. Wasatch County government actively emphasizes household accountability and preparation as individuals from less rural settings move into the area.

Development Trends

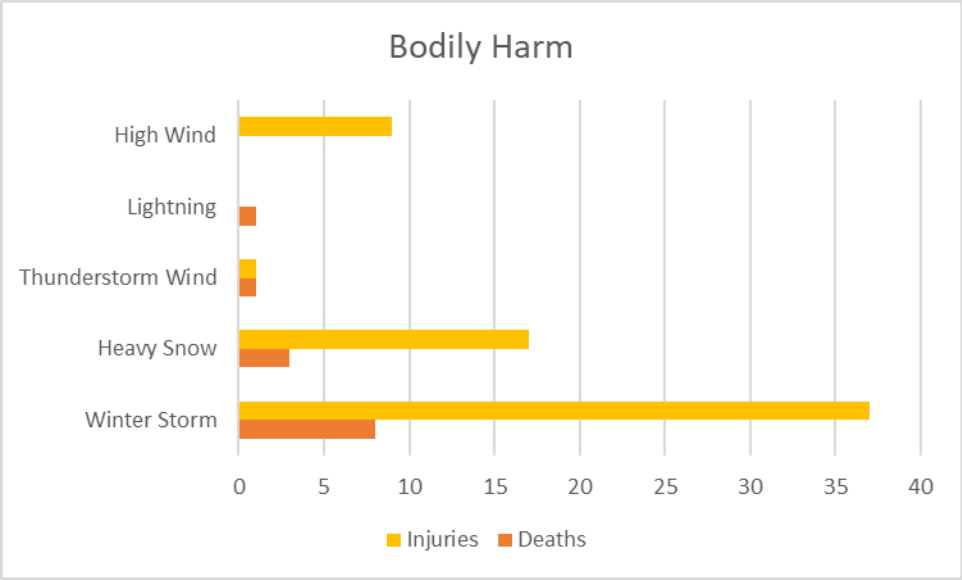
Rapid growth, particularly in the recreation sector, likely means more people will put themselves at risk for avalanches and it will take time for those migrating from less snowy areas to get used to travelling in the winter conditions.

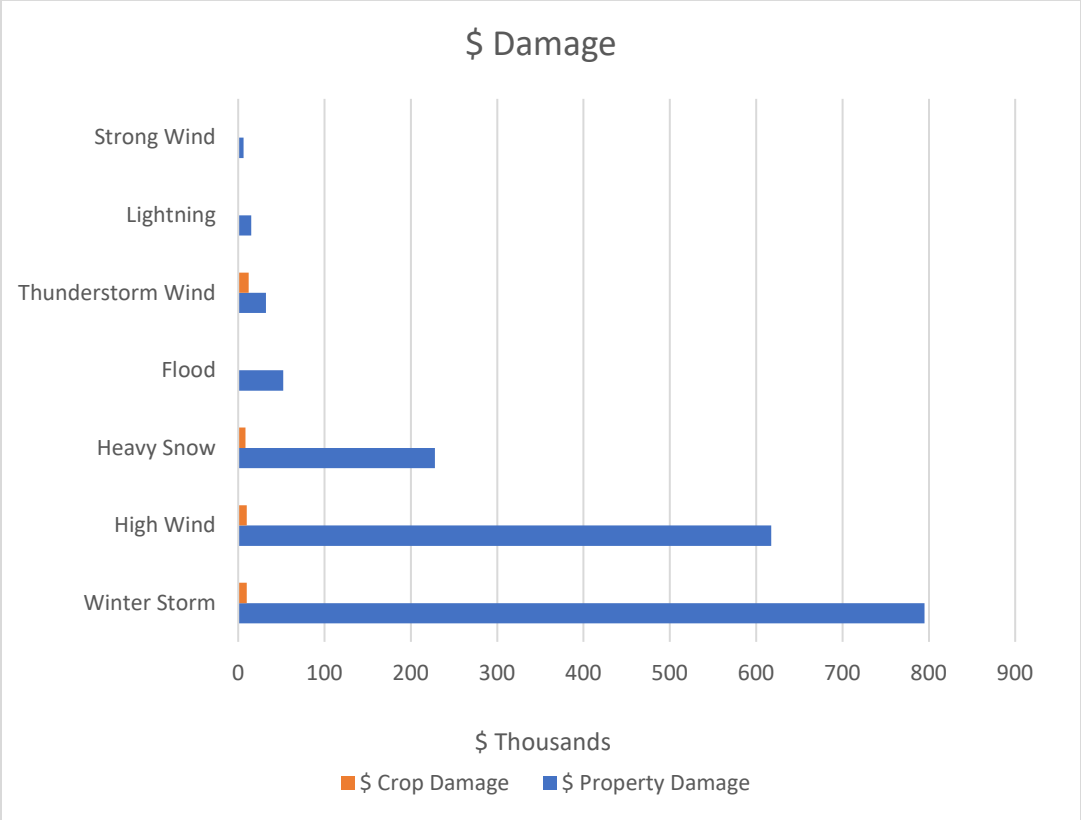
Profile

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

Row Labels	Deaths	Injuries	$ Property Damage	$ Crop Damage
Blizzard	0	0	0	0
Cold/wind Chill	0	0	0	0
Flash Flood	0	0	0	0
Flood	0	0	52000	0
Hail	0	0	0	0
Heavy Snow	3	17	227750	8600
High Wind	0	9	617600	10000
Lightning	1	0	15000	0
Strong Wind	0	0	6200	0
Thunderstorm Wind	1	1	32000	12000
Winter Storm	8	37	795000	10000
Winter Weather	0	0	0	0
Grand Total	**13**	**64**	**1745550**	**40600**





Mitigation

For buildings: Adopt and enforce building codes related to roof snow loads and wind speeds. Require CO monitors.
For Infrastructure: Install redundancies in power lines, lightning protection and surge protection on critical infrastructure, and snow sheds over roadways.
For everyone: Educate homeowners on protecting water pipes during cold weather and travelling safely. Encourage participation in emergency alerts.

See FEMA's **Strategies handbook** for a more complete list.

Damage Assessment and Mitigation

Overview

Listed below are the damage assessments for each of the participating jurisdictions followed by an update of the community's mitigation strategies from the 2017 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

The guiding factor in prioritizing mitigation strategies for local communities was the principle that mitigation should provide the ***greatest amount of good to the greatest number of people, after considering resources, staffing, and other constraints.*** Probability of occurrence, past events, and damage estimates compiled during the risk assessment in this plan were heavily considered. Overall, each community individually considered their own capabilities, staffing, and resources as they prioritized their own mitigation strategies.

Wasatch County

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	3,457	$1,010,273	10.11	1.83	12.91
Fire Risk High	1,885	$889,640	16.93	14.65	6.04
Fire Risk Moderate	3,779	$1,589,447	45.44	30.36	4.94
Flood 1% Yearly Probability	123	$33,693	4.67	2.87	1.43
Landslide	1,165	$376,379	1.83	12.28	0.00
Liquefaction Moderate to High	0	$0	0.00	0.00	0.00
Earthquake (Pre-1990 buildings)	2,036	$506,405	na	na	na

Vulnerabilities: Wasatch County faces significant wildfire risk, especially with mountainous terrain that makes firefighting difficult. The secondary effects of fire, such as debris flows, clog channels and have the potential to cause flooding. The Dollar Ridge fire in 2018 required extensive and expensive work on Strawberry Reservoir.
The county is also concerned about hazardous materials being trucked through population centers.

Mitigation Strategy	Hazard	Priority	Timeline	Estimated Cost	Potential Funding	Responsible Party
Adopt 2021 NFIP maps and update ordinances	Flood	High	1 yr.	Staff time	Local Gov	Local Gov
Lake Creek evacuation road/fire break at Timber Lakes	Fire, All	High	3 yrs.	1 million	Local Gov	Local Gov
Dollar Ridge Emergency Watershed Protection - Strawberry Reservoir erosion mitigation, bank armoring, debris removal	Flood, Fire	High	1 yr.	6 million	Wasatch and Duchesne	Wasatch and Duchesne counties

					counties, NRCT grant	
Reduce auto dependency by providing Transit and Paratransit	Climate Change, Air Quality	Mod	Ongoing		Local Gov, State grants	Local gov
Chipping and tree trimming program focusing on NE county	Fire	Mod	Ongoing	300k	BRIC, Local Gov	State Wildland Urban Interface Coordinator, Local Gov
Educate homeowners on proper burn techniques and when burning is permitted	Fire	Mod	Ongoing	Staff time	BRIC, Local Gov	State Wildland Urban Interface Coordinator, Local Gov
Disaster education through social media	Drought, all	Mod	Ongoing	Staff time	Local Gov	Local Gov
Flood controls for Lake Creek and Center Creek flood channels	Flood	Mod	5-10 yrs.	44 million	Heber, Wasatch, Independence, Grants	Heber, Wasatch, and Independence
Monitor air quality and discuss in County Air Quality Committee	Climate Change, Air Quality	Mod	Ongoing	$200/monitor	Wasatch County Health Department, cities and towns, MAG	Local gov

2017 Update

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	Yes, and Ongoing
Earthquake, Flood, Fire, Severe Weather	Education	Med	Ongoing	Minimal	Local Cash	Local Government	Yes, and ongoing
Flood	Encourage NFIP Participation	High	Ongoing	Minimal	Local Cash	Local Government	Yes, and ongoing

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

Central Utah Water Conservancy District

Due to the sensitive nature and complexity of CUWCD assets, they performed an independent risk analysis to create and prioritize the following mitigation strategies. Contact Blake Buehler of CUWCD for more information.

Vulnerabilities: The future development of the CUWCD water system will mainly be with a strong emphasis on water conservation, planning of needed additional regional water supply facilities, and incorporation of natural hazard mitigation. The District will also continue in its current efforts to address and incorporate natural hazard mitigation (i.e., seismic upgrades/standards, lightning protection, backup power, wildfire – both direct and indirect effects, etc.) into future design and construction projects whether they are for new facilities or for capital replacement projects. The following proposal is to help fulfill said efforts.

Priority (out of 18)	**Mitigation Package: Facilities**	**BCR**	**Mitigation Description**	**Outside Contractor**	**In-House**	CUWCD O&M	**CUWCD CRP**	**CUWCD CIP**	FEMA Grant	Timeline	**Cost**
8	Strawberry Pkg #2 (Lightning): *Current Creek Dam*	9.1	Nonstructural Retrofit	X			X			6-10 Years	$49,311
11	Strawberry Pkg #4 (Lightning): *Vat Diversion*	10.2	Nonstructural Retrofit	X			X		X	6-10 Years	$43,613
12	WCWEP Proj #1 (Earthquake): *Office Bldg. & Maintenance Bldg.*	0.01	Structural & Nonstructural Retrofit	X			X			6-10 Years	$228,774
13	Strawberry Pkg #5 (Earthquake): *Currant Tunnel, Vat Diversion*	0.003	Nonstructural Retrofit	X	X	X				6-10 Years	$12,328
16	Strawberry Pkg #6 (Landslide): *Currant, Stillwater, & Vat Tunnels*	-	Geological Investigation	X			X			6-10 Years	$262,187
17	General Pipeline #1 - Stockpile Materials	-	Material Stockpiling		X	X	X			6-10 Years	$755,950

18	General Pipeline #2 - Training	-	Training	X	X	X				6-10 Years	$19,538

Charleston

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	142	$54,666	2.37	0.00	0.00
Fire Risk High	7	$3,221	0.16	0.00	0.00
Fire Risk Moderate	58	$15,830	1.17	0.00	0.00
Flood 1% Yearly Probability	27	$6,923	0.49	0.00	0.00
Landslide	0	$0	0.00	0.00	0.00
Liquefaction Moderate to High	0	$0	0.00	0.00	0.00
Earthquake (Pre-1990 buildings)	157	$58,373	na	na	na

Statement of Vulnerabilities: Charleston is concerned about fire in the south part of town and hopes to direct development along the I-89 corridor rather than in those hazard-prone areas.

Mitigation Strategy	**Hazard**	**Priority**	**Timeline**	**Estimated Cost**	**Potential Funding Sources**	**Responsible Party**
Work with Wasatch County to adopt enhanced fire ordinances, especially during the fire season	Fire	High	Yearly	Staff time	Local gov	Local gov, Wasatch County

Adopt Flood Insurance Rate Maps as FEMA updates them and incorporate into codes and ordinances	Flood	High	As updated	Staff time	Local gov	Local gov, FEMA
Work with Gravel quarry to divert floods from quarry and property through yearly culvert cleaning	Flood	High	Ongoing	None	Gravel Quarry	Local gov, Gravel Quarry
Encourage development along the I-89 corridor rather than in fire-prone southern Charleston	Fire	High	Ongoing	Staff time	Local gov	Local gov
Remove vegetation around Daniel's Creek Bridge	Flood	Mod	Ongoing	2-5k	Local gov	Local gov
Consider a Wildland Urban Interface code	Fire	Mod	1-2 yrs.	Staff time	Local gov	Local gov
Look into backup generator for City Hall	All	Mod	1-2 yrs.	TBD	Local gov, Grants	Local gov
Post fire and flood maps in Town Hall	Fire, Flood	Mod	1 yr.	Staff time	Local gov	Local gov, MAG
Trim trees along major roads	Fire	Mod	Ongoing	2-5k	Local gov	Local gov

2017 Update

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	Yes, ongoing
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	Yes, ongoing

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	Yes
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	Yes

Daniel

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	0	$0	0.00	0.00	0.00
Fire Risk High	49	$8,930	0.37	0.00	0.00
Fire Risk Moderate	67	$17,433	0.49	0.00	0.00
Flood 1% Yearly Probability	17	$5,262	0.00	0.00	0.00
Landslide	0	$0	0.00	0.00	0.00
Liquefaction Moderate to High	0	$0	0.00	0.00	0.00
Earthquake (Pre-1990 buildings)	287	$74,764	na	na	na

Statement of Vulnerabilities: The recent Storms Haven annexation has brought 50+ residents into city boundaries. That subdivision has no fire protection and needs a new water tank and expanded culverts. The city works closely with Wasatch County and Central Utah Water Conservancy District to plan for fire protection and improved water systems. There is also development pressure in the 100 yr. floodplain, particularly from out-of-town buyers who don't realize they cannot build in the floodplain.

Mitigation Strategy	Hazard	Priority	Timeline	Cost	Funding Source	Responsible Party
Work with CUWCD to expand water tank for annexed Stormhaven	Fire, Drought	High	2-5 yrs.	3.5 million	CUWCD, Local gov, grants	CUWCD, Local gov
Expand culverts and implement erosion control along Daniel Creek in the Stormhaven section	Flood	High	1-3 yrs.	TBD	Local cash, grants	Local gov
Rebuild bridge at Big Hollow Road	Flood	High	4 yrs.	50k	Local cash, grants	Wasatch County, Local gov
Create early-warning system for Daniel residents independent of County system	All	High	1-2 yrs.	Staff time	Local gov	Local gov
New development must elevate structures above base flood level	Flood	High	Ongoing	0	Developers	Developers, Local gov
Utah County Fire Chief must sign off that any development in Wildland Urban Interface meets requirements such as defensible space, distance to fire hydrants, interior fire suppression, etc.	Fire	High	Ongoing	Staff time	Developers, Local gov	Developers, Local gov, Wasatch County
Examine existing water tank for seismic soundness, build new tank	Earthquake, Fire, Drought	High	2-5 yrs.	TBD	Local gov	Local gov
Build wellhouse to move instrumentation inside	All	Mod	2-5 yrs.	500k	Local gov, grants	Local gov

5 acre/lot minimum in town, 160 acres/lot on hillside due to lack of wastewater system	Fire	Mod	Ongoing	0	Local gov	Local gov
Install sewer system that ties into Twin Creeks line 2 miles away	All	Mod	5-10 yrs.	$5 million	Local gov, bonds, grants	Local gov
New development is required to turn water shares over to city	Drought	Mod	Ongoing	0	Developers, Local gov	Developers, Local gov
Ensure that realtors have informed buyers when they purchase land in the 100 yr. floodplain	Flood	Mod	Ongoing	0	Local gov	Local gov
Maintain open space and farming areas, allow urban farming	Climate Change, Air Quality	Mod	Ongoing	Depends on parcel cost	Local gov, Farming grants	Local gov

2017 Update

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
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

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	2,240	$581,598	3.04	3.45	0.56
Fire Risk High	502	$158,801	1.73	0.36	0.09
Fire Risk Moderate	789	$274,785	1.17	1.41	1.59
Flood 1% Yearly Probability	5	$960	0.07	0.23	0.00
Landslide	0	$0	0.00	0.00	0.00
Liquefaction Moderate to High	0	$0	0.00	0.00	0.00
Earthquake (Pre-1990 buildings)	1,615	$380,464	na	na	na

Statement of Vulnerabilities: Heber city is concerned about future annexations in fire and landslide-prone areas.

Mitigation Strategy	**Hazard**	**Priority**	**Timeline**	**Estimated Cost**	**Potential Funding Sources**	**Responsible Party**

No-burn days during fire and inversion seasons	Climate Change, Air Quality	High	Ongoing	Staff time	Local gov	Local gov
Adopt 2021 NFIP maps and update ordinances	Flood	High	1 yr.	Staff time	Local Gov	Local Gov
Adopt sensitive lands overlay	Landslide, Fire, Flood	High	1 yr.	Staff time	Local Gov	Local Gov
Sensitive Lands ordinance	All	High	1 yr.	Minimal	Local Gov	Local Gov
Re-route truck traffic away from Main St	Hazardous Materials spill	High	5-10 yrs.	TBD, EIS underway	UDOT, Local Gov	UDOT, Local Gov
Lawn requirements, allow more xeriscaping	Drought, all	Mod	2018	Staff time	Local Gov	Local Gov
Tree trimming	Flood, Fire	Mod	Ongoing		Local Gov	Public Works
Flood controls for Lake Creek and Center Creek flood channels	Flood	Mod	5-10 yrs.	43 million	Heber, Wasatch, Independence, Grants	Heber, Wasatch, and Independence
Education, including Ready program event on Main St, Red Ledges outreach	All	Mod	Ongoing	Minimal	Local Gov	Local Gov
Education through social media	Drought, all	Mod	Ongoing	Staff time	Local Gov	Local Gov

2017 Update

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding	Responsible Party	Completed?
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes
Flooding/ Dam Failure	Improve and construct drainage and flood control infrastructure.	High	Ongoing	TBD	Local Cash, Grants	CUP, Local Government	Yes
Earthquake	Inventory and upgrade public buildings and critical facilities for seismic standards.	High	3 years	TBD	Grants	FEMA	No - cost prohibitive

Wildfire	Educate homeowners on FIREWISE practices.	Medium	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
All	Promote the Community Emergency Response Team (CERT)	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Yes
Flooding/ Dam Failure	Promote NFIP participation.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, FEMA, UDHS	Yes
Flooding/ Dam Failure	Improve and construct drainage and flood control infrastructure.	Medium	Ongoing	TBD	Local Cash, Grants	CUP, Local Government	Yes, ongoing
Earthquake	Promote earthquake awareness and preparation.	Medium	1 year	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes
Wildfire	Incorporate FIREWISE landscaping requirements into local ordinances within areas at risk.	Medium	1 year	Minimal	Local Cash, Grants	Local Government	Yes
Landslide	Adopt ordinances that avoid development of areas prone to landslides.	Medium	Ongoing	Minimal	Local Cash, Grants	Local Government, UGS, USGS	Yes, hillside ordinance
All	Promote Community Emergency Response Team (CERT)	High	Ongoing	Minimal	Local Cash, Grants	Local Government	Yes

Hideout

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	0	$0	0.00	0.00	0.00
Fire Risk High	47	$31,752	1.10	1.61	0.00
Fire Risk Moderate	141	$74,516	1.54	0.93	0.00

Flood 1% Yearly Probability	0	$0	0.00	0.00	0.00
Landslide	0	$0	0.00	0.00	0.00
Liquefaction Moderate to High	0	$0	0.00	0.00	0.00

Statement of Vulnerabilities: Hideout's largest risk is wildfire and we do not currently have mitigating zoning or building codes in place. We need to adopt better requirements to prevent the spread of wildland fire and educate existing residents on firewise practices.

Mitigation Strategy	**Hazard**	**Priority**	**Timeline**	**Estimated Cost**	**Potential Funding**	**Responsible Party**
Educate homeowners on firewise practices such as having defensible space	Fire	High	Ongoing	Staff time	Local gov, Wasatch County	Local gov, Wasatch County
Update code to protect against wildfire in new development, including multiple evacuation routes, defensible space, fire-resistant building materials, etc.	Fire	High	1-2 yrs.	Staff time	Local gov	Local gov
Participate in an emergency notification system such as Summit County's Code Red Alerts	All	High	1-2 yrs.	TBD	Local gov	Local gov, Summit County
Require geotechnical studies for new construction	Landslide	Mod	Ongoing	Staff time	Local gov, Developers	Local gov, Developers
Assess town and HOA landscaping requirements to permit more xeriscaping without allowing noxious weeks	Drought, Noxious weeds	Mod	1-2 yrs.	Staff time	Local gov	Local gov
Study water and sewer systems for deficiencies and determine if/where backup generators are needed	Flood, all	Mod	1-2 yrs.	5-10k	Local gov	Local gov
Work with Summit County to determine if there are slopes where a wildfire might trigger debris flows	Debris Flow	Mod	2-3 yrs.	TBD	Local gov,	
Completing an inventory of locations where critical facilities, other buildings, and infrastructure are	Landslide/ Earthquake	Moderate	1-2 yrs.	5-10k	Local gov	Local gov

vulnerable to landslides and determine any action required.						
Consider ways to reduce air pollution such as EV charging stations in new developments and prohibiting wood burning on poor air quality days.	Climate Change	Mod	1-2 yrs.	Staff time	Local gov	Local gov

2017 Update

Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding Sources	Responsible Party	Completed?
Seismic	Inventory current critical facilities for seismic standards.	High	2 years	TBD	Local Cash, Grants	Local Government	Not necessary. Almost everything built after 2000
Wildfire	Educate homeowners on FIREWISE practices.	Medium	Ongoing	Minimal	Local Cash, Grants	Local Government	No, lack of staff to initiate
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	Partly complete, will finish with Infrastructure committee and TO engineering
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	Not necessary, most of town and all critical facilities built after 2000
Wildfire	Implement Wildfire Urban Construction ordinance.	High	1 year	Minimal	Local Cash, Grants	Local Government	Not yet, lack of staff

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	Not yet, working on firewise ordinances

Independence

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	17	$2,608	0.20	0.00	0.00
Fire Risk High	0	$0	1.70	0.00	0.00
Fire Risk Moderate	9	$1,659	1.80	0.00	0.00
Flood 1% Yearly Probability	1	$80	0.10	0.00	0.00
Landslide	18	$11,075	0.60	0.00	0.00
Liquefaction Moderate to High	0	$0	0.00	0.00	0.00

Statement of Vulnerabilities: Independence would like to pave the main road leading to the National Forest and keep it open year-round for fire management and recreation. Preserving open space and limiting development in the wildland-urban interface are very important for mitigating fires and keeping the natural beauty and recreation opportunities that make Independence an attractive place to live. Clustering development along main roads is part of this effort.
Independence does not currently have a water system, sewer system, or critical facilities. It will be important to plan for these as development occurs to ensure sufficient quality water.

Mitigation Strategy	Hazard	Priority	Timeline	Estimated Cost	Potential Funding	Responsible Party

Rewrite codes and ordinances to include sensitive lands, hillsides, ridgelines, and wildland-urban interfaces	All	High	2-3 yrs.	Staff time	Local gov	Local gov
Work with Wasatch County to adopt enhanced fire ordinances, especially during the fire season	Fire	High	Yearly	Staff time	Local gov	Local gov, Wasatch County
Adopt Flood Insurance Rate Maps as FEMA updates them and incorporate into codes and ordinances	Flood	High	As updated	Staff time	Local gov	Local gov, FEMA
Flood controls for Lake Creek and Center Creek flood channels	Flood	Mod	5-10 yrs.	45 million	Heber, Wasatch, Independence, Grants	Heber, Wasatch, and Independence
Pave main road to national forest and open year-round	Fire, All	Mod	2-3 yrs.	TBD	Local gov	Local gov
Trim trees along major roads	Fire	Mod	Ongoing	10k/yr.	Local gov	Local gov
Cluster development to preserve open space	Fire	Mod	Ongoing	Staff time	Local gov	Local gov
Plan for city-owned water and sewer system as development occurs or work with adjacent special service districts to do so	Drought	Mod	Ongoing	Staff time	Local gov	Local gov
Work with youth groups on fire mitigation activities	Fire	Mod	Ongoing	Staff time	Local gov	Local gov
Educate residents on low-cost retrofit options when they come in for remodeling permits	Earthquake	Mod	Ongoing	Staff time	Local gov	Local gov

2017 Update

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

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	Yes
Fire	Adopt Wildland Fire Urban Interface Code	Med	1 year	Minimal	Local Government	Local Government	No - in progress

Interlaken

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	0	$0	0.00	0.00	0.00
Fire Risk High	13	$6,038	0.00	0.00	0.00

Fire Risk Moderate	99	$22,124	0.00	0.00	0.00
Flood 1% Yearly Probability	0	$0	0.00	0.00	0.00
Landslide	0	$0	0.00	0.00	0.00
Liquefaction Moderate to High	0	$0	0.00	0.00	0.00

Statement of Vulnerabilities: Interlaken has had several close calls with fire in the past decade. There is currently only 1 road in and out of town, but developers will be required to build 3-4 more routes with subdivisions in the near future. Interlaken would also like a robust emergency notification system including a siren. The town's topography amplifies sound and past fires have started close enough to town that quick notification is essential.
Interlaken has ongoing vegetation removal, firewise code, and other requirements that should mitigate fire.

Mitigation Strategy	**Hazard**	**Priority**	**Timeline**	**Cost**	**Funding source**	**Responsible Party**
Remove green waste	Fire	High	Biannual	6k and ~200 volunteer hours	Wasatch County, Local gov	Wasatch County, Local gov
No open fires at any time, sprinklers required in new construction and remodels	Fire	High	Ongoing	0	Interlaken	Interlaken
Maintain calling tree as well as participate in Wasatch County's emergency notification system	All	High	Ongoing	0	Interlaken	Interlaken
Require sufficient roads for evacuation with new development	Fire, All	High	2-4 yrs.	0	Developers	Developers
Sensitive lands overlay requires Geotech survey for >25% slope	Landslide	Mod	Ongoing	0	Interlaken, Developer	Interlaken, Developer
1/2-acre lot minimum with 30' setback puts fewer homes in WUI	Fire	Mod	Ongoing	0	Interlaken	Interlaken

Require annexed land to come with water rights sufficient for development	Drought	Mod	Ongoing	0	Interlaken	Interlaken
New construction must submit landscaping without large turf areas	Drought	Mod	Ongoing	0	Interlaken	Interlaken
Maintain firewise community status	Fire	Mod	Ongoing	Staff Time	Interlaken	Interlaken
Purchase a siren loud enough for entire town to hear	All	Mod	1-2 yrs.	5k	Local gov, Grants	Local gov
Assign block captains and town officials to manage traffic in the event of an evacuation	Earthquake	Mod	Ongoing	0	Local gov	Local gov
Update 2002 Emergency Response Plan	All	Mod	1-2 yrs.	TBD	Interlaken	Interlaken

2017 Update

Action	Hazard	Priority	Timeline	Estimated Cost	Potential Funding	Responsible Party	Completed?
Develop an emergency response plan for wildfires	Wildfire	High	1 year	Minimal	Local Cash	Local Government, residents	No, but did become a Firewise community
Incorporate FIREWISE landscaping recommendations into local ordinances in applicable areas	Wildfire	Medium	1 year	Minimal	Local Cash	Local Government	Yes
Require slope stability analyses for susceptible areas in local land use codes	Landslide	Medium	1 year	Minimal	Local Cash	Local Government	Yes

Midway

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**

Dam Failure	362	$120,354	1.29	0.46	0.00
Fire Risk High	238	$71,769	0.27	0.09	0.00
Fire Risk Moderate	1,075	$307,450	0.98	0.47	0.00
Flood 1% Yearly Probability	10	$885,791	0.08	0.12	0.00
Landslide	0	$0	0.00	0.00	0.00
Liquefaction Moderate to High	0	$0	0.00	0.00	0.00
Earthquake (Pre-1990 buildings)	720	$167,393	na	na	na

Statement of Vulnerabilities: Wildland Fire is Midway's biggest vulnerability. Though Midway has few homes in high-risk areas, cabins in Wasatch County land nearby are cause for concern. Midway monitors water tanks on County land for use in fire suppression. There are 300-400 homes on the west side that need a second access route.
There is canyon flooding not identified in the NFIP. Midway is working to upgrade roads and culverts to mitigate impacts.
Midway has several older buildings that could be destroyed in an earthquake, including the Town Hall and Community Center.

Mitigation Strategy	Hazard	Priority	Timeline	Estimated Cost	Funding Source	Responsible Party
Promote NFIP participation	Flood	High	Ongoing	minimal	Local gov	Local gov
Enforce floodplain ordinance that requires a 50' setback from new development	Flood	High	Ongoing	Staff time	Local gov	Local gov
Complete Seismic evaluation of the Town Hall, Community Center, and generators	Earthquake	High	1-2 yrs.	TBD	Midway City	Midway City
Fire district must approve site plans, requiring defensible space, appropriate plantings and construction materials in new development	Fire	High	Ongoing	Staff time	Midway city	Midway City

Install secondary water meters on springs and wells to monitor input and new development	Drought	High	1-2 yrs./ongoing	Unknown	Midway Irrigation company (private company), developers	Irrigation company, developers
Create and maintain backcountry trails that can serve as fire access roads in Wasatch Mountain State Park and new hillside development	Fire	Mod	5	TBD	Wasatch Mountain State Park, Wasatch County, Midway, Developers, grants	Wasatch Mountain State Park, Wasatch County, Midway, Developers, grants
Participate in Shakeout and yearly County Disaster Drills	Earthquake, all	Mod	Yearly	Minimal	Midway City	Midway City, Wasatch County
Carbon date well water to find regeneration rate	Drought	Mod	1 yr.	133,000	Midway City	Midway City
Require that new subdivisions give secondary water rights to Midway City	Drought	Mod	Ongoing	0	Midway City	Midway City
Educate residents on localscapes	Drought, Fire, Climate Change	Mod	Ongoing	Staff time	Midway City	Midway City

2017 Update

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
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

Wallsburg

Loss Estimates					
Hazard	**# Buildings**	**Building value (thousands)**	**Major Road Miles**	**Transmission Miles**	**Railroad Miles**
Dam Failure	0	$0	0.00	0.00	0.00
Fire Risk High	42	$6,276	0.25	0.00	0.00
Fire Risk Moderate	31	$3,590	0.51	0.00	0.00
Flood 1% Yearly Probability	4	$701	0.00	0.00	0.00
Landslide	0	$0	0.00	0.00	0.00
Liquefaction Moderate to High	0	$0	0.00	0.00	0.00
Earthquake (Pre-1990 buildings)	96	$11,519	na	na	na

Vulnerabilities: Wallsburg's most pressing concern is constructing a new water tank to with necessary connections to serve current and future residents. The old tank leaks and will not be sufficient for coming development. We have a water management plan underway that will identify infrastructure needs for culinary water and stormwater management.
The second biggest concern is having a safe, well-functioning Town Hall. The current building isn't up to seismic safety standards, is oversized, lacks a backup generator, and isn't energy efficient. A well-constructed, right-sized building will enable ongoing town functioning and serve as an evacuation site in the event of a disaster.
The few structures located in the 100 yr. floodplain are aware of their risk and have insurance when applicable. Wallsburg also has a park on a section of floodplain, protecting it from future development.
Because Wallsburg is surrounded by well-kept fields, Wildland Fire is not as great a priority as it is in the rest of the county. We will look into adopting some for fire-resistant homes.

Mitigation Strategy	**Hazard**	**Priority**	**Timeline**	**Estimated Cost**	**Funding**	**Responsibly**
Install a new water tank and connecting pipes for current and future residents	Drought	High	1-3 yrs.	2-3 million	ARPA, CDBG, Rural Water Users grants or loans with Local match	Local gov
Complete water management plan	Flood, Drought	High	1 yr.	30k	Local gov	Local gov
Get an engineer's estimate on the cost to retrofit Town Hall for seismic safety and/or remodel entirely for improved emergency efficiency and improved functionality	Earthquake, All	Mod	3-5 yrs.	TBD	Local gov	Local gov
Consider adopting codes and ordinances similar to Wasatch County for improved fire resiliency i.e., no shingle roofs, defensible space, etc.	Fire	Mod	1-2 yrs.	Staff time	Local gov	Local gov

Prohibit building on slopes >30% and require additional mitigation for proposed buildings on steep slopes		Landslide	Mod	Ongoing	Staff time	Local gov	Local gov
Provide dumpsters for bulk waste		Fire	Mod	Ongoing	10k	Local gov	Local gov
2017 Update							
Hazard	Action	Priority	Timeline	Estimated Cost	Potential Funding	Responsible Party	
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	Partly, as part of Town Hall reroofing project
Wildfire	Educate homeowners on FIREWISE practices.	High	Ongoing	Minimal	Local Cash, Grants	Local Government, County Fire	Yes
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
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, fire not a high 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	No, efforts fell through

Contacts and Participation

See Part III: Process for a complete accounting of participation

Position	Name	Phone	Email
Emergency Manager	Kathryn McMullin	801-718-4628	kmcmullin@summitcounty.org
Summit County Planner	Ray Milliner	435-336-3118	rmilliner@summitcounty.org
Summit Co Fire Marshall	Mike Owens	435-940-2520	mowens@pcfd.org
Summit Co Public Works	Derrick Radke	435-336-3970	dradke@summitcounty.org
Henefer Planner	Robert Richins	435-336-5365	henefertown@allwest.net
Henefer Mayor	Kay Richins	801.599.8003	henefermayor@gmail.com
Park City Emergency Manager	Mike McComb	435-615-5185	mike.mccomb@parkcity.org
Coalville Mayor	Trevor Johnson	435-336-5981	mayor@coalvillecity.org
Coalville	Niki Sargent	435.659.6941	niki.sargent@coalvillecity.org
Coalville Public Works	Zane Deweese	435-336-5980	zane.deweese@coalvillecity.org

Coalville Public Works	Kyle Clark		
Coalville Wastewater Treatment	Sam Adams		
Oakley		435-783-5734	oakley@oakleycity.com
Oakley Planner	Stephanie		stephanie@oakleycity.com
Oakley	Amy Rydalch		amy@oakleycity.com
Oakley City	Kelly Kimber		kelly@oakleycity.com
Francis/Kamas	Scott Kettle	435-654-2226	skettle@horrocks.com
		cell: 801-360-9735	
Francis Public Works		435-783-6236	lthomas@francisutah.org
Francis Planner	Katie Henneuse	435-783-6236	khenneuse@francisutah.org
WUI Coordinator	Travis Wright	385-505-4030	tdwright@utah.gov
Park City Fire District	Ashley Lewis		
North Summit Fire District	Ian Nelson		
FFSL /County Fire Warden	Bryce Boyer		
N Summit School District	Kristy		kbraithwaite@nsummit.org
S Summit School District	Kip Bigelow		kbigelow@ssummit.org

S Summit School District	Kathy Carr		kathy.carr@ssummit.org
S Summit School District Superintendent	Greg Maughan		greg.maughan@ssummit.org

Part 8 Adoption and Maintenance

Plan Adoption

Example Resolution

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 October 25, 2018, 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 _____, 2022.

Community Adoption Status

Community	No Action	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			
Interlaken			
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			

Plan Maintenance

Monitoring, Evaluating and Updating the Plan

MAG will keep the plan available on its website and feature the Risk maps and a place to comment on the Pre-Disaster Mitigation landing page. MAG will also feature hazard maps at its annual Open House, where each city presents its long-range plan.

Biennial Reporting

Every 2 years MAG will contact each jurisdiction to see how the mitigation strategies are progressing and if the plan needs to be modified. The results will be shared with the Executive Council. Look forward to learning about our progress in 2024 and 2026.

Revisions and Updates

Periodic revisions and updates of the Plan are required to ensure that the goals and objectives for the MAG 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

Every 5 years MAG will conduct a comprehensive update of the Plan, accounting for development, changes in vulnerability, and new mitigation capabilities. Typically, the same process that was used to create the original plan will be used to prepare the update.

Plan Amendments

An amendment can be initiated 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. New requirements, information, needs, or errors in the original plan could trigger an amendment. All entities affected by an amendment (city, school district, water district, etc.) will be informed of the amendment and given an opportunity to comment. The proposed amendment will also be posted on MAG's website for public comment.

In determining whether to recommend approval or denial of a Plan amendment request, the Executive Council should consider the following:

- 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

Incorporating the risk analysis and strategies from this plan into General, Capital Improvement, Water Management Plans, etc. will strengthen all plans. It is the responsibility of elected representatives to make those changes at the recommendation of their staff, but MAG will provide resources and be available to collaborate with those groups.

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 be 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 MAG 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 MAG 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: Building Resilient Infrastructure and Communities

Agency: FEMA

Building Resilient Infrastructure and Communities (BRIC) will support states, local communities, tribes and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards. The BRIC program guiding principles are supporting communities through capability- and capacity-building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency.
75% Federal share with 25% local match; 90% Federal 10% local match for "small and impoverished communities"

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 Assistance 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: Natural Resource Conservation Grants

Agency: US Department of Agriculture

The USDA administers Natural Resource Conservation grants and provides crop insurance. The Federal crop insurance program is designed to provide a robust and reliable farm safety net, regardless of the size and scope of natural disasters. USDA's Risk Management Agency (RMA) works closely with Approved Insurance Providers (AIPs), who sell and service the policies that producers purchase, to ensure efficient loss adjustment and prompt claims payments, even in times of major disasters.

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.

STATE PROGRAMS

Title: Emergency Management Performance Grants

Agency: Utah Department of Emergency Management

The EMPG program provides federal grants to states to assist state, local, territorial and tribal governments in preparing for all hazards. This grant is available to all counties, cities, tribes, and public institutions of higher learning that have an emergency management program and a paid part-time or full-time emergency manager. The grant provides financial assistance and technical expertise. EMPG provides funds to supplement pre-established local emergency management programs in building capabilities to implement the National Preparedness System and support the National Preparedness Goal.

Title: Community Impact Board

Agency: Utah Department of Workforce Services

Utah's Community Development Office builds local capacity to help communities become self-reliant, self-determined and prepared for the future. Programs managed by the office work closely together to provide funding for infrastructure alongside tools and resources to help communities with coordination, training, research and analysis, planning and technical assistance.
The Office provides Community Impact Board grants and Community Development Block Grants.

Title: Historic Building Certification

Agency: Utah State Historic Preservation Office

The Certified Local Government (CLG) program is designed to promote historic preservation at the local level. This is a federal program through the National Park Service and administered by the Utah State Historic Preservation Office (SHPO). Qualified local governments become "certified" and thereby qualify to receive matching grants from the SHPO

Title: Board of Water Resources

Agency: Utah Division of Natural Resources

The Board of Water Resources appropriates funds to improve safety and water efficiency, develop new water projects, and refurbish aging infrastructure. Private or public water service providers can apply. Low-interest rates and repayment terms tailored to the project

area's affordability guidelines are available for qualifying projects. To be eligible for funding, a project cannot be routine operation and maintenance, cannot be sponsored by a developer or an individual/family and cannot be for a domestic water system where less than half of the residents live in the service area year-round. All other water projects will be considered for funding.

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.

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 for 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.

Title: Various

Agency: County Fire Departments

County fire departments are involved in outreach and education, enforcing fire-related laws, approving plans, and conducting mitigation efforts such as controlled burns and fuel thinning.

See your county's fire department for program information and how to match funding for projects.

Title: Transportation Improvement Program
Agency: Mountainland Association of Governments

MAG plans for and funds transportation-related projects that could include evacuation routes, seismic upgrades for structures, and fire break trails.
MAG also facilitates other projects that require coordination across boundaries and provides land-use planning and other assistance for smaller localities.

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.

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 MAG'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 offered additional help to participating jurisdictions depending on their desires, whether it be hosting a booth at a local event, presenting to City Council, or preparing educational materials.

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 public 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 at the request of participating organizations 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.

Part 9 Resources and Capabilities

Capabilities

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 communities in the MAG 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 person 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.

Each jurisdiction's technical and staffing capabilities are described in their **Community Capabilities Assessment** in the **Appendix**.

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.
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.

Policy and Program Capability

All thirty-six jurisdictions in the MAG Region have an adopted General Plan. Most Plans have a Flood Damage Prevention Ordinance.

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.

Resources

Utah Division of Emergency Management

For Associated state laws see “Authority” in this plan’s Introduction.

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 plans of the federal government.

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 application 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 is 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 Department's 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 of 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; encourages 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 may 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 district's geotechnical consultant.

Division of Water Resources

Mitigation Functions

The Division's 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 drainage.

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 appropriations to help construct irrigation projects, wells and rural culinary water systems. Additional appropriations have been added to this fund.

Conservation and Development Fund – This fund was created in 1978 with 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 sponsor and 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 through 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 regulates 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 Engineer's office to the Division of Water Rights.

All water in Utah is 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 of 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 control, disturbance and/or possession of wildlife, and introduction or 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:

- Stream Channel Alteration Permit Applications
- Water Rights Filings
- Energy and Mineral Exploration and Extraction Applications
- Federal Agency land management plans
- Wastewater 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

The Division of Drinking Water's Mission Statement is to "protect the public against waterborne health risks through assistance, education, 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 qualify 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 an 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 interest 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 10 Methods

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: 10 -100% probability in next year, or at least one chance in next 10 years.
Possible: 1 - 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.

Mitigation Prioritization

The guiding factor in prioritizing mitigation strategies for local communities was the principle that mitigation should provide the ***greatest amount of good to the greatest number of people, after considering resources, staffing, and other constraints*.** Probability

of occurrence, past events, and damage estimates compiled during the risk assessment in this plan were heavily considered. Overall, each community individually considered their own capabilities, staffing, and resources as they prioritized their own mitigation strategies.

Hazard Selection and Analysis

Identified Hazards

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, MAG 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.

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, HAZUS Provo-Orem Scenario
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, National Integrated Drought Information System

Mass Movement (Landslide & Debris Flow)	Yes	• Review of Past Disasters • High Cost of Homes in Areas at Risk • Often Triggered by Other Hazards	Utah Geological Survey
Avalanche	Coordinates Available	• Public Awareness • Relatively High 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, US Department of Agriculture
Radon Gas	Yes, but varies greatly	• Public Awareness • Second Leading Cause of Cancer	Utah Department of Air Quality
Air Quality and Climate Change	Yet, but not appropriate at a city level	• High profile • Air Quality affects all residents	Kem C Gardner Policy Institute
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 Super volcano 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

Links to GIS Data used in this Plan

Data Type	Original Layer	SOURCE	LINK	DATE ACCESSED/ CREATED
Natural Hazards				
Wildfire Area	BLM Utah Fire Perimeter (Polygons)	BLM, 2018	https://www.blm.gov/basic/programs-gis-utah-data-management-fire	12/1/2019
Wildfire Locations	Wildfire History 1980-2016 (Points)	Federal Wildland Fire Occurrence Data, USGS	https://wildfire.cr.usgs.gov/firehistory/data.html	12/1/2019
Wildfire Potential	Wildfire Potential	USFS, 2018	https://www.fs.usda.gov/rds/archive/catalog/RDS-2015-0046-2	7/7/1905
Liquefaction Potential	Utah State University 1994 Study	Liquefaction Potential Map for Central Utah Complete Technical Report, UGS, 1994	https://digitallibrary.utah.gov/awweb/main.jsp?flag=collection&smd=1&cl=all_lib&lb_document_id=37305&tm=1558538200102	12/1/2019
Dams	Dams	Utah Division of Water Resources, 2017	https://drive.google.com/drive/folders/0ByStJjVZ7c7mNmZwYjN4ZFZpaFE	12/1/2019
Earthquake Epicenter	Earthquake Locations 1850-2018	University of Utah	http://quake.utah.edu/regional-info/earthquake-catalogs	12/31/2019
Dam Inundation	Dams	Utah Division of Water Rights	https://opendata.gis.utah.gov/datasets/utahDNR::daminundation	
Faults	Quaternary Faults	UGS, 2019	https://gis.utah.gov/data/geoscience/quaternary-faults/	3/2/2020

Landslide Susceptibility	Landslide Susceptibility	UGS, 2007	https://geology.utah.gov/hazards/info/maps/#tab-id-6	3/2/2020
Jordanelle Dam Failure	US Geological Survey 1991	UGS, 1991		
Facilities and Infrastructure				
Airports	Airports	Utah AGRC, 2018	https://gis.utah.gov/data/transportation/air/	12/14/2018
Bridges	UDOT Structures	UDOT, 2018	https://data-uplan.opendata.arcgis.com/datasets/f128fb58ce9f4e68bb06b27d46572109_0	12/14/2018
Culverts	UDOT Structures	UDOT, 2018	https://data-uplan.opendata.arcgis.com/datasets/f128fb58ce9f4e68bb06b27d46572109_0	12/14/2018
Electrical Transmission Lines	Electrical Transmission Lines	HIFLD, 2018	https://hifld-geoplatform.opendata.arcgis.com/datasets/electric-power-transmission-lines	5/2/2018
EMS Faculties	EMS	Utah AGRC, 2013	https://gis.utah.gov/data/health/health-care-facilities/	12/14/2018
Emergency Operations Center (EOC)	Local Emergency Operations Centers	HIFLD, 2018	https://hifld-geoplatform.opendata.arcgis.com/datasets/local-emergency-operations-centers-eoc	5/16/2019
Emergency Site	National Shelter System Facilities	HIFLD, 2018	https://hifld-geoplatform.opendata.arcgis.com/datasets/national-shelter-system-facilities	5/16/2019
Fire Stations	Fire Stations	Utah AGRC, 2013	https://gis.utah.gov/data/society/public-safety/	12/14/2018
Health Care Facilities	Health Care Facilities	Utah AGRC, 2017	https://gis.utah.gov/data/health/health-care-facilities/	12/14/2018
Interstate	Roads	Utah AGRC, 2019	https://gis.utah.gov/data/transportation/roads-system/	5/3/2019
Law Enforcement Station	Law Enforcement	Utah AGRC, 2013	https://gis.utah.gov/data/society/public-safety/	12/14/2018
Major Local Road	Roads	Utah AGRC, 2019	https://gis.utah.gov/data/transportation/roads-system/	5/3/2019
Railroad	Railroads	Utah AGRC, 2017	https://gis.utah.gov/data/transportation/railroads/	5/17/2019

Schools	Schools	Utah AGRC, 2017	https://gis.utah.gov/data/society/schools-libraries/	12/14/2018
Underpass	UDOT Structures	UDOT, 2018	https://data-uplan.opendata.arcgis.com/datasets/f128fb58ce9f4e68bb06b27d46572109_0	12/14/2018

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 staff, 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 and Commercial Buildings- 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.

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. Since MAG often shares data, it did not offer to do any analysis that would require housing sensitive data on its servers.

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 AOG Website since the creation of the data.

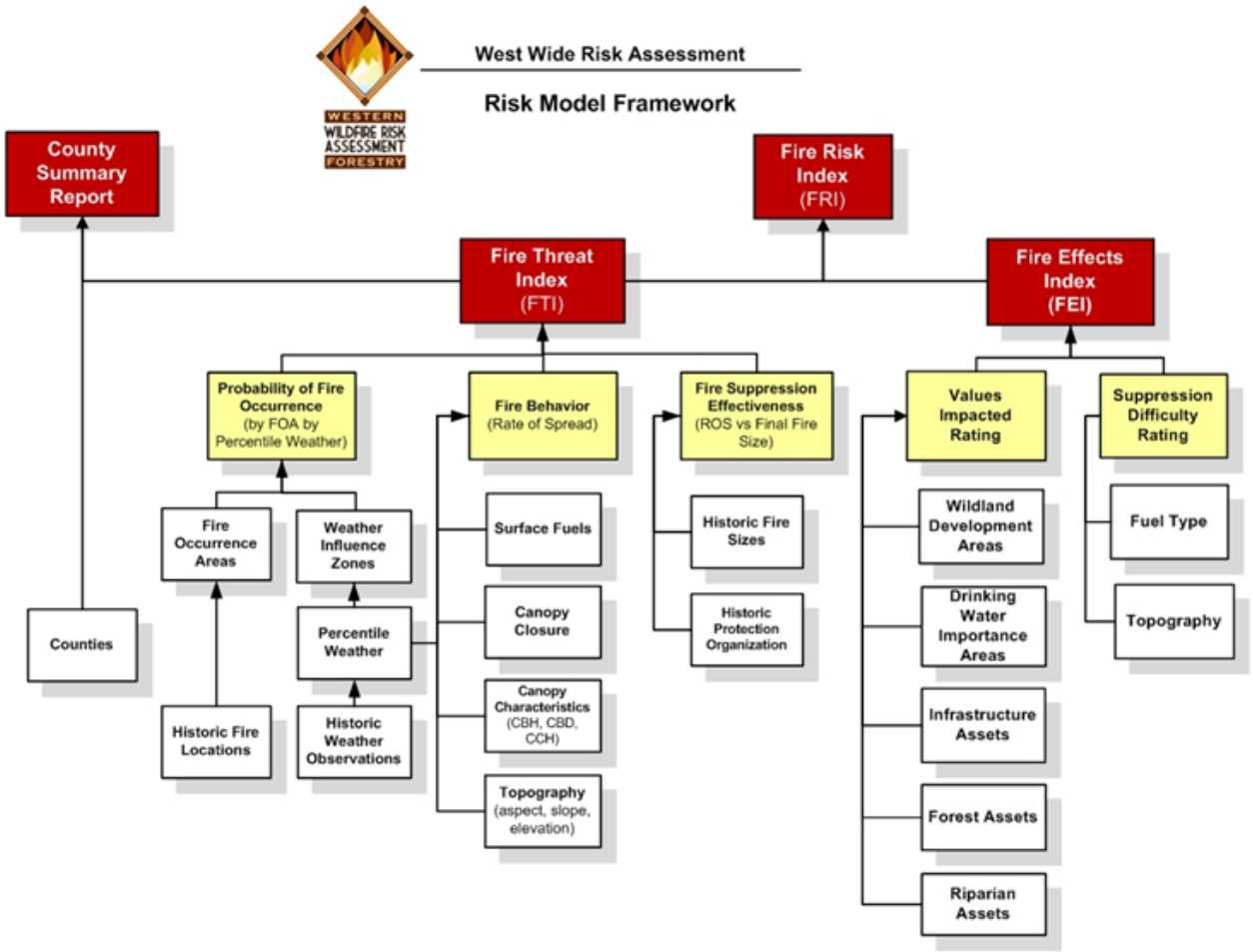
This information should not take the place of accurate field verified mapping from which ordinances need to be based off of. Owners of critical facilities should, and in most cases do, have detailed pre-hazard mitigation plans for their specific facilities.

Processing Hazard Layers

Fire

The Bureau of Land Management and Forest Service provided locations, both area and point, of historic fires from 1918-2014. All variations of the data since the 2014 analysis have used the 2014 baseline conditions (vegetation, elevation, etc.). 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%	
	6	85.5 - 92.5%	7.0%	
	7	92.5 - 96.5%	4.0%	
	8	96.5 - 98.5%	2.0%	Highest 30% used to determine at risk buildings
	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

MAG used FEMA's FIRMS, many of which have been updated since the 2017 plan, to determine areas at risk. As with other hazards, MAG intersected the 1% annual chance floodplain shapefiles downloaded from FEMA with building values to create a risk estimate.

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. The BoR is reviewing its sharing policies and MAG hopes to use more recent data in the next plan update.

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.

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.

Earthquake

Building construction seems to be the biggest factor in whether or not a building is destroyed during an earthquake. Since builders were not aware of earthquakes along the Wasatch Front until the 1970s and appropriate codes were not fully implemented until about 1990, we determined $ building losses by calculating the building values (improvement values) for all buildings constructed before 1990. HAZUS model runs from the state aggregate at county, not city, level.

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 (i.e.: an agricultural building misclassified as residential). At this point I was confident that most building points were classified correctly and located with their respective hazard areas.

Identifying Buildings at Risk

To determine the number of buildings at risk, MAG selected all buildings within a city's boundary then intersected those with each hazard. MAG 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.

Central Utah Water Conservancy District

Potential Losses Methodology

The potential losses to CUWCD and its customers from a natural hazard event were determined for each of the critical facilities/assets using predicted damage states. The two components used to account for the potential loss at each facility were: 1) estimated physical damage to CUWCD assets, 2) estimated loss of water service function.

The baseline damage state for each facility/asset was determined from the identified risks/hazards in the 'Potential Economic Loss Hazards Events (2021)' table. The table below provides a summary of the general damage state definitions and associated expected damage and range of estimated physical loss values.

General Damage State Definitions

Damage State	Expected Damage	Estimated Loss
None	No damage	0%
Light	Architectural damage, light and easily repairable; minimal disruption of use; meets Immediate Occupancy performance criteria	5%
Light-Moderate	Limited damage with some localized structural damage potentially leading to short-term business/operational interruption	15%
Moderate	Substantial structural damage, but with minimal potential for localized collapse; structure likely to be closed/inoperable until critical repairs are completed; meets Life Safety performance criteria	30%
Moderate-Severe	Severe structural damage, possibly including partial collapse and critical economic loss; structure likely to be closed/inoperable for an extended period	50%
Severe	Severe structural damage leading to partial or total structural collapse and major economic loss; repair may not be feasible or economically reasonable	70%
Complete	Catastrophic damage and complete loss or failure	100%

Avoided loss-of-function impacts (i.e., economic impacts of loss of water service) were determined in accordance with the FEMA BCA standard utility loss of service values and Sections 6.3 and 6.4.2 of FEMA's *What is a Benefit? (2001)* document. The economic impacts of loss of water service are estimated based on three levels of loss of service: 1) complete loss of potable water service, 2) potable water service that is 'unsafe for drinking', and 3) complete loss of secondary water service.

Part 11 Appendix

Contacts and Participation

Position	Name	Phone	Email	Small Meeting	Group Meeting
Summit County Emergency Manager	Kathryn McMullin	801-718-4628	kmcmullin@summitcounty.org		Yes
Summit County Planner	Ray Milliner	435-336-3118	rmilliner@summitcounty.org	18 August	
Park City Fire District Marshal	Mike Owens	435-940-2520	mowens@pcfd.org	March 9 2022	
Summit Co Public Works	Derrick Radke	435-336-3970	dradke@summitcounty.org		Yes
Summit Co Manager's Office	Janna Young				Yes
Summit Co	Glenn Wright				Yes
Summit Co Environmental Health	Spencer Smith				Yes
Henefer Planner	Robert Richins	435-336-5365	henefertown@allwest.net		
Henefer Mayor	Kay Richins	801.599.8003	henefermayor@gmail.com	Aug 11	
Park City Emergency Manager	Mike McComb	(435) 615-5185	mike.mccomb@parkcity.org	March 9 2022	
Coalville Mayor	Trevor Johnson	435-336-5981	mayor@coalvillecity.org		
Coalville	Niki Sargent	435.659.6941	niki.sargent@coalvillecity.org		
Coalville Public Works	Zane Deweese	435-336-5980	zane.deweese@coalvillecity.org		
Coalville Public Works	Kyle Clark			Oct 28	Yes
Coalville Wastewater Treatment	Sam Adams			Oct 28	Yes
Oakley		435-783-5734	oakley@oakleycity.com		
Oakley Planner	Stephanie		stephanie@oakleycity.com		
Oakley	Amy Rydalch		amy@oakleycity.com	Aug 16?	
Oakley City	Kelly Kimber		kelly@oakleycity.com		Yes
Francis/Kamas	Scott Kettle	435-654-2226	skettle@horrocks.com	June 14	Yes

		cell: 801-360-9735			
Francis Public Works		435-783-6236	lthomas@francisutah.org	June 14	
Francis Planner	Katie Henneuse	435-783-6236	khenneuse@francisutah.org	June 14	Yes
WUI Coordinator	Travis Wright	385-505-4030	tdwright@utah.gov		
Park City Fire District	Ashley Lewis	(435) 940-2503	alewis@pcfd.org		Yes
North Summit Fire District	Ian Nelson				Yes
FFSL /County Fire Warden	Bryce Boyer				Yes
N Summit School District	Kristy		kbraithwaite@nsummit.org		
S Summit School District	Kip Bigelow		kbigelow@ssummit.org	19 July	Yes
S Summit School District	Kathy Carr		kathy.carr@ssummit.org	19 July	Yes
S Summit School District Superintendent	Greg Maughan		greg.maughan@ssummit.org		

Utah County Contacts for Hazard Mitigation Plan					
Position	**Name**	**Phone**	**Email**	**Small Meeting**	**Group Meeting**
Northern					
Mayor Cedar Fort	David Gustin	801.768.2147	mayor@cedarfort.town	12/17/2020	
Alpine	Shane Sorensen	801-420-2962	ssorensen@alpinecity.org	6/17/2021	Yes
Saratoga Fire	Spencer Kyle	801-766-9793	skyle@saratogaspringscity.com		
Saratoga Planning	David Stroud	801.766.9793x4	dstroud@saratogaspringscity.com		
Saratoga Springs Engineer		801-766-9793x5			
Lehi Engineering	Ross		rdinsdale@lehi-ut.gov	7/7/2021	

Lehi Planning	Kim Struthers	385-201-2521	kstruthers@lehi-ut.gov	7/7/2021	Yes
Lehi Emergency Management Committee director	Scott DaBell		sdabell@lehi-ut.gov	7/7/2021	Yes
Lehi Emergency Management Committee director	Scott Sampson	385-201-2268	ssampson@lehi-ut.gov	7/7/2021	Yes
Lehi Planning	Mike West			7/7/2021	Yes
Lehi Environmental Sustainability	Todd Munger		tmenger@lehi-ut.gov		Yes
Lehi Planning				7/26/2021	
Lehi City Council	Paige Albrecht				Yes
Cedar Hills Emergency Manager	Laurie Petersen	801-785-9668 x104	lpetersen@cedarhills.org		
Cedar Hills City Manager	Chandler Goodwin		cgoodwin@cedarhills.org	6/14/2021	
Cedar Hills/AF Fire	Aaron Brems	801-763-3045	abrems@americanfork.gov	6/14/2021	
Cedar Hills City Council	Mike Geddes		mgeddes@cedarhills.org		
American Fork Public Works/Engineer	Ben Hunter	801.854.5930	bhunter@afcity.net	6/14/2021	
American Fork Engineer	Scott Sensanbaugher	801-763-3060	ssensanbaugher@afcity.net	6/14/2021	Yes
Fairfield	Chianne Barnson	435-231-4027	chybarnson_fairfieldtown@yahoo.com		
Fairfield Mayor	Brad Gurney	801-874-8386	mayor@fairfieldtown.org	12/17/2020	

Eagle Mountain Primary	Jeff Weber		JWeber@emcity.org	6/22/2021	Yes
Eagle Mountain	Greg Stone		gstone@emcity.org	6/22/2021	Yes
Eagle Mountain Fire Chief	Embret Fossum		efossum@UFA-SLCO.org	6/22/2021	
Eagle Mountain Engineer	Chris Trusty		ctrusty@emcity.org		Yes
Eagle Mountain Planning	Tayler Jensen	(801) 789-6615	tjensen@emcity.org		
Highland Planning	Nathan Crane	801-756-5751x3	ncrane@highlandcity.org	6/17/2021	
Highland Planning	Joann		joann@highlandcity.org		
Highland Planning	Erin Wells	801-772-4566	erin@highlandcity.org		
Highland Finance Director	Tyler Bahr			6/17/2021	
Highland Mayor	Rod Mann				Yes
Central					
Orem Engineer	Sam Kelly	801-229-7328	srkelly@orem.org	6/22/2021	
Orem Emergency Manager	Heath Stevenson	801-229-7146	hmstevenson@orem.org	6/22/2021	Yes
Provo EM	Chris Blinzinger	801-404-6368	cblinzinger@provo.org	6/10/2021	Yes
Provo Stormwater Engineer	Jared Penrod		jpenrod@provo.org	6/10/2021	Yes
Provo Airport	Donavon Cheff				Yes
Provo	Melissa McNalley		MMcNalley@provo.utah.gov	6/10/2021	
Provo Planner	Robert Mills	801-852-6407	rmills@provo.org	6/10/2021	Yes
Lindon Administration (secondary)	Adam Cowie	801-785-5043	acowie@lindoncity.org	6/15/2021	Yes

Lindon Emergency Manager (primary)	Kelly Johnson		kjohnson@lindoncity.org	6/15/2021	Yes
Vineyard	George Reid		Georger@vineyardutah.org	6/7/2021	Yes
Vineyard Public Works	McDermott, Kinsli	801-226-1929	kinslim@vineyardutah.org		
Vineyard Planner	Morgan Brimm	385-248-7029	morganb@vineyardutah.org		
Vineyard Planner	Briam Perez	385-329-1730	briamp@vineyardutah.org	6/7/2021	
Vineyard Engineer	Nassim			6/7/2021	Yes
Spanish Fork Economic Development	Dave Anderson	801-804-4586	danderson@spanishfork.org	6/9/2021	Yes
Spanish Fork Public Works	Chris Thompson	801-804-4556	cthompson@spanishfork.org		
Spanish Fork Public Works	Marlo		msmith@spanishfork.org	6/9/2021	
Spanish Fork Emergency Manager	Trevor Sperry	801.804.4768	tsperry@spanishfork.org	6/9/2021	
Spanish Fork	Jered Johnson	801-804-4575	jjohnson@spanishfork.org		
Spanish Fork Floodplain Engineer	John Little		jlittle@spanishfork.org		
Spanish Fork	Travis Warren			6/9/2021	Yes
Mapleton Planner	Brian Tucker	801-806-9108	btucker@mapleton.org	6/30/2021	Yes
Mapleton Ready	Derek Haynie	(801) 491-1111	derek@mapletonready.org		
Mapleton Public Works	Steven Lord	(801) 489-6253	slord@mapleton.org	6/30/2021	
Springville Engineer	Jeff Anderson	801-491-2719	janderson@springville.org	6/30/2021	

Springville emergency prep mtgs			EM@springville.org		
Springville Planner	Laura Thompson		lthompson@springville.org		
Springville Head Building Official-secondary	Jason Van Ausdal	801-491-7832	JVanausdal@springville.org		
Springville EM	JoAnna Larsen	801-635-5776	em@springville.org		Yes
Pleasant Grove Community Development	Daniel Cardenas		dcardenas@pgcity.org		
PG Engineering	Marty Beaumont	801-785-2941	mbeaumont@pgcity.org		Yes
PG Fire Chief	Andrew Engermann		aEngemann@pgcity.org		
PG Engineering	Aaron Wilson		awilson@pgcity.org	6/15/2021	Yes
Southern					
Goshen	Steven Staheli		goshentown@gmail.com	6/9/2021	
Salem	Bruce Ward		brucew@salemcity.org		
Salem	Greg Gurney		ggurney@salemcity.org		Yes
Payson Fire Marshall	Scott Spencer	801-465-5252	scotts@payson.org	6/14/2021	
Payson Facilities Manager	Shane Spencer	801.404.6473		6/14/2021	
Payson	Jill Spencer	801-465-5233	jills@payson.org	6/14/2021	Yes
Payson	Travis Jockumsen		travisj@payson.org	6/14/2021	Yes

Santaquin	Jason Bond	801-754-1011 ex 223	jbond@santaquin.org	7/26/2021	Yes
Santaquin EM	Chris Lindquist	(801)754-1940	clindquist@santaquin.org	7/26/2021	Yes
Santaquin Fire Chief	Ryan Lind	(801)754-1940		7/26/2021	
Santaquin Engineer	Jason Lidet			7/26/2021	
Santaquin Engineer	Norm Beagley			7/26/2021	Yes
Santaquin	Jon Lundell				Yes
Genola	Chris Steele	801-754-5300	gcpw@rfburst.com		
Genola Planning & Zoning			genolapz@gmail.com		
Genola Town Clerk	Lucinda Daily	801.754.5300	Genolaclerk@gmail.com	7/29/2021	Yes
Elk Ridge Public Works Director	David Gene	801.423.2300	davidj@elkridgecity.org		
Elk Ridge Fire Chief Primary	Seth Waite		firechief@elkridgecity.org		
Elk Ridge City Manager	Royce		royce@elkridgecity.org	7/8/2021	
Woodland Hills	Corbett Stephens	801-857-0788	works@woodlandhills-ut.gov	7/8/2021	
Woodland Hills	Jodie Stones	801-423-1962	recorder@woodlandhills-ut.gov		
	Greg Northup		fire@woodlandhills-ut.gov		
Others					
WUI Coordinator	Dax Reid	801-678-1655	daxreid@utah.gov	6/30/2021	Yes
Utah County Fire Warden FFSL	Josh Berg	385-254-8010	jberg@utah.gov	6/30/2021	
County Commissioner	Bill Lee		WilliamL@utahcounty.gov		

	Thomas SAKIEVICH		Thomas@utahcounty.gov		
			AmeliaP@utahcounty.gov		
Health Dept Emergency Response Coordinator	Ryan Strabel	801.851.7525	ryanst@utahcounty.gov	6/30/2021	
BOR	Dale		dthamilton@usbr.gov		
CUWCD	Mike Whimpey		mwhimpey@cuwcd.com		
Alpine School District	Frank Pulley		frankpulleyjr@alpinedistrict.org		
	Kimberly Bird		kbird@alpinedistrict.org		
	Mike Browning		mbrowning@alpinedistrict.org		
Nebo Risk Management	Kathy Carling	801-354-7474	kathy.carling@nebo.edu	7/20/2021	
Utah Co. Emergency Manager	Peter Quittner	801-404-6050	peterq@utahcounty.gov	6/30/2021	
Utah County Emergency management	Allison Jester/Janeen Olson		AllisonJ@utahcounty.gov	6/30/2021	
Provo Airport	Heather	8018526715	hrollins@provo.org		
Utah County Emergency Management			ryanst@utahcounty.gov		
Utah County Temporary employees	Emily, Lindsey, James			6/30/2021	

Provo School District Facilities Director	Mark Wheeler	801-374-4923			
MAG's TAC				Presented 7/26/2021	
Utah County Emergency Manager Monthly Meeting				Presented 10/26/2021	
Central Utah Water Conservancy District	Mike Whimpey		mwhimpey@cuwcd.com		
CUWCD	Blake Buehler	801.226.7133	blake@cuwcd.com	12/8/2021	
CUWCD	Chris Elison			12/8/2021	
CUWCD	Cort Lambson			12/8/2021	
CUWCD	KC Shaw			12/8/2021	

Wasatch Contacts for Hazard Mitigation Plan						
Position	**Name**	**Phone**	**Email**		**1st Small Mtgs**	**Draft Presentation Oct 13**
Central Utah Water Conservancy District	Derek Burton		derek@cuwcd.com	5 May email		13 Oct
Central Utah Water GIS	David Pritchett		dave@cuwcd.com	5 May email		

Charleston Mayor	Brenda Kozlowski		mayorkozlowski@gmail.com	5 May email	8/25/2021	
CUWCD	Roger Pearson					13 Oct
Daniel	Eric Bunker	435-647-6086	ericbunker@danielutah.org	5 May email	7/7/2021	
Daniel Councilmember	Mary Duggin					13 Oct
FEMA	Daniel Webb					13 Oct
Heber City	Brad Mumford		bmumford@heberut.gov	5 May email		
Heber City Administrator	Matt Brower					13 Oct
Heber City EM	Lt. Jeremy Nelson	435-657-7915	jnelson@heberut.gov	5 May email	6/15/2021	
Heber City Mayor	Keleen Potter					13 Oct
Heber City Planner	Jamie Baron	435-657-7914	jbaron@heberut.gov	5 May email	6/15/2021	13 Oct
Heber City Planning Director	Tony Kohler	435-657-7900	tkohler@heberut.gov	5 May email		13 Oct
Hideout	Jamie?		jmccosh@hideoututah.gov	5 May email		
Hideout	Lynnette Shindurling	435-659-4739	alutes@hideoututah.gov	12 May email	8/4/2021	
Independence	Jodi Hoffman		jhoffman@xmission.com	5 May email		
Independence	Lauren Boldger		independenceut@gmail.com	5 May email	8/25/2021	13 Oct
Interlaken Clerk	Bart Smith	206-851-2053	interlakenclerk@gmail.com	5 May email	8/27/2021	

Interlaken Engineer			APays@TO-Engineers.com	5 May email		
Interlaken Mayor	Greg Harrigan	435-714-0909	interlaken.mayor@gmail.com	5 May email	8/27/2021	
Midway	Michael Henke	435-654-3223 x4	mhenke@midwaycityut.org	5 May email	7/7/2021	
Midway Councilmember	Luke Robinson					13 Oct
Midway Councilmember	Steve Dougherty					13 Oct
Wallsburg	Rylee Allen		rylee_b@hotmail.com	5 May email		
Wallsburg	Celeni Richins	435-654-8608	celenirichins@gmail.com	5 May email	8/23/2021	
Wasatch Co GIS	Ivan Spencer	435-657-3194	ispencer@wasatch.utah.gov	5 May email	6/15/2021	
Wasatch County	Lewis Hastings	435-657-3262	lhastings@wasatch.utah.gov	5 May email		13 Oct
Wasatch County Councilmember	Kendall Crittenden					13 Oct
Wasatch County Emergency Manager	Jeremy Hales	(435) 657-3544	EM@wasatch.utah.gov	5 May email	6/15/2021	
Wasatch County School District	Shawn Kelly	435.654.0280	shawn.kelly@wasatch.edu	July 13 call		
Wasatch County Sheriff's Office	Jeremy Hales	435-657-1098	jhales@wasatch.utah.gov	5 May email		
WUI Coordinator	Travis Wright	385-505-4030	tdwright@utah.gov	5 May email		

Other Contacts	Name	Cell	Email	Emailed all in Nov '19	Type of Involvement
State Mitigation Specialist	Eric Martineau	801-946-4022	emartineau@utah.gov		
Central Utah Water Conservancy District	Mike Whimpey		mwhimpey@cuwcd.com	Sep 27 email	Hosted Central Utah County Mitigation meeting
Wasatch County Fire District		435-940-9636	admin@wasatchcountyfiredistrict.com		
North Utah County Water Conservancy District	John Jacobs	801-756-7039	john.nucwcd@gmail.com		
Weber Basin Water Conservancy District	Sherrie Mobley	801-771-1677	smobley@weberbasin.com		
Kamas Valley Conservation District	Wendell Stembridge	435-783-2595			
FFSL- Wasatch & Summit	Ken Ludwig		kenludwig@utah.gov		
Roads	Richard Nielsen	801-851-8601	richardjn@utahcounty.gov		
Utah Floodplains Manager (previous)	Kathy Holder	801-538-3332	kcholder@utah.gov		
Utah Floodplains Manager (current)	Angelia Crowther		acrowther@utah.gov		Provided NFIP and other floodplain information
Alpine School District Risk Manager	Kim Walker	801-610-8085	kwalker@alpinedistrict.org		
Nebo School District Risk Manager	Kathy Carling	801.354.7433	kathy.carling@nebo.edu		
Provo School District Facilities Director	Mark Wheeler	801-374-4923	markwh@provo.edu	5 May email	

Park City Fire District	Ashley Lewis				Attended Summit County Draft Presentation Meeting
Wasatch School District	Jill	435-654-0280			
Duchesne County Emergency Manager	Mike Lefler	435-738-1184	mlefler@duchesne.utah.gov		
Tooele County Emergency Management	Bucky Whitehouse	435-833-8100	bwhitehouse@tcem.org		
Salt Lake County Emergency Services		385-468-7092	emergencyserv@slco.org		
Morgan County Emergency Services	Ian Nelson	801-845-4048	Inelson@morgan-county.net		
Juab Planning & Zoning		435-623-3400	glenng@co.juab.ut.us		
Uinta Wyoming Emergency Management	Kim West	307-783-0327			
Sweetwater Wyoming Emergency Management	Judy Roderick	307-922-5370	roderickj@sweet.wy.us		
Sanpete/ Central Utah Public Health Emergency Response	Zacharia Kearney		ZKearney@utah.gov		
Provo Airport		8018526715		4 June phone message	Joined Provo's small group meeting
Rocky Mountain Power Electric Safety			publicsafety@rockymountainpower.net	4 June email	Spoke at Utah County Emergency Manager's Meeting

RMP Tree Pruning			vegetationmgmtpaccor@pacificorp.com	4 June email	
UTA Emergency Manager		8017433882	Sheldon Shaw	4 June phone message	
Chief Mecham	801-743-7103				
Captain Keith Bevan	801-743-7143				
Structural Engineers Association of Utah			Dallin.Pedersen@bhbengineers.com		Presented at Springville Contractor meeting on Seismically Sound Buildings
Structural Engineers Association of Utah			Chris.Hofheins@bhbengineers.com		Presented at Springville Contractor meeting on Seismically Sound Buildings
FEMA Mitigation Specialist-Field Integration Team	(303) 513-4415 (cell)		brandon.webb2@fema.dhs.gov		Spoke at Draft Luncheons
UVU Risk Management					Attended Utah County Emergency Manager's Meeting
BYU Risk Management					Attended Utah County Emergency Manager's Meeting

Code Examples

Air Quality

8.06.010 Purpose And Scope for Heber City

1. PURPOSE: In order to protect Heber City's citizens and their health, safety and welfare, this ordinance incorporates the Envision 2050 General Plan ideas on "Clean Air: Options for Residential and Business Land Uses" (pg. 32). It incorporates air quality solutions in the "Utah Roadmap: Positive Solutions on Climate and Air Quality" and "Utah Climate and Clean Air Compact" developed and adopted in 2020 for Utah. Heber City is known nationally and internationally for its incomparable mountain views with beautiful open space and agricultural vistas, its pristine environmental quality, and its clean air. Yet Heber City faces unique geographic features that lead to inversions, degraded air quality, other environmental concerns, as well as growth pressures. This ordinance will maintain the citizens' commitment to protecting the health of their families, school children, and protecting the quality of our natural environment. The Heber City Council will adopt an air quality slogan as desired. Initially the city slogan is: "I Care About Heber Air."
2. SCOPE: The City Manager and other administrators are responsible for establishing programs to implement this policy at their respective departments and locations. The City will establish an Energy Management Steering Committee to ensure best practices are evaluated and implemented for all City owned and operated facilities. Such Committee can develop annual Energy Management Plans for city departments and help administer this ordinance.

8.06.030 Anti-Idling

1. City anti-idling signage shall include the current city slogan. When businesses with drive-thru's or other idling/pick-up/delivery areas renew their annual business license such business will receive the initial set of anti-idling signage and install it in areas to be approved by the Planning Office, unless the private property owner:
    1. Has a private business posts a sign provided by or acceptable to the city informing its customers and the public of the city's time limit for idling vehicle engines.

2. Or already has anti-idling signage previously installed with current city slogan.

B. Drivers while operating a vehicle within city limits should not idle vehicles, except for the following kinds of idling:

1. Idling while stopped:

a. For an official traffic control device; b. For an official traffic control signal; c. At the direction of a police officer;

2. Idling as needed to operate heaters or air conditioners where the temperature is below thirty-two degrees Fahrenheit (32°F) or above ninety degrees Fahrenheit (90°F), as measured at the Heber City Airport or determined by the National Weather Service, for the health or safety of a driver or passenger, including service animals.

3. Idling for the minimum amount of time required for the operation of defrosters or other equipment to clear the windshield and windows to provide unobstructed views and ensure visibility while driving.

4. Idling as needed for emergency vehicles to operate equipment.

5. Idling as needed to ascertain that a vehicle is in safe operating condition and equipped as required by all provisions of law, and that all equipment is in good working order, either as part of the daily vehicle inspection, or as otherwise needed.

6. Idling as needed for testing, servicing, repairing, installation, maintenance, or diagnostic purposes.

7. Idling for the period recommended by the manufacturer to warm up or cool down a turbocharged heavy-duty vehicle.

8. Idling as needed to operate auxiliary equipment for which the vehicle was primarily designed or equipped, other than transporting goods, such as: operating a transportation refrigeration unit (TRU), lift, crane, pump, drill, hoist, ready mixed equipment, except a heater or air conditioner.

9. Idling as needed to operate a lift or other piece of equipment designed to ensure safe loading and uploading of goods or people.

10. Idling to recharge a battery or other energy storage unit of a hybrid electric vehicle.

11. Idling as needed for vehicles that house K-9 or other service animals.

12. Idling by on duty police officers as necessary for the performance of their official duties.

8.06.040 Open Wood Burning Stoves And Fireplaces

No open wood burning stoves or open wood burning fireplaces are allowed within new development. EPA certified wood burning stoves/devices, and wood burning,

natural gas, or propane fire pits & devices are allowed within residential, commercial, mixed-use, or industrial development.

8.06.050 Air Quality Monitoring

A. City or its designees will install and maintain IOT air monitors. City website will provide links to IOT air quality monitoring websites. Actual locations will be determined with collaboration between the Wasatch County Health Department and City.

8.06.060 Electric Vehicle Charging Stations

A. In annexation agreements, Master Development agreements, or zone changes the City Council may negotiate for EV-Ready Outlets or Level 1 chargers to be included in garages for condominiums, townhouses, duplexes, and single-family homes to allow for charging of hybrid and electric vehicles.

B. In annexation agreements, Master Development agreements, or zone changes the City Council may negotiate for Level 2 charging stations within mixed use or residential parking garages at a potential rate of 1 for every 8 units.

C. In annexation agreements, Master Development agreements, or zone changes the City Council may negotiate for two or more Level 2 charging stations for every 100 stalls. For park & ride or central transportation areas, the City may negotiate for Level 3 charging stations.

D. Minimum Parking Requirements. An electric vehicle charging station space may be included in the calculation for minimum required parking spaces that are required pursuant to other provisions of the code.

E. Location and Design Criteria.

Where provided, parking for electric vehicle charging purposes is required to include the following:

Clearance. Charging station equipment mounted on pedestals, light posts, bollards, or other devices shall be a minimum of twenty-four inches clear from the face of curb.

Charging Station Equipment. Charging station outlets and connector devices shall be no less than thirty-six inches or no higher than forty-eight inches from the top of surface where mounted, and shall contain a retraction device and/or a place to hang permanent cords and connectors sufficiently above the ground or paved surface.

Charging Station Equipment Protection. When the electric vehicle charging station space is perpendicular or at an angle to curb face and charging equipment, adequate equipment protection, such as wheel stops or concrete-filled steel bollards, shall be used.

Location. Placement of a single electric vehicle charging station is preferred at the beginning or end stall on a block face.

Signage. Each charging station space shall be posted with signage indicating the space is only for electric vehicle charging purposes. Days and hours of operations shall be included if time limits or tow away provisions are to be enforced. Signage shall include: A phone number or other contact information shall be provided on the charging station equipment for reporting when the equipment is not functioning, or other problems are encountered.

F. Location and Design Criteria.

Maintenance. Charging station equipment shall be maintained in all respects, including the functioning of the charging equipment. Damaged or unusable EV Chargers should be repaired as soon as possible.

Electricity Charges. When payment is required charging station owners should ensure that such payments can be made using an established national network with NFC (near-field communication technology) payments. For DC charging, in addition, the EVSE should provide a card reader to accept credit card payments. Actual EV charges should be comparable to average regional EV charges.

Accessibility. Where charging station equipment is provided within an adjacent pedestrian circulation area, such as a sidewalk or accessible route to the building entrance, the charging equipment shall be located so as not to interfere with accessibility requirements for sidewalks, trails, other parking stalls. In new development, the EV charging parking stalls will be next to handicapped parking stalls.

Lighting. Where charging station equipment is installed, adequate site lighting is required for use of charging station during nighttime hours per dark sky compliance standards.

8.06.070 Radon Air

The City encourages property owners to complete radon testing in all commercial, industrial, mixed-use, and residential development. The City also encourages radon mitigation design in all developments. The City and the Wasatch County Health

Department can provide radon mitigation design, radon risk maps and health facts, availability on radon test kits, and radon engineering guidelines to building permit applicants.

8.06.080 Fugitive Dust

City will require dust control measures for any development or other activity which includes the sifting of dirt or rocks, or any other nuisance or pollution dust-generating activities by requiring the use of daily watering using water trucks, tarping, fencing, etc. See City Code 8.04.030.17 & 17.38.080.I.

8.06.090 Other Air Quality Initiatives

A. The City can encourage new HOA CC&R's to use electric based landscaping and snow removal equipment instead of combustion-based engine equipment.

B. City can show business locations of Tier 3 (or higher) gasoline businesses on city website.

C. The City can promote the County Air Quality Website on city website and promote other information regarding air quality; such as smog ratings of vehicles, a city air quality toolbox, etc.

D. The City can identify and negotiate Park & ride lots for future mass transit & other transportation needs in future annexations or Master Development Agreements, etc.

E. The City can conduct emissions inventories to identify point sources of city vehicle, industry, and other area sources. The City can ensure City vehicles use Tier 3 or higher gasolines and create a Zero Emission Vehicle Program, thus lowering pollution emissions.

F. The City can set city goals to reduce city-generated CO2 emissions according to 2030 and 2050 goals in The Utah Roadmap standards, pg. 10.

G. The City can conduct energy audits for city buildings and set goals on how to make city buildings achieve 'net zero' ratings. The City can promote energy efficiency within development and redevelopments.

H. The City can allow solar farming on city buildings or city property or join interlocal or public/private partnerships for solar farming. The City can promote geothermal and solar options for city and citizen use.

I. The City can recognize business and private buildings within Heber City that meet or use energy efficient requirements, such as energy star, LEED requirements, etc.

The City can specifically negotiate for 'net zero' and/or LEED standards buildings in new development.

J. The City can encourage the use of evergreen trees and plants on private property because such trees and plants provide the highest filtration of particulates.

Flood Damage Prevention

FLOOD DAMAGE PREVENTION

Sections:

9.20.010 Findings of fact.

(A) The flood hazard areas of Syracuse City are subject to periodic inundation which results in loss of life and property, health and safety hazards, disruption of commerce and governmental services, and extraordinary public expenditures for flood protection and relief, all of which adversely affect the public health, safety and general welfare.

(B) These flood losses are created by the cumulative effect of obstructions in floodplains which cause an increase in flood heights and velocities, and by the occupancy of flood hazard areas by uses vulnerable to floods and hazardous to other lands because they are

inadequately elevated, floodproofed or otherwise protected from flood damage. [Ord. 07-17 § 1 (Exh. A); Code 1971 § 9-4-010.]

9.20.020 Purpose.

It is the purpose of this chapter to promote the public health, safety, and general welfare of the residents of Syracuse, Utah, and to minimize public and private losses due to flood conditions in specific areas by provisions designed:

(A) To protect human life and health;

(B) To minimize expenditure of public money for costly flood control projects;

(C) To minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;

(D) To minimize prolonged business interruptions;

(E) To minimize damage to the public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, and streets and bridges located in special flood hazard areas;

(F) To help maintain a stable tax base by providing for the second use and development of special flood hazard areas so as to minimize future flood blight areas;

(G) To ensure that potential buyers are notified that property is in a special flood hazard area; and

(H) To ensure that those who occupy a special flood hazard area assume responsibility for their actions. [Ord. 07-17 § 1 (Exh. A); Code 1971 § 9-4-020.]

9.20.030 Methods for reducing flood losses.

In order to accomplish its purposes, this chapter 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 excessive increases in erosion or flood heights or 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 are involved in the accommodation of 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 to other lands. [Ord. 07-17 § 1 (Exh. A); Code 1971 § 9-4-030.]

9.20.040 Definitions.

Unless specifically defined below, words or phrases used in this chapter shall be interpreted so as to give them the meaning they have in common usage and to give this chapter 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 land form below which the flow path of the major stream that formed the fan becomes unpredictable and alluvial fan flooding can occur.

“Appurtenant structure” means a structure which is located on the same parcel of property as the principal structure and the use of which is incidental to the use of the principal structure. Appurtenant structures should constitute a minimal investment, may not be used for human habitation, and be designed to have minimal flood damage potential. Examples of appurtenant structures are detached garages, carports, storage sheds, pole barns and hay sheds.

“Area of shallow flooding” means a designated AH, AO, or VO zone with a one percent 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.

“Base flood” means the flood having a one percent chance of being equaled or exceeded in any given year.

“Base flood elevation” means the computed elevation to which floodwater is anticipated to rise during the base flood. Base flood elevations (BFEs) are shown on flood insurance rate maps (FIRMs) and on the flood profiles.

“Basement” means any area of the building having its floor subgrade (below ground level) on all sides.

“Breakaway wall” means a wall that is not part of the structural support of the building and is intended through its design and construction to collapse under specific lateral loading forces without causing damage to the elevated portion of the building or the supporting foundation system.

“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 manmade change to improved or 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 located within the special flood hazard area.

“Elevated building” means:

(1) A nonbasement building which is:

(a) 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

(b) 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.

(2) 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.

“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 ordinance codified in this chapter.

“Expansion to 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; or

(3) Mudslides (i.e., mudflows) which are proximately caused by flooding as defined in subsection (2) of this definition and are akin to a river of liquid and flowing mud on the surfaces of normally dry land areas, as when earth is carried by a current of water and deposited along the path of the current.

“Flood elevation study” means an examination, evaluation and determination of flood hazards and, if appropriate, corresponding water surface elevations, or an examination, evaluation and determination of mudslide (i.e., mudflow) and/or flood-related erosion hazards.

“Flood insurance rate map (FIRM)” means the official map on which the Federal Emergency Management Agency has delineated both special flood hazard areas and the risk premium zones applicable to the City.

“Flood insurance study” means the official report provided by the Federal Emergency Management Agency that includes flood profiles, the flood boundary floodway map, and the water surface elevation of the base flood.

“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 area 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 constructed in conformance with sound engineering standards.

“Floodplain” or “floodprone 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 any state law or City ordinance, including Syracuse City zoning ordinances, subdivision regulations, building codes, health regulations, special purpose ordinances such as this floodplain ordinance, etc., which provide standards for the purpose of flood damage prevention and reduction.

“Floodproofing” means any combination of structural and nonstructural 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” 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 one foot.

“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 the 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 the state register as promulgated by the Utah Division of State History; 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.

“Hydrodynamic loads” means forces imposed on structures by flood waters due to the impact of moving water on the upstream side of the structure, drag along its sides, and eddies or negative pressures on its downstream side.

“Hydrostatic loads” means loads or pressures resulting from the static mass of water at any point of floodwater contact with a structure. They are equal in all directions and always act perpendicular to the surface on which they are applied.

“Levee” means a manmade 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 of 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 nonelevation design requirements 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 attached 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 North American Vertical Datum (NAVD) of 1988 or other datum, to which base flood elevations shown on a community’s flood insurance rate map are referenced.

“New construction” means, for purposes of determining insurance rates, structures for which the “start of construction” commenced on or after the effective date of the City’s 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 the ordinance codified in this chapter, 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 the ordinance codified in this chapter.

“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.

"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 one foot.

"Special flood hazard area" means the land in the floodplain subject to a one percent or greater chance of flooding in any given year.

"Start of construction" includes substantial improvement, and means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, placement or other improvement was within 180 days of the permit date. The "actual start" means 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 or filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for a 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 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 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 the "start of construction" of the improvement. This term 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 to assure safe living 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" means a grant of relief from the requirements of this chapter which permits construction in a manner that would otherwise be prohibited by this chapter in accordance with Section 60.6 of the National Flood Insurance Program Regulations.

"Violation" means failure to comply with any of the terms and conditions of this chapter.

"Water surface elevation" means the height, in relation to the North American Vertical Datum (NAVD) of 1988 (or other datum, where specified), of floods of various magnitudes and frequencies in the floodplains of coastal or riverine areas. [Ord. 07-17 § 1 (Exh. A); Code 1971 § 9-4-040.]

9.20.050 General provisions.

(A) Lands to Which This Chapter Applies. This chapter shall apply to all special flood hazard areas within the jurisdiction of Syracuse City.

(B) Basis for Establishing the Special Flood Hazard Areas. The special flood hazard areas identified by the Federal Emergency Management Agency in a scientific and engineering report entitled "The Flood Insurance Study for the City of Syracuse," dated June 18, 2007, with an accompanying flood insurance rate map (FIRM), is hereby adopted by reference and declared to be a part of this chapter. The flood insurance study and FIRM are available for inspection at the City offices located at 1979 West 1900 South, Syracuse, Utah, 84075.

(C) Compliance. No structure or land shall hereafter be constructed, located, extended, converted, or altered unless the modification fully complies with the terms of this chapter and other applicable regulations.

(D) Abrogation and Greater Restrictions. This chapter is not intended to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. However, where this chapter and another ordinance, easement, covenant, or deed restriction conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

(E) Interpretation. In the interpretation and application of this chapter, all provisions shall be:

(1) Considered as minimum requirements;

(2) Liberally construed in favor of the governing body; and

(3) Deemed neither to limit nor repeal any other powers granted under state statutes.

(F) Warning and Disclaimer of Liability. The degree of flood protection required by this chapter 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 manmade or natural causes. This chapter does not imply that land outside the special flood hazard areas or uses permitted within such areas will be free

from flooding or flood damages. This chapter shall not create liability on the part of Syracuse City or any officer or employee thereof, or the Federal Emergency Management Agency for any flood damages that result in reliance on this chapter or any administrative decision lawfully made thereunder. [Ord. 21-30 § 1 (Exh. A); Ord. 07-17 § 1 (Exh. A); Code 1971 § 9-4-050.]

9.20.060 Designation of the Public Works Director.

The Public Works Director or his or her designee (hereinafter referred to as the "Public Works Director") is hereby appointed to administer and implement the provisions of this chapter and relevant provisions of 44 C.F.R. (National Flood Insurance Program Regulations) pertaining to floodplain management, and performing all other duties as provided herein. [Ord. 07-17 § 1 (Exh. A); Code 1971 § 9-4-060.]

9.20.070 Duties and responsibilities of the Public Works Director.

Duties of the Public Works Director shall include, but are not limited to, the following:

(A) Permit Review.

(1) Review and approve or deny all applications for floodplain development permits required by this chapter.

(2) Review all development permits to determine that the permit requirements of this chapter have been satisfied.

(3) Review all development permits to determine that all necessary permits have been obtained from those federal, state, or local governmental agencies from which prior approval is required (including Section 404 of the Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. 1334).

(4) Review all development permits to determine whether proposed building sites, including the placement of manufactured homes, will be reasonably safe from flooding.

(5) Review all development permits to determine if the proposed development is located in the floodway. Except as provided in SCC 9.20.130, no development shall be permitted within a floodway.

(B) Use of Other Base Flood Data. When base flood elevation data has not been provided in accordance with SCC 9.20.050(B), Basis for Establishing the Special Flood Hazard Areas, the Public Works Director shall obtain, review, and reasonably utilize any base flood elevation data available from a federal, state, or other source as criteria for requiring that new construction, substantial improvements, or other development is administered in accordance with SCC 9.20.120, Specific standards.

(C) Information to Be Obtained and Maintained.

(1) Obtain and record the actual elevation (in relation to mean sea level) of the lowest floor (including basement) of all new or substantially improved structures, and whether or not the structure contains a basement; provided, that in any V1 – 30, VE, and V Zones, the actual elevation to be obtained and recorded is that of the bottom of the lowest structural member of the floor (excluding piling and columns) of all new or substantially improved structures, and whether or not the structure contains a basement.

(2) For all new or substantially improved floodproofed structures:

(a) Verify and record the actual elevation (in relation to mean sea level) to which the structure has been floodproofed.

(b) Maintain the floodproofing certifications required in SCC 9.20.080.

(3) Maintain for public inspection all records pertaining to the provisions of this chapter.

(D) Alteration of Watercourses.

(1) Notify adjacent communities, the Utah State Division of Water Rights, and the Utah State Division of Water Resources prior to any alteration or relocation of a watercourse, and submit copies of such notification to the Federal Emergency Management Agency.

(2) Assure that the flood carrying capacity within the altered or relocated portion of any watercourse is maintained.

(E) Interpretation of FIRM Boundaries. Make interpretations where needed, as to the exact location of the boundaries of the special flood hazard areas (for example, where there appears to be a conflict between a mapped boundary and actual field conditions). The person contesting the location of the boundary shall be given a reasonable opportunity to appeal the interpretation as provided in SCC 9.20.090.

(F) Construction When No Regulatory Floodway Has Been Designated. When a regulatory floodway has not been designated, the Public Works Director 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.

(G) Application for Conditional FIRM Revision. The Public Works Director shall review applications for conditional FIRM revisions in accordance with SCC 9.20.130, Floodways. [Ord. 07-17 § 1 (Exh. A); Code 1971 § 9-4-070.]

9.20.080 Permit procedures.

A floodplain development permit ("permit") shall be obtained before construction or development begins within any special flood hazard area established in SCC 9.20.050(B). Application for a permit shall be made on forms furnished by the City and may include, but not be limited to, plans in duplicate drawn to scale showing the nature, location, dimensions, and elevations of the area in question; existing or proposed structures, fill, storage of materials, drainage facilities; and the location of the foregoing. The Public Works Director may require certification of any of these requirements by a professional engineer, architect, or surveyor as he or she deems necessary.

(A) Specific Requirements. The applicant must provide the following information:

(1) The elevation in relation to the mean sea level of the lowest floor (including the basement) of all new and substantially improved structures;

(2) The elevation in relation to the mean sea level to which any nonresidential structure shall be floodproofed;

(3) Certification by a registered professional engineer or architect that the nonresidential floodproofed structure shall meet the floodproofing criteria of this chapter; and

(4) A description of the extent to which any watercourse or natural drainage will be altered or relocated as a result of the proposed development.

(B) Approval or Denial. Approval or denial of a permit by the Public Works Director shall be based on the provisions and intent of this chapter and the following relevant factors:

(1) The danger to life and property due to flooding or erosion damage;

(2) The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner;

(3) The danger that materials may be swept onto other lands to the injury of others;

(4) The compatibility of the proposed use with existing and anticipated development;

(5) The safety of access to the property in times of flood for ordinary and emergency vehicles;

(6) 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;

(7) 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;

(8) The necessity to the facility of a waterfront location, where applicable;

(9) The availability of alternative locations, not subject to flooding or erosion damage, for the proposed use;

(10) The relationship of the proposed use to the comprehensive plan and floodplain management plan for that area; and

(11) The importance of the services provided by the proposed facility to the community. [Ord. 07-17 § 1 (Exh. A); Code 1971 § 9-4-080.]

9.20.090 Appeal procedure.

(A) Any person adversely affected by a final decision of the Public Works Director made in the administration or interpretation of this chapter may, within the time provided herein, appeal that decision to the City Council by alleging that there is error in any such final order requirement, decision, or determination made by the Public Works Director in the administration or interpretation of this chapter. Appeals filed hereunder shall be in writing and shall be filed with the City Recorder within 30 days of the decision which is appealed. The appeal shall include any required City appeal forms and shall set forth, at a minimum: the name, address and telephone number of the appellant; the decision being appealed; the grounds for appeal; and a description of the alleged error in the decision or determination of the Public Works Director. Only decisions of the Public Works Director applying this chapter may be appealed to the City Council as provided herein. Appeals may not be used to waive or modify the terms or requirements of this chapter.

(B) After the appeal application is deemed complete, the City Recorder shall schedule the matter to be heard by the City Council. Prior to the appeal hearing, the City Recorder shall transmit all papers constituting the record of the decision or action being appealed to the City Council and the appellant. The City Council shall review the record of the decision or action of the Public Works Director and provide the appellant an opportunity to be heard regarding the appeal. In reviewing the appeal, the City Council shall consider and review all relevant technical evaluations and the specific factors set forth in SCC 9.20.080(B). The City Council shall decide the matter in accordance with the standard of review set forth in subsection (C) of this section.

(C) The City Council may affirm or reverse the decision of the Public Works Director, in whole or in part, or may remand the administrative decision to the Public Works Director. The City Council is also authorized to impose additional conditions as part of its determination of the appeal as necessary to conform with the purposes and intent of this chapter. The City Council shall review the administrative decision of the Public Works Director for correctness in determining whether there is substantial evidence in the record to support the order, decision, or determination. The appellant shall have the burden of proving that an error has been made. The City Council shall issue a written decision.

(D) A record of all appeals shall be maintained by the City in accordance with the Utah Government Records Access and Management Act, Section 63G-2-101, et seq., Utah Code Annotated 1953, as amended. [Ord. 21-30 § 1 (Exh. A); Ord. 07-17 § 1 (Exh. A); Code 1971 § 9-4-090.]

9.20.100 Variance procedure.

(A) The Syracuse City Council is hereby designated to hear and decide requests for variances from the requirements of this chapter.

(B) The applicant shall have the right to a hearing before the Syracuse City Council on the question of whether or not the request for the variance fulfills the variance requirements of this chapter. The City Council shall render a decision denying the variance, granting the variance, or granting the variance with conditions.

(C) Those aggrieved by the decision of the Syracuse City Council may appeal such decision to the court of competent jurisdiction.

(D) The City shall maintain a record of all variance actions, including justification for their issuance, and report such variances issued in its annual or biennial report submitted to the Public Works Director. The Public Works Director shall report any variances to the Federal Emergency Management Agency upon request.

(E) In passing upon applications for a variance, the City Council shall consider all technical evaluations, those specific factors established in SCC 9.20.080(B), the intent and purpose of this chapter, and the following conditions:

(1) Due to the dangers caused by flooding to human life and property and the costs and hardship caused thereby, only under limited circumstances may variances be granted in Syracuse City. Variances shall only be issued upon:

(a) A showing of good and sufficient cause;

(b) A determination that failure to grant the variance would result in exceptional hardship to the applicant; and

(c) A determination that the granting of a variance will not result in increased flood heights, additional threats to human life and public safety, extraordinary public expense, create nuisances, cause fraud on or victimization of the public, or conflict with existing local laws or ordinances.

(2) 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. 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 chapter.

(3) Variances shall not be issued within any designated floodway if any increase in flood levels during the base flood discharge would result.

(4) Variances shall only be issued when a determination has been made that the variance is the minimum necessary, considering the flood hazard, to afford relief.

(5) Variances issued for new construction and substantial improvements and for other development necessary for the conduct of a functionally dependent use may only be granted provided the structure or other development is protected by methods that minimize flood damage during the base flood and create no additional threats to public safety.

(6) Any applicant to whom a variance is granted shall be given written notice that the issuance of a variance to construct a structure below the base flood level will result in increased risk to life and property and an increase in premium rates for flood insurance, which may be substantial and will be commensurate with the risk of construction below the base flood level. Insurance rates may amount up to as high as $25.00 for $100.00 of insurance coverage. This notice shall be maintained with a record of all variance actions as required in subsection (D) of this section.

(7) All variances shall include a condition that the applicant sign an assumption of risk and waiver of liability agreement, in a form acceptable to the City, absolving Syracuse City of any and all liability in the event flood damage occurs to that portion of a structure for which the variance is granted. This agreement shall be recorded in the office of the Davis County recorder, shall run with the land, and shall be binding upon all future owners thereof.

(F) The Syracuse City Council may attach such conditions to the granting of variances as it deems necessary and which fulfill the criteria of the variance provisions of this chapter. [Ord. 07-17 § 1 (Exh. A); Code 1971 § 9-4-100.]

9.20.110 General standards.

In all special flood hazard areas the following standards are required:

(A) Construction Materials and Methods.

(1) All new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage.

(2) All new construction and substantial improvements shall be constructed using methods and practices that minimize flood damage.

(3) All new construction and 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.

(B) Anchoring. All new construction and substantial improvements shall be designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement of the structure and capable of resisting the hydrostatic and hydrodynamic loads, including the effects of buoyancy.

(C) Utilities.

(1) All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system.

(2) New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharge from the systems into flood waters.

(3) On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.

(D) Subdivision Proposals.

(1) All subdivision proposals (including proposals for manufactured home parks and subdivisions) shall be consistent with the need to minimize flood damage in accordance with the purposes and intent of this chapter.

(2) All subdivision proposals (including proposals for manufactured home parks and subdivisions) shall meet the permit requirements of SCC 9.20.080 and all applicable provisions of this section and SCC 9.20.120.

(3) All subdivision proposals (including proposals for 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.

(4) All subdivision proposals (including proposals for manufactured home parks and subdivisions) shall have adequate drainage provided to reduce exposure to flood hazards.

(5) Base flood elevation data shall be provided for subdivision proposals and other proposed development (including proposals for manufactured home parks and subdivisions) which contain at least 50 lots or five acres (whichever is less), if not otherwise provided by SCC 9.20.050(B), Basis for Establishing the Special Flood Hazard Areas, or

SCC 9.20.070(B), Use of Other Base Flood Data. [Ord. 07-17 § 1 (Exh. A); Code 1971 § 9-4-110.]

9.20.120 Specific standards.

In all special flood hazard areas where base flood elevation data has been provided as set forth in SCC 9.20.050(B), Basis for Establishing Special Flood Hazard Areas, or SCC 9.20.070(B), Use of Other Base Flood Data, the following provisions are required:

(A) Residential Construction.

(1) New construction and substantial improvement of any residential structure shall have the lowest floor (including basement) elevated to or above the base flood elevation, with certification provided to the Administrator by a registered professional engineer, architect, or land surveyor.

(2) Require within any AO Zone on the City's FIRM that 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 City's FIRM (at least two feet if no depth number is specified).

(3) Require adequate drainage paths around structures on slopes, to guide flood waters around and away from proposed structures within Zones AH and AO.

(B) Nonresidential Construction.

(1) New construction and substantial improvement of any commercial, industrial or other nonresidential structure shall either have the lowest floor (including basement) elevated to or above the level of the base flood elevation; or, together with attendant utility and sanitary facilities, shall:

(a) Be floodproofed so that below the base flood elevation the structure is watertight with walls substantially impermeable to the passage of water;

(b) Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy; and

(c) Be certified by a registered professional engineer or land surveyor that the design and methods of construction are in accordance with accepted standards of practice for meeting the provisions of this subsection. Such certifications shall be provided to the Public Works Director and include the specific elevation (in relation to mean sea level) to which such structures are floodproofed.

(2) Require within any AO Zone on the City's FIRM that all new construction and substantial improvements of nonresidential structures: (a) 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 City's FIRM (at least two feet if no depth number is specified) or (b) together with attendant utility and sanitary facilities, be completely floodproofed to that level to meet the floodproofing standard specified in subsection (B)(1)(a) and (b) of this section.

(3) Require adequate drainage paths around structures on slopes, to guide flood waters around and away from proposed structures within Zones AH and AO.

(C) Openings in Enclosures Below the Lowest Floor. For all new construction and substantial improvements, 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 floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or must 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 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; and

(3) Openings may be equipped with screens, louvers, valves, or other coverings or devices; provided, that they permit the automatic entry and exit of floodwaters.

(D) Manufactured Homes.

(1) All manufactured homes to be placed within Zone A must be elevated and anchored to resist flotation, collapse or lateral movement and capable of resisting the hydrostatic and hydrodynamic loads. 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. Specific requirements may be:

(a) Over the top ties be provided at each of the four corners of the manufactured home, with two additional ties per side at intermediate locations, with manufactured homes less than 50 feet long requiring one additional tie per side;

(b) Frame ties be provided at each corner of the home with five additional ties per side at intermediate points, with manufactured homes less than 50 feet long requiring four additional ties per side;

(c) All components of the anchoring system be capable of carrying a force of 4,800 pounds; and

(d) Any additions to the manufactured home be similarly anchored.

(2) All manufactured homes or those to be substantially improved which are proposed to be located on sites (a) outside of a manufactured home park or subdivision, (b) in a new

manufactured home park or subdivision, (c) in an expansion to an existing manufactured home park or subdivision, or (d) in an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as the result of a flood, shall meet the following requirements:

(a) Within Zones A1 – 30, AH, and AE, such manufactured homes must 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;

(b) Within Zones A1 – 30, AH and AE, such manufactured homes to be placed or substantially improved on sites in existing manufactured home parks or subdivisions that are not subject to the provisions in subsection (D)(2)(a) of this section must be elevated so that either:

(i) The lowest floor of the manufactured home is at or above the base flood elevation; or

(ii) 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 is securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement.

(E) Recreational Vehicles.

(1) Recreational vehicles placed on sites within Zones A1 – 30, AH, and AE must either: (a) be on the site for fewer than 180 consecutive days, (b) be fully licensed and ready for highway use, or (c) meet the permit requirements of SCC 9.20.080 and the elevation and anchoring requirements for resisting wind forces of subsection (D)(2)(a) of this section.

(2) 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. [Ord. 07-17 § 1 (Exh. A); Code 1971 § 9-4-120.]

9.20.130 Floodways.

Located within special flood hazard areas established in SCC 9.20.050(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, encroachments, including fill, new construction, substantial improvements and other development are prohibited unless the following requirements are met:

(A) Certification by a registered professional engineer or land surveyor is provided demonstrating through hydrologic and hydraulic analyses, performed in accordance with standard engineering practice, that encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge.

(B) All fill, new construction, and substantial improvements, or other development shall comply with all applicable flood hazard reduction provisions of SCC 9.20.110 and 9.20.120.

(C) The Public Works Director may permit encroachments within the adopted regulatory floodway that would result in an increase in base flood elevations, provided the Public Works Director has applied for and been granted a conditional FIRM and floodway revision through FEMA, under the provisions of 44 CFR Chapter 1, Section 65.12, of the National Flood Insurance Regulations. [Ord. 07-17 § 1 (Exh. A); Code 1971 § 9-4-130.]

9.20.140 Violation – Penalty.

Any person, firm or corporation, whether as principal, agent, employee or otherwise, violating or causing or permitting the violation of any of the provisions of this chapter shall be guilty of a Class B misdemeanor, and upon conviction thereof shall be punishable by a fine, or by imprisonment in the Davis County jail, or by both as provided by law. Such person, firm, or corporation shall be deemed to be guilty of a separate offense for each day during which any portion of any violation of this chapter is committed, continued, or permitted by such person, firm, or corporation, and shall be punishable as herein provided. [Ord. 07-17 § 1 (Exh. A); Code 1971 § 9-4-140.]

Capabilities Assessments

Location	Do you have any maps, documents, or plans related to hazards?	Describe building, zoning, ordinances, or other tools to address natural hazards and/or regulate construction in hazard-prone areas	Does your community have the following administrative and technical capabilities?	Which education or outreach programs exist that could be used to implement mitigation activities and communicate hazard-related information?	Should any of these capabilities be expanded or improved to reduce risk?

	Maps and Plans	Codes and Ordinances	Admin and Technical	Education and Outreach	Ways to Improve
Alpine	Flood maps, Lone Peak Emergency Response doc, CIP and stormwater plans, geologic maps showing potential areas or debris flow, landslide and rockfall areas; and fault maps.	Hillside Protection and Wildland Urban Interface ordinances, floodplain ordinance, current building codes. Require studies to verify if potential hazards are really there and to what extent for new developments. If hazards are present, our code requires mitigation measures to be designed and installed. We also require acknowledgement by homeowners, prior to obtaining a building permit, that they are building in an area with potential hazards, especially in areas where development occurred prior to the city having a sensitive lands ordinance.	Community Planner, Warning systems/services, Hazard Data and Information, Maintenance programs to reduce risk, Mutual Aid Agreements, Chief Building Official, Floodplain Administrator, Civil Engineer, GIS Coordinator, Planning Commission, Contract with Lone Peak, Emergency Manger works with Fire Chief	Ongoing public education or information program	I think our staffing is adequate.
American Fork City	Yes. We have the FIRM maps and we keep them updated.	Sensitive Lands Ordinance, Stormwater Management and Discharge Control Ordinance, floodplain management ordinances	Emergency Manager, Community Planner, Warning systems/services, Hazard Data and Information, Maintenance	Ongoing public education or information program	We always could use more resources, but we are routinely

	Maps and Plans	Codes and Ordinances	Admin and Technical	Education and Outreach	Ways to Improve
			programs to reduce risk, Mutual Aid Agreements, Chief Building Official, Floodplain Administrator, Civil Engineer, GIS Coordinator, Planning Commission, Public Information Officer		adding new staff and capabilities.
Cedar Fort	no	zoning ordinances limiting construction on steep slopes and in mountain foothills	Community Planner, Warning systems/services, Maintenance programs to reduce risk, Mutual Aid Agreements, Civil Engineer, Planning Commission		sure
Cedar Hills	Maps locating natural fault lines and flood hazard areas	Hillside development is regulated to require geotechnical studies, slope stability studies, and zoning ordinances dictate slopes for cut and fill areas.	Community Planner, Maintenance programs to reduce risk, Mutual Aid Agreements, Chief Building Official, Civil Engineer, Planning Commission	Ongoing public education or information program	I operate as the Emergency Manager, but need to coordinate with American Fork Fire and Rescue on EM efforts in the Cedar Hills community.
Central Utah Water Conservancy District	Yes; available upon request	We work with cities and counties to address water quality and infrastructure concerns within hazard-prone areas	Emergency Manager, Warning systems/services, Hazard Data and Information, Maintenance programs to reduce risk, Mutual Aid Agreements, Civil Engineer, GIS Coordinator, Communications (SCADA), operations and maintenance staff	Ongoing public education or information program, Public-private partnership initiatives	
Charleston	Flood maps adopted, CIP, wildland protection	Hillside ordinance, follow FEMA floodplain regulations	Emergency Manager, Warning systems/services, Maintenance programs to reduce risk, Chief Building Official, Civil Engineer,		Yes, as Charleston grows

	Maps and Plans	Codes and Ordinances	Admin and Technical	Education and Outreach	Ways to Improve
			Planning Commission, Wasatch county - warning systems & emergency management		
Coalville	Culinary Water Master Plan, general plan: Parks, Open Space and Environment section	Building codes related to fire and steep slopes, open space preservation goals especially in hazardous areas, flood hazard reduction code, sensitive lands ordinance preventing building within 100' of floodplain.	Community Planner, Warning systems/services, Hazard Data and Information, Maintenance programs to reduce risk, Mutual Aid Agreements, Floodplain Administrator, Civil Engineer, Planning Commission	Ongoing public education or information program	
Daniel	Yes, fire, FIRM, geological (faults, landslide, slope)	160 acres/lot in fire-prone areas, 100 yr. floodplain new development must elevate structures, Wasatch County Fire must sign off on all homes in WUI	Emergency Manager, Community Planner, Warning systems/services, Hazard Data and Information, Maintenance programs to reduce risk, Mutual Aid Agreements, Chief Building Official, Floodplain Administrator, Civil Engineer, GIS Coordinator, Planning Commission, Warning systems, Emergency Manager with County	County-wide CERT, educational flyers with water bill, website has newsletter	Emergency notification text system for Daniel, not just through the County
Eagle Mountain	Hazard Maps through GIS department available on website, part of emergency operations plan, Stormwater management plan	Multiple ingress/egress in subdivisions, roofing materials, some defensible space, Geotech reports for development on hillsides	Emergency Manager, Community Planner, Warning systems/services, Hazard Data and Information, Maintenance programs to reduce risk, Mutual Aid Agreements, Chief Building Official, Floodplain Administrator, Civil Engineer, GIS Coordinator, Planning Commission, Volunteer preparedness committee	Citizen or non-profit organizations focused on environmental protection, emergency prep, access and functional needs populations, etc., Ongoing public education or information program, Community Wildfire Protection Plan	No
Elk Ridge	Work with County and MAG	WUI ordinance	Community Planner, Warning systems/services, Hazard Data	Citizen or non-profit organizations focused on	No

	Maps and Plans	Codes and Ordinances	Admin and Technical	Education and Outreach	Ways to Improve
			and Information, Maintenance programs to reduce risk, Civil Engineer, Planning Commission, County Emergency Manager, hire building official, County GIS	environmental protection, emergency prep, access and functional needs populations, etc., Ongoing public education or information program	
Fairfield	no	zoning ordinances limiting construction on steep slopes and foothills	Community Planner, Warning systems/services, Maintenance programs to reduce risk, Mutual Aid Agreements, Civil Engineer, Planning Commission		
Francis City	In our General Plan, we have an earthquake map, fire risk index, past fires map and flood map.	Our city code address building in flood hazards and other sensitive lands.	Community Planner, Civil Engineer, Planning Commission	Ongoing public education or information program	Not right now. Potentially as the city grows.
Genola	NFIP maps	Geotechnical and soils studies for new development, Critical lands overlay, JUB does hydraulic analysis for culinary water	Emergency Manager, Warning systems/services, Hazard Data and Information, Maintenance programs to reduce risk, Mutual Aid Agreements, Chief Building Official, Floodplain Administrator, Civil Engineer, Planning Commission, MAG helps with General Plan, JUB & Franson does engineering, part of regional fire dept, agreement with Santaquin for police	Ongoing public education or information program, Natural disaster or safety related school programs	No
Goshen	No		Warning systems/services, Maintenance programs to reduce risk, Planning Commission, Fire Chief, Hazard date from MAG		No

	Maps and Plans	Codes and Ordinances	Admin and Technical	Education and Outreach	Ways to Improve
Heber City	Wasatch County Personal Emergency Preparedness Pamphlet	Hillside overlay, sensitive lands, floodplain (buildings must be above base flood level), wildfire ordinance	Emergency Manager, Community Planner, Warning systems/services, Hazard Data and Information, Maintenance programs to reduce risk, Mutual Aid Agreements, Chief Building Official, Floodplain Administrator, Civil Engineer, GIS Coordinator through the county, Planning Commission	Citizen or non-profit organizations focused on environmental protection, emergency prep, access and functional needs populations, etc., Ongoing public education or information program, Firewise Communities certification, Public-private partnership initiatives	In-house GIS, more staff for wildfire maintenance monitoring
Henefer	Gas line mapping and evacuation plan, lots of local knowledge on Dominion Energy, Capital Improvements Plan	Multiple ingress/egress, State building codes, no new buildings in the floodplain, newly subdivided land must have grinders on sewer system	Emergency Manager, Community Planner, Warning systems/services, Hazard Data and Information, Maintenance programs to reduce risk, Mutual Aid Agreements, Chief Building Official, Floodplain Administrator, Civil Engineer, GIS Coordinator, Planning Commission, Councilmember is EM, Summit warning system and HAM radios, some hazard data for gas lines	Citizen or non-profit organizations focused on environmental protection, emergency prep, access and functional needs populations, etc., Ongoing public education or information program, May be a firewise community	Need to bolster emergency preparedness
Hideout	No	Geotechnical studies in proposed annexation area, NFIP requirements, State building codes	Community Planner, Chief Building Official, Civil Engineer, GIS Coordinator, Planning Commission		Need to be part of Summit County's emergency alert system, getting a Public Works director, update code for fire mitigation
Highland	FIRM, general plan includes	Building regulations, some environmentally sensitive lands,	Community Planner, Warning systems/services, Hazard Data	Ongoing public education or information program,	

	Maps and Plans	Codes and Ordinances	Admin and Technical	Education and Outreach	Ways to Improve
	environmentally sensitive lands, Emergency Operations Plan (Long Peak), Stormwater management, dam safety plan (debris basin), CWPP (Lone Peak)	FIRMS, natural drainage requirements	and Information, Maintenance programs to reduce risk, Mutual Aid Agreements, Chief Building Official, Floodplain Administrator, Civil Engineer, GIS Coordinator, Planning Commission, Work with Lone Peak for emergency operations, esp. fire	Natural disaster or safety related school programs	
Independence	Wildland Urban Interface map, flood maps	WUI ordinance, revamping code in 1-3 yrs.	Warning systems/services, Maintenance programs to reduce risk, Mutual Aid Agreements, Planning Commission, Town administrator, clerk and mayor, County Sheriff and Fire	Citizen or non-profit organizations focused on environmental protection, emergency prep, access and functional needs populations, etc.	As development occurs
Interlaken	Slope study map that highlights sensitive slope areas, Emergency Response Plan from 2002	Fire standards for new construction remodels, Geotech studies required for slopes	Warning systems/services, Maintenance programs to reduce risk, Mutual Aid Agreements, Civil Engineer, Planning Commission, Interlocal agreement with Wasatch County Fire, contract with TO engineering	Citizen or non-profit organizations focused on environmental protection, emergency prep, access and functional needs populations, etc., Ongoing public education or information program, Firewise Communities certification	Improve warning system with siren
Kamas	Yes, in our General Plan we have a fire risk and historic fire map. Also, a potential landslide map.	We have a sensitive land overlay zone.	Community Planner, Civil Engineer, Planning Commission		Not at this time
Lehi City	Flood Map, General plan environmentally sensitive areas. Debris Management Plan,	Ordinances, International Building Code, Urban wild land interface. Overlay zones	Emergency Manager, Community Planner, Warning systems/services, Hazard Data and Information, Maintenance	Citizen or non-profit organizations focused on environmental protection, emergency prep, access	Mutual aid agreements to be renewed,

	Maps and Plans	Codes and Ordinances	Admin and Technical	Education and Outreach	Ways to Improve
			programs to reduce risk, Mutual Aid Agreements, Chief Building Official, Floodplain Administrator, Civil Engineer, GIS Coordinator, Planning Commission	and functional needs populations, etc., Ongoing public education or information program, Natural disaster or safety related school programs, Public-private partnership initiatives	Additional Staff, Maintenance,
Lindon City	Yes. Environmental features map for sensitive areas (3 identified) with fault lines, conserved wetlands, flood zones, and streams. Ordinances, listed below. EOP describing potential hazards that could affect Lindon City with Appendices including FEMA HAZUS models, Utah quaternary fault and fold map (USGS), moderate and high hazard dams with quaternary fault overlay, Tier II Hazardous Materials, emergency declaration and evacuation orders, and zoning maps. Adopted the FEMA	Established Sensitive Area Districts Ordinance; Flood hazard area standards (raising lowest floor level above flood plain); steep slope ordinance regulates building and grading on steep slope areas; seismic & wind load building code standards for structures.	Emergency Manager, Community Planner, Warning systems/services, Hazard Data and Information, Maintenance programs to reduce risk, Mutual Aid Agreements, Chief Building Official, Floodplain Administrator, Civil Engineer, GIS Coordinator, Planning Commission, Board of Adjustments Commission, Historic Preservation Commission	Citizen or non-profit organizations focused on environmental protection, emergency prep, access and functional needs populations, etc., Ongoing public education or information program, Natural disaster or safety related school programs, CERT, Block Captain System	I think we're doing well in terms of personnel. Perhaps we could look at additional wildland fire hazard risk reduction strategies.

	Maps and Plans	Codes and Ordinances	Admin and Technical	Education and Outreach	Ways to Improve
	FIRM maps as part of our ordinances;				
Mapleton City	No	Flood plain ordinance	Community Planner, Maintenance programs to reduce risk, Mutual Aid Agreements, Chief Building Official, Floodplain Administrator, Civil Engineer, Planning Commission	Citizen or non-profit organizations focused on environmental protection, emergency prep, access and functional needs populations, etc., Ongoing public education or information program	
Midway	We have a chapter in our General Plan devoted to sensitive land and protection of those areas. Included in the chapter are several sensitive land maps that include slope, wetlands, FEMA flood zones, ridgelines, etc. The Midway Land Use ordinance also protects sensitive land.	The Midway Land Use ordinance also protects sensitive land including slopes, wetlands, FEMA flood zones, etc.	Community Planner, Warning systems/services, Hazard Data and Information, Maintenance programs to reduce risk, Chief Building Official, Floodplain Administrator, Civil Engineer, Planning Commission		This will need to be assessed.
Nebo School District	Emergency Plans, Sheltering Plans, Evacuation Plan	Schools have higher standard for building	Emergency Manager, Warning systems/services, Maintenance programs to reduce risk, Mutual Aid Agreements, Chief Building Official, State Risk of Utah insures buildings, School Board	Citizen or non-profit organizations focused on environmental protection, emergency prep, access and functional needs populations, etc., Natural disaster or safety related school programs	No

	Maps and Plans	Codes and Ordinances	Admin and Technical	Education and Outreach	Ways to Improve
Oakley	Sensitive lands, water usage, and geological maps available on website and in plan.	Sensitive lands, State building codes, fire marshal approve site plans in sensitive areas, engineering review	Community Planner, Warning systems/services, Hazard Data and Information, Maintenance programs to reduce risk, Mutual Aid Agreements, Chief Building Official, Floodplain Administrator, Civil Engineer, GIS Coordinator, Planning Commission	Citizen or non-profit organizations focused on environmental protection, emergency prep, access and functional needs populations, etc., Ongoing public education or information program	A specific emergency manager
Orem	Emergency Management Plan, City Communication Plan, Fire Risk Maps, Flood Maps from Dam Break, MAG maps	Hillside ordinance	Emergency Manager, Community Planner, Warning systems/services, Hazard Data and Information, Maintenance programs to reduce risk. Mutual Aid Agreements, Chief Building Official, Floodplain Administrator, Civil Engineer, GIS Coordinator, Planning Commission	Citizen or non-profit organizations focused on environmental protection, emergency prep, access and functional needs populations, etc., Ongoing public education or information program, Natural disaster or safety related school programs, Firewise Communities certification, Public-private partnership initiatives	No
Park City Municipal Corporati on	Yes - Comprehensive Emergency Management Plan (CEMP), Community Wildfire Protection Plan, multiple GIS products, NFIP flood zone maps	Adopting a wildland-urban interface code in order to create home hardening/fire resistant communities.	Emergency Manager, Community Planner, Warning systems/services, Hazard Data and Information, Maintenance programs to reduce risk, Mutual Aid Agreements, Chief Building Official, Floodplain Administrator, Civil Engineer, GIS Coordinator, Planning Commission	Citizen or non-profit organizations focused on environmental protection, emergency prep, access and functional needs populations, etc., Ongoing public education or information program, Natural disaster or safety related school programs, Firewise Communities certification, Public-private partnership initiatives	

	Maps and Plans	Codes and Ordinances	Admin and Technical	Education and Outreach	Ways to Improve
Payson	FEMA maps on Payson website, GIS person can find maps on county GIS system	Wildland Urban Interface area, geotechnical reports required for development, city informs developers of mapped hazards, floodplain maps, international building codes, a sensitive lands ordinances and hillside development to interact with the native landscape and help buffer between the two as well as flood plain requirements.	Emergency Manager, Community Planner, Warning systems/services, Hazard Data and Information, Maintenance programs to reduce risk, Mutual Aid Agreements, Chief Building Official, Floodplain Administrator, Civil Engineer, GIS Coordinator, Planning Commission	Citizen or non-profit organizations focused on environmental protection, emergency prep, access and functional needs populations, etc., Ongoing public education or information program, Education upon request for schools, clubs, church, etc.	All could be expanded, especially hiring a Fire Marshal
Pleasant Grove	NO	WE HAVE A HILLSIDE ORDINANCE ADDRESSING SENSITIVE LANDS PRONE TO GEOLOGICAL HAZARDS.	Emergency Manager, Community Planner, Maintenance programs to reduce risk, Civil Engineer, Planning Commission		WORKING ON GETTING A MUTUAL AID AGREEMENT
Provo City	FEMA FIRMs; Slide-prone areas & known fault zones shown on our GIS	Ordinances/guidelines for flood zones, fault zones, debris-prone areas along frontal canyons, and sensitive lands.	Emergency Manager, Community Planner, Warning systems/services, Hazard Data and Information, Maintenance programs to reduce risk, Mutual Aid Agreements, Chief Building Official, Floodplain Administrator, Civil Engineer, GIS Coordinator, Planning Commission	Ongoing public education or information program, Citizen or non-profit organizations focused on environmental protection, emergency prep, access and functional needs populations, etc., Public-private partnership initiatives	Yes - plan to create levee/river maintenance plan this year
Salem	Watershed operations plan, Emergency Operations Plan in progress	Slope and floodplain ordinances, but all should be updated and improved	Emergency Manager, Warning systems/services, Hazard Data and Information, Maintenance programs to reduce risk, Mutual Aid Agreements, Chief Building Official, Floodplain Administrator, Civil Engineer, GIS Coordinator, Planning Commission	Citizen or non-profit organizations focused on environmental protection, emergency prep, access and functional needs populations, etc., Ongoing public education or information program,	Code enforcement officer

	Maps and Plans	Codes and Ordinances	Admin and Technical	Education and Outreach	Ways to Improve
				Natural disaster or safety related school programs	
Santaquin City	Yes. Plans from EWP NRCS work performed. Also, Supplemental Environmental Assessment Plans for east bench of Santaquin and in the lower area of Santaquin Canyon.	Hillside overlay zones, wetland area restrictions, etc.	Emergency Manager, Community Planner, Hazard Data and Information, Mutual Aid Agreements, Chief Building Official, Civil Engineer, GIS Coordinator, Planning Commission	Ongoing public education or information program	Yes.
Saratoga Springs	yes, GIS	Flood and Grading Ordinances	Hazard Data and Information, Chief Building Official, Floodplain Administrator, Civil Engineer, GIS Coordinator, Planning Commission		Yes, the Emergency Manager needs to be a full-time position
South Summit school district	Emergency Response Plan	Follow ordinances in each jurisdiction, also State Board of Education standards.	Warning systems/services, Maintenance programs to reduce risk, Chief Building Official, School Board, mutual aid with YMCA and others, i.e., for evacuation center	Ongoing public education or information program, Natural disaster or safety related school programs	Better define emergency manager's responsibilities
Spanish Fork	Yes	Flood and Fire zoning, current building codes for seismic, etc.	Emergency Manager, Community Planner, Warning systems/services, Hazard Data and Information, Maintenance programs to reduce risk, Mutual Aid Agreements, Chief Building Official, Floodplain Administrator, Civil Engineer, GIS Coordinator, Planning Commission	Citizen or non-profit organizations focused on environmental protection, emergency prep, access and functional needs populations, etc., Ongoing public education or information program, Natural disaster or safety related school programs	

	Maps and Plans	Codes and Ordinances	Admin and Technical	Education and Outreach	Ways to Improve
Springville City	NFIP Maps are being updated and final maps will be adopted in June 2020. 280 structures are entering the floodplain with this update. We have fault lines, high liquefaction areas, high potential for debris and landslides and the FEMA flood plain on layers on our City GIS Map.	Hill Side Overlay prevents development on slopes greater than 25%. Floodplain development ordinance.	Emergency Manager, Community Planner, Warning systems/services, Hazard Data and Information, Maintenance programs to reduce risk, Mutual Aid Agreements, Chief Building Official, Floodplain Administrator, Civil Engineer, GIS Coordinator, Planning Commission	Citizen or non-profit organizations focused on environmental protection, emergency prep, access and functional needs populations, etc., Ongoing public education or information program, Natural disaster or safety related school programs	
Summit County	Engineering dept posts hazard maps (such as floodplain maps) online as does GIS dept. Summit County Emergency Management Plan, Summit County Community Wildland Preparedness Plan 2019, UFFSL UWRAP Wildland Fire Reports - https://wildfirerisk.utah.gov	Follow the IBC, Critical lands regulations, wildland urban interface requirements, Fire dept. and sewer advisory committees must approve site plans. Fire sprinkler & building material requirements Summit County Development Codes: https://www.summitcounty.org/828/Development-Codes	Emergency Manager, Community Planner, Warning systems/services, Hazard Data and Information, Maintenance programs to reduce risk, Mutual Aid Agreements, Chief Building Official, Floodplain Administrator, Civil Engineer, GIS Coordinator, Planning Commission	Citizen or non-profit organizations focused on environmental protection, emergency prep, access and functional needs populations, etc., Ongoing public education or information program, Natural disaster or safety related school programs, Firewise Communities certification, Public-private partnership initiatives	Strengthen WUI Codes, increase Community Involvement. Everything is dependent on resources.
Utah County	EWP, CWPP, EOP (not yet promulgated), Watershed	Require defensible space, etc. for new construction,	Emergency Manager, Warning systems/services, Hazard Data and Information, Maintenance programs to reduce risk, Mutual	Citizen or non-profit organizations focused on environmental protection, emergency prep, access	No

	Maps and Plans	Codes and Ordinances	Admin and Technical	Education and Outreach	Ways to Improve
	Operations, various evacuation plans.		Aid Agreements, Floodplain Administrator, Civil Engineer, GIS Coordinator, Planning Commission	and functional needs populations, etc., Ongoing public education or information program, Firewise Communities certification	
Vineyard	Draft evacuation plan (Chris)	Comply with state building code, 90+% of building less than 10 yrs. old	Emergency Manager, Community Planner, Warning systems/services, Maintenance programs to reduce risk, Mutual Aid Agreements, Chief Building Official, Floodplain Administrator, Civil Engineer, GIS Coordinator, Planning Commission, Mutual aid w/Orem, County warning system	Ongoing public education or information program, Jr. Building Inspectors program	Amplification of Emergency Manager position & GIS, strengthen maintenance and prevention program
Wallsburg	CIP	Can't build on slopes >30%, slope management. Follow Wasatch County's requirements for slope.	Floodplain Administrator, Civil Engineer, Planning Commission, Wasatch Co: Emergency Manager, GIS Coordinator, Warning System MAG: Community Planner		Educate planning commission on building requirements
Wasatch County	CWPP (community wildland protection program), Emergency Action Plan,	Hillside ordinance, floodplain,	Emergency Manager, Community Planner, Warning systems/services, Hazard Data and Information, Maintenance programs to reduce risk, Mutual Aid Agreements, Chief Building Official, Floodplain Administrator, Civil Engineer, GIS Coordinator, Planning Commission	Citizen or non-profit organizations focused on environmental protection, emergency prep, access and functional needs populations, etc., Ongoing public education or information program, Firewise Communities certification, Public-private partnership initiatives	

	Maps and Plans	Codes and Ordinances	Admin and Technical	Education and Outreach	Ways to Improve
Woodland Hills	Yes, Geostrategy hazard maps used in all new construction	WUI, require geotechnical studies, required fire permits, fire hydrant ordinance for new construction	Warning systems/services, Hazard Data and Information, Maintenance programs to reduce risk, Mutual Aid Agreements, Chief Building Official, Civil Engineer, Planning Commission, LEI engineering contracted for planning & engineering, County EM & GIS	Citizen or non-profit organizations focused on environmental protection, emergency prep, access and functional needs populations, etc., Ongoing public education or information program, Natural disaster or safety related school programs, Firewise Communities certification	Yes, fire dept needs more $