SECTION 4 COUNTY HAZARDS, GOALS AND CAPABILITIES

INTRODUCTION

The county natural hazards, goals and capabilities section provides a definition of each natural hazard analyzed in this plan, a list of shared county goals, and a description of county and local capabilities.

COUNTY NATURAL HAZARDS

Tooele County contains 16 hazards, identified in this plan, that impact at varying degrees all of cities and town within the area. The following county natural hazard definitions are intended to provide a basic understanding of how they occur, where they occur, when they occur, how often they occur, and their impacts on the people, property and natural environment in the region. Maps of the natural hazards and historic occurrence were also included along with their source, event criteria, and limitations. Due to data limitations, avalanche, severe weather and wildlife have only historic occurrences, and drought and radon have no maps.

Rating hazard risks for the county and each community

Each hazard was rated for each community as well as the county as a whole. This risk was classified generally as high, medium, or low based on the extent of the hazard area, frequency of past occurences, and the severity of past hazard events, including damages and losses from those hazards. Since data was limited for most hazard events, these ratings were generalized qualitatively, but informed by quantitative data where possible.

Mapping and GIS Data Disclaimer

Maps created for the Tooele County Pre-Disaster Mitigation Plan are provided "as is." The Bear River Association of Governments (BRAG) and the Tooele County assume no responsibility for errors or omissions. Users of these maps and data assume the entire risk associated with their use. BRAG and Tooele County shall not be held liable for any use or misuse of the maps and data described and/ or contained herein. These maps and data are provided for informational purposes only and were not prepared for, or may not be suitable for legal, engineering, or surveying purposes. Users of this information should consult the primary data and information sources to ascertain the usability of the information (see Appendix D for GIS data references).



ALLUVIAL FANS AVALANCHE CLIMATE CHANGE DAM INUNDATION DEBRIS FLOW DROUGHT EARTHQUAKE **EROSION** FLOOD LANDSLIDE **PROBLEM SOILS** RADON **SEVERE WEATHER STEEP SLOPE** WILDFIRE WILDLIFE/AUTO

ALLUVIAL FANS

DESCRIPTION

"An alluvial fan is a fan-shaped area where silt, sand, gravel, boulders, and woody debris are deposited by rivers and streams over a long period of time. Alluvial fans are created as flowing water interacts with mountains, hills, or steep canyon walls. Sediment and debris can be deposited over time by powerful rivers or small creeks. The top, or narrow point, of the alluvial fan is called the "apex," and the wider portion is called the "apron" or "cone." Alluvial fans can be small or large, depending on the historical water flows." (https://slco.org/conte ntassets/908d08705b834358a5261a60a0aab 9f2/neffs_sheet2.pdf)

Alluvial Fan Hazard in Tooele County

Mapping of alluvial fans in Tooele County is limited. The majority of identified alluvial fans are present in the foothills of the Oquirrh Range on the eastern side of the county. As this study is being conducted efforts are being made to map alluvial fans south and west of the Granstville area. Initial findings indicate that alluvial fan formation is persistent to the southwest. These formation likely contribute to ground water flooding events within Grantsville City. No significant events involving alluvial fans in Tooele County have caused damage in Tooele County to date.

TOOELE COUNTY GOALS

Alluvial fans play an important role in the hydrologic cycle. Watershed functionality within the county rely on alluvial fans to distribute flood water energies during storm events, and distribute water runoff into Aquifers for long term storage.

County Goals for alluvial fans are:

- Avoid residential, commercial and industrial development within identified alluvial fans.
- Seek alternative uses for alluvial fans with reduced negative impact on flood hazard and water quality.



Alluvial Fans - Pink areas represent alluvial fan risk data (courtesy of the Utah Geological Survey).

HAZARD PROFILE

Location			
Area of Impact	Drainage Basins and Foothills		
Timing			
Duration	Single event to long term damage to aquifer system		
Speed of Onset	Moderate		
Seasonal Pattern	Annual		
Occurrence			
Frequency	Geologic Formation		
Probability of Future Occurrence	High		
Impact			
Severity	Severe		
RELATED HAZARDS Flood Events Planning Resources			
		TAH GEOSPATIAL RI https://gis.utah.gov/da	ESOURCE CENTER UGR

AVALANCHE HAZARD INFORMATION: https://utahavalanchecenter.org/

AVALANCHE

DESCRIPTION

An avalanche is a rapid flow of snow down a hill or mountainside. They can occur when stress from gravity pulling snow downhill exceeds the strength of the snow cover.

AVALANCHE TYPES

Gliding

Gliding avalanches occurs when the entire snowpack slowly slides as a unit over the ground. This can occur with wet, moist, or almost entirely dry snow usually on steep slopes (around 40° or greater) with relatively smooth ground surface.

Slab

Slab avalanches occur when a slab of snow on the surface detaches from a weaker snow layer underneath. The slab layer becomes heavier than the weaker under layer of snow either because the slab layer becomes wet and heavy from quickly warming conditions, or hard and heavy over time due to wind drifts or old, hardened layer of snow.

AVALANCHES IN TOOFLE COUNTY

Avalanches generally occur between a slope of 35° and 45°, above timberline, and away from prevailing winds. In the Tooele County Avalanche deaths have been relatively rare. Most deaths are backcountry recreationist between the months of November and April. As the popularity of backcountry recreation increases, so will risk in Tooele County.

No significant avalanches have caused damage in Tooele County to date.

TOOFLE COUNTY GOALS

Coordinate with local and federal organizations to make avalanche safety information and resources available to recreators in the county.



Loose

Loose avalanches occur when dry, uncompacted snow releases from a point, and spreads out downhill collecting more snow, forming a fan shape.











- Purple areas represent avalanche risk terrain, and includes steep slope and vegetation communities with dispursed shrubs, grasses, and bare ground.

HAZARD PROFILE

Location	
Area of Impact	Isolated
Timing	
Duration	Seconds to minutes
Speed of Onset	Seconds
Seasonal Pattern	Late fall through spring

Occurrence

Frequency	High
Probability of Future Occurrence	High

Impact

Severity

RELATED HAZARDS

Minor

Earthquakes can trigger an avalanche

Planning Resources

UTAH AVALANCHE CONDITIONS: https://utahavalanchecenter.org/

AVALANCHE HAZARD INFORMATION: https://utahavalanchecenter.org/

CLIMATE CHANGE

DESCRIPTION

Climate change is a long-term shift in climate patterns. For the purposes of this plan, climate change refers to the rise in global temperatures which affects local weather variations. Although not considered a natural hazard on its own in this plan, rising temperatures affect and amplify the location, timing, occurrence and impacts of most natural hazards (National Academy of Sciences, Engineering, and Medicine, 2016). Impacts from climate change include:

- Prolonged drought
- Increased flooding and erosion
- More extreme weather events (heat, cold)
- Longer growing season
- Shifts in the water cycle with less winter precipitation falling as snow
- Snowmelt and rainwater runoff
 occurring earlier
- Larger and more severe wildfires
- Less resilient ecosystems

CLIMATE CHANGE IN TOOELE COUNTY

Tooele County is located within the basin and range region. This area is characterized by

arid and semi-arid climates. Prolong drought and shifting weather patterns are likely to become an more common occurrence in this region as the effects of climate change become more pronounced. This will put stress on water resources, agriculture, tourism and communities.

In the basin and range where snow packs are projected to decrease as warmer temperatures occur. According to U.S. Forest Service research (2008) the result for water resources are increased winter flows, reduced and earlier spring peaks, and reduced summer and fall flows. Agriculture will likely grow better due to a longer growing season if water supplies are sufficient.

It is difficult to determine if severe weather events in Tooele County have been caused by climate change or not. As such, it is also difficult to quantify damages to the county specifically from climate change-related events.

TOOELE COUNTY GOALS

• Encourage wise water use practices in residential, commercial and industrial

applications.

- Integrate water quality and quantity planning into general plan documentation
- Reduce county emissions by prioritizing transit oriented development patterns





- The entirety of Tooele County can be potentially impacted by current and future climate change.



HAZARD PROFILE

Location	
Area of Impact	Widespread
Timing	
Duration	Persistent
Speed of Onset	Years
Seasonal Pattern	Year-round
Occurrence	

Frequency	High
Probability of Future Occurrence	Highly Likely

Impact

Severity

Minor to catastrophic

Related Hazards See climate change description

Planning Resources

MEASURING CLIMATE CHANGE: https://www.noaa.gov/education/resourcecollections/climate/climate-data-monitoring

PLANNING FOR CLIMATE CHANGE https://toolkit.climate.gov/topics/ built-environment/planning-and-land-use

DAM INUNDATION

DESCRIPTION

A dam failure is the sudden, rapid and uncontrolled release of impounded water, causing downstream flash flooding. Dams can fail for one or more of the following reasons:

- Overtopping caused by floods that exceed the capacity of the dam
- Deliberate acts of sabotage
- Structural failure of materials used in dam construction
- Movement and/or failure of the foundation supporting the dam
- Settlement and cracking of concrete or embankment dams
- Piping and internal erosion of soil in embankment dams
- Inadequate maintenance and upkeep

DAM FAILURE IN TOOELE COUNTY

Dam failure is not a common hazard in Tooele County. Currently there are 2 high hazard dams in the County and 5 moderate hazard dams (see the next page). High hazard dams are defined as a dam whose failure will cause loss of human life and significant property destruction.

Most dams in the county are owned and

operated by private canal and irrigation companies. Dam owners are responsible for the upkeep and are also primarily responsible when dams fail and cause environmental, economic, and personal damage.

No significant damage has occured to date from dam failure in Tooele County.

TOOELE COUNTY GOALS

 Promote the regular inspection and maintainance of all dams within the region.





Dam Innundation Areas

- Blue areas represent potentially flooded areas if a dam breaks when at full capacity.

HAZARD PROFILE

<u>_ocation</u>	
Area of Impact	Isolated to local

Timing

_	
Duration	Hours to weeks
Speed of Onset	No warning to hours
Seasonal Pattern	Any time of year, but is more likely to occur in spring when the snow melts

Occurrence

Frequency	Low
Probability of Future Occurrence	Low: 1-2% chance per year

Impact

Severity

Minor

Related Hazards

Earthquake can trigger a dam failure Severe Weather can increase likelihood of a dam failure Flooding can result from a dam failure

Planning Resources

UTAH DAM CONDITIONS: https://waterrights.utah.gov/daminfo/

DAM FAILURE HAZARD INFORMATION: https://www.fema.gov/why-dams-fail

DEBRIS FLOW

DESCRIPTION

"Debris flows and related sediment flows are fast-moving, flow-type landslides composed of a slurry of rock, mud, organic matter, and water that move down drainage-basin channels onto alluvial fans. Debris flows generally initiate on steep slopes or in channels by the addition of water from intense rainfall or rapid snowmelt and often occur after wildland fires." (https://geology.utah.gov/ hazards/landslides/debris-flows/)

DEBRIS FLOW N TOOELE COUNTY

Debris flow potential in Tooele County has yet to be extensively mapped. The mapped areas shown on the fallowing page identify drainage areas associated with mountain ranges in the eastern parts of the county. These areas should not be considered a full extent of areas where debris flows might occur.

The mapped areas better describe areas from which debris flows might eminate, actual debris flow events would be expected to follow typical flood channels.

Debris flow events are exacerbated by other types of hazard events in the area such as

wildfire, landslide, earthquake, and flood. Large scale disturbances to the landscape, especially at higher elevations, can be strong indicators of increased potential for debris flow hazard.

No reported damage has occured in Tooele County to date from debris flow events.

TOOELE COUNTY GOALS

 Work with land owners to stabilize banks of streambeds throughout the county



Debris Flow

- Pink areas represent potential debris flow risk areas in Tooele County (data courtesy of the Utah Geological Survey).



HAZARD PROFILE

Location	
Area of Impact	Isolated to local
Timing	
Duration	Hours to weeks
Speed of Onset	No warning to hours
Seasonal Pattern	Any time of year, but is more likely to occur in spring when the snow melts
	more likely to occur in spring when the snow melt

Occurrence

Frequency	Low
Probability of Future Occurrence	Low

Impact

Severity Minor to Severe

Related Hazards

Earthquake can trigger Severe Weather can increase likelihood Flooding can increase likelihood

Planning Resources

DROUGHT

DESCRIPTION

A drought is a prolonged period of unusually dry weather that causes decreased water supply to surface and subsurface sources. While droughts occur naturally, they can be exacerbated by how humans use and managed water. Cause of drought range from natural to human factors, including:

- Fluctuating ocean and land temperature, especially warming temperatures leading to evaporation and severe weather conditions
- · Air circulation and weather patterns
- Reduced soil moisture
- Demand and management of water
- Climate change
- Deforestation and soil degradation

The Palmer Drought Severity Index (PDSI) is used to measure drought by three categories: moderate, severe and extreme.

Moderate Drought

- Some damage to crops, pastures;
- Streams, reservoirs, or wells low, some water shortages developing or imminent;
- Voluntary water-use restrictions requested

Severe Drought

- Crop or pasture losses likely;
- Water shortages common;
- Water restrictions imposed

Extreme Drought

- Major crop/pasture losses;
- Widespread water shortages or restrictions

DROUGHT IN TOOELE COUNTY

Drought is one of the more common hazards affecting Tooele County. Drought impacts water related sectors, such as agriculture and municipal water supplies, recreation, tourism, vegetation, and wildlife.

Based on the Palmer Drought Severity Index (October 2021), the state is currently experiencing a severe to exceptional drought (drought.gov/current-conditions).

No reported substantial damage has occured to Tooele County communities from drought to date, though it is likely that some damage has occured on some level.

TOOELE COUNTY GOALS

- Encourage wise water use practices in residential, commercial and industrial applications.
- Integrate water quality and quantity planning into general plan documentation





- Drought will impact every community in Tooele County at some point. This can be in the form of severe storms, high winds, tornado's, hail, temperature fluxuations, or other types of severe weather.



HAZARD PROFILE

Location	
Area of Impact	Widespread
Timing	
Duration	Weeks to years
Speed of Onset	Weeks to months
Seasonal Pattern	Anytime of year, but peaks during the fall around October

Occurrence

Frequency	High
Probability of Future Occurrence	High: 70% chance per year

Impact

Severity

Minor to serious

Related Hazards

Problem Soils can result from drought Severe Weather can increase the chance of drought Wildfires can result from drought

Planning Resources

UTAH DROUGHT CONDITIONS: https://droughtmonitor.unl.edu/

HOW TO PLAN FOR DROUGHT https://drought.unl.edu/droughtplanning/

DROUGHT HAZARD INFORMATION: https://drought.unl.edu/

EARTHQUAKE

DESCRIPTION

An earthquake is the vibrations or shaking that occurs after large blocks of the earth's crust move against each other along a fault or by volcanic activity. Earthquakes are described in terms of magnitude and intensity:

Richter Scale (magnitude)

• Measures the total energy released by an earthquake

Modified Mercalli Intensity Scale (intensity)

Measures the effects of an earthquake
 at a particular area

EARTHQUAKE IN TOOELE COUNTY

Tooele County is located in the Intermountain Seismic Belt; an area stretching from Canada through central Utah that is characterized by frequent earthquake activity. Although earthquakes generally occur in mountainous regions, their impacts can be experienced throughout the entire County. The County has historically experienced over 7 earthquakes ranging from 3.0 to 4.8 magnitude on the Richter Magnitude Scale. However, in March of 2020, the county experienced a much larger earthquake with a magnitude of 5.7. See Appendix F for more information on historical earthquakes in Tooele County.

All quaternary faults in the region were mapped and 1,500' buffer was applied to the fault to imply a fault damage zone. Significant faults within the county include:

- Oquirrh fault zone
- Southern Oquirrh Mountains fault zone
- Skull Valley (Mid-valley) faults
- South Mountain Marginal fault

Liquefaction potential was also collected in order to identify further earthquake hazard risk potential. Liquefaction areas have only been mapped in the northeastern section of the county and show significant liquefaction potential in soils approaching the shoreline of the Great Salt Lake.

TOOELE COUNTY GOALS

- Work with Utah DEM to better understand earthquake risk
- Assess structural inventory of countyowned buildings related to earthquake risk









- Orange areas represent quaternary geologic faults with 1,500' buffers to represent potential damage zones, as well as moderate to high liquefaction risk areas (data courtesy of the Utah Geological Survey).

HAZARD PROFILE

Location	
Area of Impact	Local to widespread

Timing

Duration	Minutes
Speed of Onset	No warning
Seasonal Pattern	None

Occurrence

Frequency	Moderate
Probability of Future Occurrence	High

Impact

Severity

Limited to catastrophic

Related Hazards

Avalanches can be triggered by an earthquake Dam Failure and Flooding can result from an earthquake Landslides can be triggered by an earthquake Liquefaction can result from an earthquake Wildfires can result from the damaged caused by an earthquake

Planning Resources

UTAH EARTHQUAKE CONDITIONS: https://quake.utah.edu

EARTHQUAKE HAZARD INFORMATION: https://geology.utah.gov/hazards/earthquakes/

EROSION

DESCRIPTION

"Subsurface erosion of soil or rock by groundwater flow that forms narrow voids. Piping can remove support of overlying soil and rock, resulting in collapse. This internal erosion of soil can lead to failure of the structure and to sinkhole formation as voids within the soil cause the progressive development of internal erosion by seepage appear downstream as a hole discharging water. Piping and erosion can cause AC and PCC pavement failure, severe building and infrastructure distress and differential movement and canals and other gravity flow utilities to fail." (https://site.utah.gov/ dps-emergency/wp-content/uploads/ sites/18/2019/02/8-Geologic-Hazards.pdf)

EROSION IN TOOELE COUNTY

Erosion potential is pervasivive throughout the county. The majority of mapped erosion hazard occures at higher elevation sloped terrain within and arround the counties mountian ranges.

Erosion hazard is multiplied be distrubance events in the landscape. These can be caused by natural events such as wildfires or by construction of roads and development of homes and industrial facilites.

No reported substantial damage has occured in Tooele County from erosion events.

TOOELE COUNTY GOALS

 Coordinate with local and federal entities to revegitate distirbed sites



- Areas in organge depict potential erosion hazard areas, particularly as they relate to roads and trails in Tooele County (data extracted from the USDA NRCS SSURGO soils dataset).

HAZARD PROFILE

Location		
Area of Impact	Isolated	
Timing		
Duration	Seconds to minutes	
Speed of Onset	Seconds	
Seasonal Pattern	Late fall through spring	
Occurrence		
Frequency	High	
Probability of Future Occurrence	High	
Impact		
Severity	Minor	
RELATED HAZARDS		
Wildfire Landslide		
Planning Resources		
PROBLEM SOILS INFORMATION: https://geology.utah.gov/hazards/problem-soils/		

DESCRIPTION

A flood is the partial or complete inundation of normally dry land from either:

- Overflow of stream banks;
- The unusual and rapid accumulation of runoff of surface waters from any source; or
- Mudflows or the sudden collapse of shoreline land

Flooding occurs when the flow of water in a stream is above its normal carrying capacity or accumulates faster than the ground can absorb it. The severity of a flood event depends on several factors, including precipitation (rain and/or snow) and weather patterns, stream basin topography and physiography, stormwater conveyance, soil moisture, and the amount of bare earth and/or impervious surfaces.

TYPES OF FLOODS

Flash Flood

Flash floods occurs when runoff from excessive rainfall causes a rapid rise in the water height (stage) or a stream or normallydry channel. Causes of flash floods include dam failure, heavy rain, and ice or debris jams.

River Flood

River floods occur when runoff from longerlasting rainstorms or snow melt cause a slow water-level rise over a large area. Causes of river floods include precipitation and snowmelt.

FLOODS IN TOOELE COUNTY

Flooding occurs annually in Tooele County, especially during the spring runoff when snow melts off the mountains. The most prone flood prone areas include valley bottoms along streams (floodplains) and canyons.

Landscape elements with a direct relationship to flooding have been included in the flood areas of this plan. Riparian and Wetland ecosystems are dependent on seasonal and intermittent flooding. Their presence indicates that these ares are likely flooded at some interval allowing the fauna of these ecosystems to persist.

In August of 2021, the county experienced fairly severe flooding. The damages from that flood are still being assessed.

TOOELE COUNTY GOALS

• Work with Federal and local authorities to improve flood mapping in the region.







- Areas in various shades of blue represent flood risk based on various datasets and methodologies (data courtesy of FEMA, NRCS, State of Utah, UGS, USU, and UGRC.

HAZARD PROFILE

Area of Impact	Isolated to widespread

Timing

Duration	Hours to weeks
Speed of Onset	Hours
Seasonal Pattern	Spring during the snowmelt, and summer/ fall from burn scars

Occurrence

Frequency	High
Probability of Future Occurrence	High

Impact

Severity Minor to extensive

Related Hazards

Earthquakes can cause a dam failure leading to a flood Severe Weather can increase the chance of a flood Wildfires can create conditions (burn scars) that increase an areas susceptibility to a flood (debris flow)

Planning Resources

UTAH FLOOD FORECAST: https://www.cbrfc.noaa.gov/

LAND USE PLANNING FOR FLOODS: https://floodresilience.net/how-can-land-useplanning-help-to-reduce-flooding

LANDSLIDE

DESCRIPTION

A landslide is the downward and outward movement of slopes composed of rock, soils, and/or debris. Landslides include rock falls mud flows, and debris flows. Landslides occur when the resisting forces that hold the earth decrease or the driving forces that facilitate its movement increase. Conditions that increase landslide susceptibility:

- Strong geologic units overlying weak geologic units
- Orientations of dip slope or bedding planes that dip out of slope.
- Additional weight to the top of a slide, such as rain; snow; adjacent landslides; mine waste piles; buildings; leaks from pipes, sewers, canals; and construction or fill materials
- Ground shaking from earthquakes or mechanical vibrations
- Human activities, such as cut and fill practices, quarries, mine pits, road cuts, and rapid lowering of reservoirs.
- Removal of underlying support, including undercutting of river banks
- Increase in pore water pressure consistent with snow melt, rain, and irrigation

LANDSLIDES IN TOOELE COUNTY

Landslides occur naturally across Tooele County on a continuous basis, and can also be triggered by human actions, such as mining and land development. Landslides generally occur in the mountainous parts of the county where there are steep slopes.

No substantial damage has occured in Tooele County from landslides to date.

TOOELE COUNTY GOALS

Limit development in areas with slop and soil conditions that create landslide risk





- Areas in purple represent generalized landslide risk in Tooele County (data courtesy of the Utah Geological Survey).

HAZARD PROFILE

<u>Location</u>	
Area of Impact	Isolated

Timing

Hours to weeks
No warning to hours
Spring through fall

Occurrence

Frequency	Low
Probability of Future Occurrence	Low

Impact

Severity

Minor to serious

RELATED HAZARDS

Flood/Severe Weather can cause a landslide Wildfires can create conditions (burn scars) that increase an areas susceptibility to a landslide/ debris flow

Planning Resources

LANDSLIDE PREPAREDNESS INFORMATION: https://www.ready.gov/landslides-debris-flow

LANDSLIDE HAZARD INFORMATION: https://geology.utah.gov/hazards/landslides/

PROBLEM SOILS

DESCRIPTION

Problem soils are a group of hazards related to the specific properties of soils, and include:

- Collapsible soil: Soils that have considerable strength when in a day, natural state, but significantly settle due to hydrocompaction (reduction of air space within the soil) when wetted;
- Expansive soil: Soils with high clay content that swell when wet and shrink when dried. They result from seas or lake hundreds of thousands to millions of years ago. Often causes cracked foundations and road surfaces, and failure of wastewater disposal systems;
- Subsidence: The sinking of the ground caused by groundwater depletion and/ or underground mine subsidence or collapse; and
- Erosion: Often initiated by water or wind, is the removal and transportation of earth material from one location to another.

Problem soils can cause extensive damage to structures and foundations, and may also damage pavements after construction. They have caused an undetermined, but very significant amount of infrastructure damage and resulting economic impact.

PROBLEM SOILS IN TOOELE COUNTY

Problem soils are widespread throughout Tooele County. Weather, topography and hydrology greatly influence the extent and severity. Generally, problem soils can be found in these areas:

Expansive soil: Because most of the Region was submerged by ancient Lake Bonneville, expansive soils can be found throughout the county.

<u>Collapsible soil</u>: Occur where loose, unconsolidated soil are deposited, such as canyon mouths (alluvium), the foot of steeps slopes (colluvium), landslide deposits, or clay-rich bedrock, such as shale or mudstone. Generally collapsible soils can be found near foothills and canyon mouths throughout the Region.

<u>Subsidence</u>: Occurs in areas where groundwater has been depleted and have unconsolidated aquifer systems.

No substantial damage has occured from problem soils in Tooele County to date.

TOOELE COUNTY GOALS

 Discourage development within problem soil areas







Problem Engineering Soils



- Areas in yellow depict soils that could cause structural problems for various buildings and infrastructure (data extracted from the USDA NRCS SSURGO soils dataset).

HAZARD PROFILE

<u>.ocation</u>	
Area of Impact	Widespread

Timing

Duration	Hours to weeks
Speed of Onset	Hours to days
Seasonal Pattern	Any time of year following wet/dry events

Occurrence

Frequency	Persistent
Probability of Future Occurrence	High

Impact

Severity

Minor to serious

RELATED HAZARDS

Earthquake can trigger liquefaction Drought can cause soils to shrink or sink Flood can cause soils to swell or compact

Planning Resources

UTAH PROBLEM SOIL CONDITIONS: https://geology.utah.gov/hazards/problem-soils/

PROBLEM SOIL HAZARD INFORMATION AND MITIGATION ACTIONS: https://www.nrcs.usda.gov/Internet/FSE_ DOCUMENTS/16/nrcs143_019308.pdf

RADON

DESCRIPTION

Radon is an orderless, tasteless, and clear radioactive gas resulting from the natural decay of uranium that is found in nearly all rocks and soil. When concentrated in areas, such as buildings, it can lead to lung cancer. It is the most fatal of all Utah's hazards (Utah Division of Emergency Management, 2019). Radon gas is easily dissolved in water and is released into the air during water use and movement. High levels of radon are not common in Utah's public-water supplies, but may be present in well water.

RADON IN TOOELE COUNTY

In Tooele County, outdoor radon levels rarely reach dangerous concentrations because air movement scatters radon into the atmosphere. However, dangerous outdoor radon levels are often encountered near uranium ore processing waste piles, mine openings, and related operations, such as the Tintic Mining District.

Radon is a hazard in buildings because the gas collects in enclosed spaces. Building conditions that can contribute to high indoor

radon levels, include:

- Structures built on or near groundwater that contains sufficient uranium;
- Underlying soil that allows easy movement of radon;
- Porous building materials, cracks, and/ or other openings below the ground surface that allow radon from soil to enter the building; or
- Lower air pressure inside than in the soil around a building foundation

The best way to identify radon is through short-term or long-term testing administered through the Utah Department of Environmental Quality: *https://deq.utah.gov/wastemanagement-and-radiation-control/radon/ radon-program.*

It is unclear what type of damage has occured in Tooele County from radon, though it is likely that individual impacts have occured.

TOOELE COUNTY GOALS

 Promote Radon testing throughout the county

HAZARD PROFILE

Location	
Area of Impact	Isolated

Timing			
Duration	Persistent		
Speed of Onset	Years		
Seasonal Pattern	Year round, higher in winter		

Occurrence

Frequency	High
Probability of Future Occurrence	High

Impact

Severity Minor to serious

Planning Resources

CENTRAL UTAH HEALTH DEPT. RADON INFORMATION: https://www.centralutahpublichealth.com/radon_ testing.html

RADON TESTING IN UTAH: https://deq.utah.gov/waste-management-andradiation-control/radon/radon-program

RADON HAZARD INFORMATION: https://geology.utah.gov/hazards/problem-soils/

radon/#tab-id-3



Description: This map displays areas by the percentage of it with radon home test results greater than or equal to 4 pCi/L, which is considered unsafe levels (Utah DEQ, 2019).

Limitations: Data does NOT identify areas with high radon levels. Radon can vary site to site.



SEVERE WEATHER

DESCRIPTION

Severe weather is considered any weathercaused hazard event, such as extreme cold, extreme heat, hail, lightning, tornado, wind, and winter storms. Because of their relative unpredictably, these events are classified and addressed together.

- <u>Extreme cold</u>: An event characterized by temperatures at or below freezing for an extended period of time
- <u>Extreme heat</u>: Weather that is substantially hotter and/or more humid than the average for a location at that time of year
- <u>Hail</u>: Precipitation in the form of irregular pellet- or ball-size ice which occurs when strong, rising currents of air within a storm carry water droplets to a height where they freeze. As ice particles grown in size, they become too heavy to be supported and fall to the ground
- •
- Lightning: A visible electrical discharge produced by a thunderstorm
- •
- <u>Wind</u>:
- <u>High winds</u>: Sustained wind speeds of

40 mph or greater and lasting one hour or long, or winds 58 mph or greater for any duration

- <u>Tornados</u>: A funnel-shaped violent rotating column of air generated by thunderstorms
- <u>Thunderstorms</u>: An event characterized by the presence of lightning and thunder that it usually accompanied by strong winds, heavy rain, and hail, or sometimes no precipitation at all
- <u>Winter Storm</u>: A prolonged snow or ice event that is classified by the amount of snow or ice, temperature, wind and event duration. It can include:
- <u>Heavy snow</u>: 4 or more inches of snow in 12 hours or less)
- <u>Blizzard</u>: Low temperatures, wind gusts above 35 mph, snow and/or blowing snow that reduces visibility to 1/4-mile or less for 3 or more hours
- <u>Sleet</u>: Ice composed of frozen or mostly frozen raindrops or refrozen partially melted snowflakes
- <u>Ice storms</u>: When damaging accumulations of ice are observed or expected during freezing rain situations

SEVERE WEATHER IN TOOELE COUNTY

Severe weather can occur anywhere in

Tooele County. High winds are prevalent in mountainous areas as downslope wind coming over mountains or gap winds in canyons. The county has observed at least 3 tornado event since 1950 as recorded by NOAA.

No updated/accessible NOAA data exists for Tooele County. However, it can be assumed that some type of severe weather occurs in the county on an annual basis.

TOOELE COUNTY GOALS



HAZARD PROFILE			
Area of Impact Widespread			
Timing			
Duration	Seconds to days		
Speed of Onset	Seconds to days		
Seasonal Pattern	Anytime of year, depending on the event		
Occurrence			
Frequency	High		
Probability of Future Occurrence	High		

Impact

Severity

Minor to extensive

Related Hazards

Dam failure, Flood and Landslide can result from a precipitation event Drought can result from extreme heat and wind events

Planning Resources

U.S. STORM PREDICTION CENTER: https://www.spc.noaa.gov/

SEVERE WEATHER PREPAREDNESS: https://www.weather.gov/ama/severesafetyplan

STEEP SLOPE

DESCRIPTION

A landslide is the movement of a mass of rock, debris, or earth down a slope by force of gravity. They flow rapidly, striking at avalanche speeds that can travel several miles, growing in size as they pick up trees, boulders, cars and other materials.

Landslides occur when the slope or soil stability changes from stable to unstable, which may be caused by earthquakes, storms, volcanic eruptions, erosion, fire, or additional human-induced activities. Slopes greater than 10 degrees are more likely to slide, as are slopes where the height from the top of the slope to its toe is greater than 40 feet. Slopes are also more likely to fail if vegetative cover is low and/or soil water content is high. However, landslides can occur with very little slope, sometimes classified as earth slumping or earth flow.

Hazard Description: This map displays areas of steep slopes (30 percent slope or greater) and was developed using the U.S. Geologic Survey National Elevation Dataset. For more information visit: https://www.usgs.gov/core-sciencesystems/national-geospatial-program/ national-map

STEEP SLOPE IN TOOELE COUNTY

Severe weather can occur anywhere in Tooele County. High winds are prevalent in mountainous areas as downslope wind coming over mountains or gap winds in canyons. The county has observed at least 4 tornado event since 1950 as recorded by NOAA.

No reported damages have occured directly from steep slopes in Tooele County.

TOOELE COUNTY GOALS



Diagram of an idealized landslide showing commonly used nomenclature for its parts.



Major types of landslides and their physical characteristics (from U.S. Geological Survey Fact Sheet 2004-3072 [http://pubs.usgs.gov/fs/2004/3072/fs-2004-3072.html]).



- Areas in pink depict steep slopes in Tooele County (data extracted from a 10-meter digital elevation model courtesy of UGRC).

HAZARD PROFILE

Location			
Area of Impact Isolated			
Timing			
Duration	Seconds to minutes		
Speed of Onset	Seconds		
Seasonal Pattern	Late fall through spring		
Occurrence			
Frequency	High		
Probability of Future Occurrence	High		
Impact			
Severity Minor			
RELATED HAZARDS			
Earthquakes can trigger an avalanche on steep stopes			
Planning Resources			
Visit gis.utah.gov for access to topographic datsets.			

Visit geology.utah.gov for more information on unstable slopes and soils.

WILDFIRE

DESCRIPTION

A wildfire is an unwanted fire spreading uncontrolled through primarily wildland vegetation. Wildfire probability depends on fuel, weather and topography. Wildfires can occur in the:

- <u>Wildland</u>: An area where development is almost nonexistent, except for roads, railroads, or power lines, and the
- <u>Wildland Urban Interface (WUI)</u>: An area where structures and other human development meet or intermingle with wildland or vegetation fuels

Fuel: Anything that will burn including vegetation and structures

Weather: High temperatures, low humidity and high winds increase the likelihood that a wildfire will spread.

Topography: Affects speed at which a wildfire will spread. A fire will move more quickly uphill which causes hot gases to rise in front of it. These gases in turn, pre-heat and dry vegetation ahead of the wildfire causing it to catch fire more rapidly.

WILDFIRE IN TOOELE COUNTY

Between 1972 and 2018 there were 292 wildfires, or an average of 5 per year. Most wildfires were naturally occurring and less than 0.1 acres in size. However, the Region also experiences human-caused wildfires, and averages about 2 wildfires that burn 500 acres or more per year.

Most recently, the following wildfires threatened communities in Tooele County between 2018 and 2021:

- Middle Canyon Wildland Fire July 2018
- Cedar Mountain Fire July 2018
- Green Ravine Wildland Fire August 2019
- Stansbury Island Fire May 2020
- Puddle Valley Fire May 2021

Wildfires are prevalent in areas of pinyonjuniper woodland, invasive grasses, such as cheat grass, and stands of coniferous and hardwood trees.

TOOELE COUNTY GOALS

- Work with Utah Forestry, Fire and State Lands, the U.S. Forest Service, the BLM, and other land management agencies and private landowners to decrease fuel loads in high risk areas.
- Educate local residents on risk reduction strategies such as defensible space and sprinkler systems in high risk areas.









- Areas in orange represent moderate to high wildfire risk (data from the Wildfire Hazard Potential map courtesy of the US Forest Service, Fire Modeling Institute).

HAZARD PROFILE

Location		
Area of Impact	Isolated to widesprea	

Timing

_		
Duration	Hours to weeks	
Speed of Onset	Hours	
Seasonal Pattern	Early summer through fall	

Occurrence

Frequency	High
Probability of Future Occurrence	High

Impacts

Severity

Minor to extensive

Related Hazards

Drought can increase dry fuels Earthquake damage could ignite a wildfire Flood/Landslide can result from a burn scar High Winds damage could ignite a wildfire and/or increase dry fuels Lightning can ignite a wildfire

Planning Resources

ACTIVE WILDFIRES IN UTAH: https://utahfireinfo.gov/active-wildfires/

WILDFIRE OUTLOOK: https://www.nifc.gov/nicc/predictive/outlooks/outlooks. htm

PLANNING FOR WILDFIRE: https://www.fs.fed.us/openspace/fote/reports/GTR-299. pdf https://www.nfpa.org/Public-Education/Fire-causesand-risks/Wildfire

WILDLIFE

DESCRIPTION

Infrastructure corridors traverse the landscape, including wildlife habitat. The result is an increased likelihood of vehicle-wildlife crashes. Factors that contribute to vehicle-wildlife crashes can include:

- Proximity to suitable wildlife habitat
- Season
- Weather
- Size of road
- Traffic volume of road
- Speed of vehicles
- Road surface type
- Proximity to human development

WILDLIFE CRASHES IN TOOELE COUNTY

Wildlife crashes can occur on any road in Tooele County. The Utah Department of Transportation collects crash data for state highways in the region. More crashes occur during the winter when deer, elk and moose come down to lower elevations for food.

Areas with historically high rates of vehiclewildlife crashes are often areas near populated and well travel corridors, including: Highway 36 Corridor (south and north of Tooele City)

It is unclear how many fatal accidents have occured from wildlife crashes in Tooele County since 2016.

TOOELE COUNTY GOALS





Wildlife Auto Collision



- Areas in red represent high risk areas for wildlife-auto collisions based on historical data from the Utah Department of Transportation (UDOT).

HAZARD PROFILE

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Location	
Area of Impact	Isolated

Timing

Duration	Seconds	
Speed of Onset	Seconds	
Seasonal Pattern	Anytime of year, higher rates of crashes in winter	

Occurrence

Frequency	High
Probability of Future Occurrence	High

Impact

Severity	Minor to serious

Related Hazards

Drought, Flood and Wildfire can all cause wildlife to migrate in and out of their home range

Planning Resources

METHODS FOR REDUCING TRAFFIC CRASHES INVOLVING DEER: https://defenders.org/sites/default/files/publications/ methods_to_reduce_traffic_crashes_involving_deer. pdf

NFIP, REPETITIVE LOSSES, AND COMMUNITY CAPABILITIES

NATIONAL FLOODPLAIN INSURANCE PROGRAM (NFIP) COMPLIANCE

The NFIP was created to reduce the impacts of flooding on private and public structures by providing affordable insurance to property owners, renters and businesses. This is accomplished by encouraging communities to adopt and enforce floodplain management regulations to help mitigate the effects of flooding on new and improved structures. Included in the program is the reduction of repetitive loss properties.

During the planning process, Floodplain Administrators (FPA's) were invited via local elected and appointed officials and community staff, many of which are currently serving in that capacity in addition to other duties.

NFIP PARTICIPATION

The list to the right shows communities that are, and are not, active participants in the NFIP. Any flood related mitigation strategies that these communities created related to continued compliance with NFIP were described in their mitigation action.

National Flood Insurance Program (NFIP) Participation and Flood Data/Status						
	Community Name	CID	Initial FIRM Identified	Current Effective Map Date	Online FIRM?	GIS Data Available**
	Confederate Tribe of the Goshute Reservation	NO INFORMATION AVAILABLE				
	Erda				Y	Limited
	Grantsville	490141#	11/18/2009	(NSFHA)	Ν	Ν
	Lake Point				Ν	Ν
	Ophir				Ν	Ν
TOOELE	Pine Canyon				Y	Ν
COUNTY	Rush Valley	NOT PARTICIPATING Y			Y	
	Skull Valley				Ν	Ν
	Stansbury Park				Ν	N
	Stockton	490144#	8/5/1980	11/18/09(M)	Y	Y
	Tooele	490145#	9/29/1989	11/18/2009	Y	Y
	Tooele County	490140#	11/16/1990	11/18/09(M)	Y	Y
	Vernon	NOT PARTICIPATING		Y	Y	
	Wendover	490222#	8/19/1980	11/18/09(M)	Y	Y

Source: Federal Emergency Management Agency (FEMA) National Flood Insurance Program, 2021

* Unincorporated areas only

**(GIS) Geographic Information Systems (Mapping and geographic analysis software)

(E) Emergency Program or (R) Regular Program

(NSFHA) No Special Flood Hazard Area

REPETITIVE LOSS PROPERTIES

A repetitive loss property is any insurable building that has had two or more claims of more than \$1,000 paid by the NFIP within a rolling ten-year period. As of October of 2021, there are no repetitive loss properties in the Tooele County.

COMMUNITY CAPABILITIES

The following is a description of the planning, regulatory, administrative and technical capabilities for the region. Capabilities were generalized for the region because most jurisdictions have similar resources available to them.

Planning and Regulatory Capabilities

Most incorporated jurisdictions in Tooele County have an adopted General Plan as required by state code. Although some communities have recently updated their General Plan, some are very outdated and have not been revised in years. Generally speaking, if these plans address natural hazards at all, they are addressed generally.

All of the seven municipalities have an adopted zoning ordinance, including Tooele County. For the smaller communities these ordinances can be outdated and may not be as consistent with the jurisdiction's General Plan as would be ideal.

Most zoning ordinances do not address natural hazards even if they are mentioned in the General Plan. A few communities have a "sensitive area" or "hazard area" overlay zone, but they are very basic, often mentioning a brief requirement for geotechnical reports or other studies. All incorporated communities issue building permits and enforce local building codes. This service is usually contracted out to the county. Many of the smaller communities lack emergency response plans.

Local Organizational and Technical Capabilities

Only a handful of communities in Tooele County have full or part-time professional staff of any kind. In many cases a limited tax base means that hiring 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 volunteer city council members or planning commissioners assigned the task of emergency management, grant writing, or long-range planning. Professional staff with Tooele County Emergency Management help provide some technical and natural hazards planning assistance to some of the smaller communities. This assistance is often limited by staffing capacity and funding. As funding allows, some communities are able to contract for professional services from private consultants. Only Tooele County, Tooele City, Dugway Proving Grounds, and Grantsville have staff that is, for the most part, dedicated full-time to emergency management, planning, public works, or related tasks.

Jurisdictional Capability to Expand Policies and Program

Each incorporated community in Tooele County is authorized by state law to regulate land use activities and plan for future growth in their respective community. By law, cities, towns, and counties are required to address land use, transportation, and affordable housing (for larger communities) in their community General Plan. Especially in recent years, communities have been much more proactive with updating their plans to include more detail and more fully comply with state codes and ordinances, and to protect them from liability should a natural hazard event occur.

However, many of the smaller cities and towns do not have adequate funding, staffing, or financial resources to update their local General Plan every 3-5 years per state and other recommendations. In fact, some communities have not updated their General Plans since they were first created in the late 1970's and early 1980's. These smaller jurisdictions often do not have the resources to expand on or improve existing policies and programs as professionally, extensively, or as timely, as the larger jurisdictions do. There are some resources which can help, although they are limited. Tooele County, Utah League of Cities and Towns, The State of Utah, and other resources are available, but each has limited funding, staffing, or resources to provide assistance.

Those communities with full-time staff are much more likely to have adequate capacity to apply for funding or update the General Plan and other plans/documents in house. See the table to the right which shows staffing, emergency response capacity, and technical capacity for jurisdictions in Tooele County.

LOCAL COMMUNITY CAPABILITIES - TOOELE COUNTY								
Jurisdiction		Professional Staffing	Emergency Response Capacity	Technical Capacity				
		(e.g. Emergency Manager, City Manager, Engineer, Planner)		(In House)				
	TOOELE COUNTY	County Emergency Management, Building and Development Services, Roads Department	Fire, EMS, and Law	Planning and Development, GIS, Engineering				
ies	Grantsville City	Public Works, Planning and Zoning Administrator, Building Official	Local Fire, EMS, and Law	Planning and Development				
nuniti	Ophir Town	Volunteer\County consultant	County Fire, County Law and Contracted EMS	None				
Comr	Rush Valley Town	Volunteer\County consultant	Local Fire, County Law and Contracted EMS	None				
Incorporated	Stockton Town	Volunteer\County consultant	Local Fire and Law and Contracted EMS	None				
	Tooele City	Community Development, Public Works, Engineering	Local Fire, EMS, and Law	Planning and Development, GIS, Engineering				
	Vernon Town	Volunteer\County consultant	Local Fire, County Law and Contracted EMS	None				
	Wendover City	Volunteer\County consultant	Local Fire, County Law and Contracted EMS	None				
s	Dugway	Military Oversight, Emergency Management, GIS support	Local Fire, EMS, and Law	Planning, Engineering, GIS				
unitie	Erda	Volunteer\County consultant	Local Fire, County Law and Contracted EMS	None				
Unincorporated Comm	Goshute Reservation	Volunteer\County consultant	Local Fire, County Law and Contracted EMS	None				
	Lake Point	Volunteer\County consultant	Local Fire, County Law and Contracted EMS	None				
	Pine Canyon	Volunteer\County consultant	Local Fire, County Law and Contracted EMS	None				
	Skull Valley	Volunteer\County consultant	Local Fire, County Law and Contracted EMS	None				
	Stansbury Park	Stansbury Park Service Agency	Local Fire, County Law and Contracted EMS	None				

MITIGATION STRATEGY GOALS

The following goals reflect the collective conditions that jurisdictions in the region would like to meet to mitigate natural hazards. Jurisdictions developed their mitigation strategies based on these goals with a particular emphasis on developing two goals for each hazard. One for protecting current residents and property, and one for protecting future residents and property. Jurisdictions were encourage to develop their own community specific goals. No jurisdictions elected to develop any. In Section 4-9, each jurisdictions mitigation strategy coincides with at least one for the following goals for either current or future residents and property. Goals in that section were denoted with the goal number and whether it applies to "C" current, "F" future or "CF" current and future residents and property. For example: 5C means consider minimize damages and losses to critical facilities, structures and infrastructure for current residents.

REGIONAL MITIGATION STRATEGY GOALS

- 1. Eliminate and/or reduce loss of life from natural hazard events;
- 2. Protect the health, safety and welfare of residents before, during and after a natural hazard, especially for vulnerable

populations;

- Improve and promote systems that provide early warning communications prior to and during an emergency;
- 4. Minimize damages and losses to critical facilities, structures and infrastructure;
- Consider maintaining or improving existing facilities, structure and infrastructure before building new;
- Incorporate hazard mitigation into building codes, land use ordinances, long-range planning, budgeting and other development related actives;
- Improve public outreach and access to hazard information, data, and maps to enhance understanding of natural hazards and their risk;
- Improve public knowledge of natural hazards and protective measures so individuals can prepared for and respond to them;
- Educate public officials, developers, realtors, contractors, buildings owners and the general public about hazards risks and developing contingency plans;
- 10. Protect, maintain and restore natural systems, features and other environmentally important lands that provide mitigation, such as floodplains, riparian areas and other open spaces;
- 11. Form partnerships to leverage and share resources;
- 12. Increase the coordination and cooperation

among local, state and federal governments, and private organizations in carrying out hazard mitigation actions; and

 Monitor, evaluate and record natural hazard areas and events through mapping and other tracking methods

PRIORITIZATION OF MITIGATION STRATEGIES

A guiding factor in prioritizing mitigation strategies was the principle that mitigation should provide the greatest amount of good to the greatest number of people, after considering funding, staffing, and other resource constraints.

Probability of occurrence, impacts to people, property, economy and future development were summarized during the assessment of vulnerability (risk summary tables) and were also considered for priority and time line values. Priorities were also based on community staffing, resources, and elected official support. High priority strategies are supported by elected officials, there is staffing to manage the project, and the community has resources for implemenation. Medium priority projects were based on at least two of those elements, and low priority projects were based on one element.