

Toquerville

The City of Toquerville was settled by Mormon Pioneers in the mid-1800s, by Mormon pioneers. Its placement in a riverine canyon bottom made Toquerville a good location for agricultural endeavors in the area. The community is located south of Black Ridge and located on the stream called Ash creek, roughly 30 miles south of Cedar city and 20 miles north of St. George. The community has a small population of full-time residents and sees annual visitation to the community and Zion National Park over 3.5 million. Toquerville provides access from the North to Zion National Park from I-15, and sees people traveling Highway 17, which runs through the center of town.

The community may receive snow during the winter, which often melts during the heat of the day. Summer tends to produce high heat and monsoon thunderstorms, which drops rainfall, hail, and lightning across the region. Annual precipitation is sparse and the city regularly receives strong winds.

Demographics

Toquerville is a rural community in southwestern Utah. As of the 2018 American Community Survey, the community has a population of 2,031 people, described in Figure 312. The 2020 census is not yet available to include in this document, so the 2018 ACS estimates the most recent population for the area.

The Toquerville population saw growth from 1970 to 2010, although the 2018 estimated population indicates a decline in population. Population changes over the past several years, described in Figure 313, shows that the population has been increasing by an average of 41% each decade between 1960 and 2010, with peak change observed in 2000 at 86.5%.

Population projections for the county have been completed by the Kem C. Gardner Institute describe that Washington County is expected to see an 229% increase in population between 2015 and 2065. If applied to Toquerville, the community could see 6,047 people living in the community in the next 45-years¹.

Economy

Toquerville's historic economy revolved around homemaking and wineries in the region at the time of colonial settlement. Since that time, the community has grown to include several local businesses,

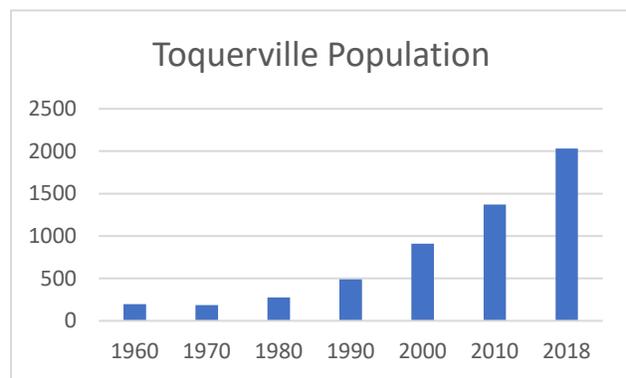


Figure 1: Toquerville Population by Decade

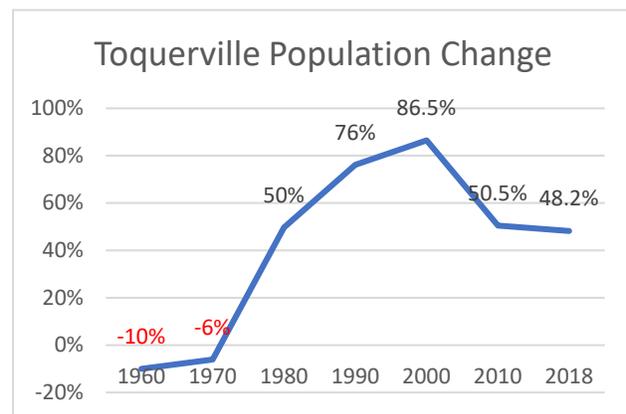


Figure 2: Toquerville Population Change

¹ This estimate is created using the 2015 ACS population estimate for Toquerville, which was 1,838, and adding 229% of this population estimate to the population for that year.

restaurants, and other commercial endeavors. The community is a gateway to Zion National Park, which draws millions of annual visitors through the community.

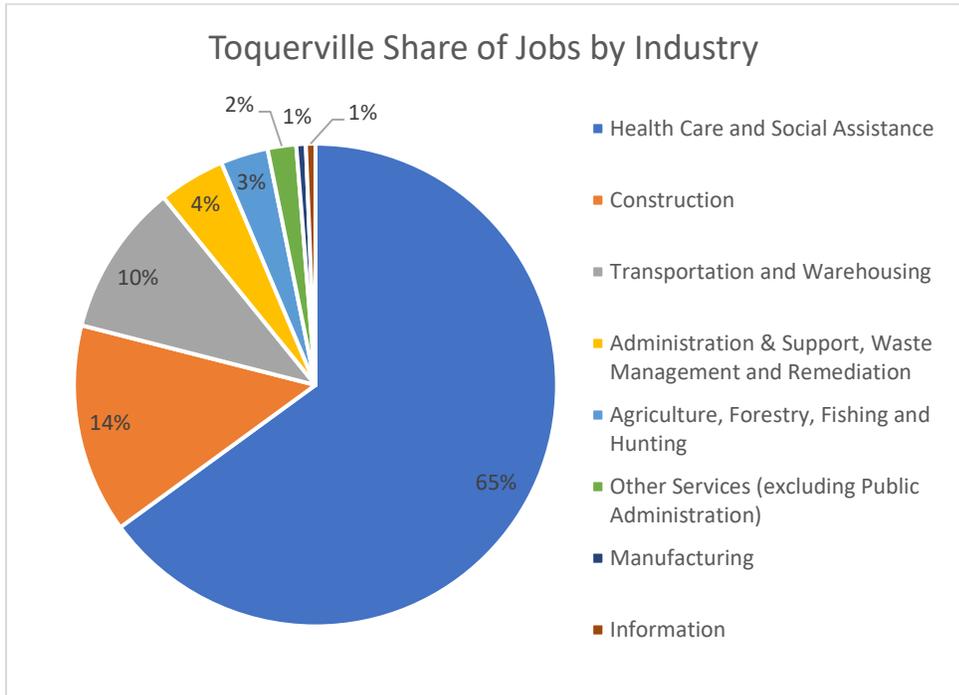


Figure 3: Toquerville share of Private Primary Jobs by Industry

The US Census Bureau OnTheMap tool depicts Toquerville’s prominent industries by the number of jobs supported in the community, illustrated in Figure 313. Over 65% of the jobs in the community are in the Healthcare and Social Assistance industry. A recovery center is in Toquerville, which likely contributes to the prominence of this industry in the community, in addition to an overall aging population which may need additional services. Construction and transportation and warehousing are also significant employers. The community still maintains agriculture, forestry, fishing, and hunting industries, which were historically prominent to the area following colonial settlement.

Development

New development in Toquerville is occurring or is anticipated in the following areas:

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Community Capabilities

Toquerville is governed by a mayor and council, who engage in executive and legislative activities for the community, respectively. Elections for these positions are every four years. Administrative staff include a city manager, treasurer, recorder, public works administrator, building inspector, and water and maintenance official who support the implementation of legislative actions. A planning commission also supports specialized review and recommendation of planning and zoning activities in the community to the council.

Public safety is provided by Washington County, who provides law enforcement through the Sheriff’s office. Fire and Emergency Medical Services (EMS) is provided by the Hurricane Valley Fire District.

Garbage, water, and sewer utilities are provided by Toquerville City. Natural Gas is provided through Rocky Mountain Power.

The community has three City parks available for public use and open space.

Plans and Policies

Toquerville City has developed plans and policies which set goals, objectives, and laws for the community. Several of these documents describe natural hazards in the goals, objectives, and laws, which have been summarized here. The following section provides an overview of Toquerville City's plans and policies as they relate to natural hazards. Additional plans may exist, which were not made available for review.

Please review the community plans in full to understand current policies and ordinances. The section below is for summary purposes only.

Codes and Ordinances

Local codes and ordinances for Toquerville city address a range of natural hazards, including landslides, floods, wildfire, severe weather, drought, and problem soils. The community sets requirements for development in areas exposed to these natural hazards and practices local homeowners can take to mitigate community wide impacts of the respective natural hazards.

General Plan

The Toquerville General Plan (2017) documents the long-term community vision for the city, as described by residents through public comments and hearings. Natural Hazards are not an element of the general plan; however, the land use, housing, transportation, economy, and public services elements can describe natural hazard risks and gaps to mitigation. General plans are often a vision which is implemented through the adoption of code by a community. The general plan describes the need for consideration of development and placement of infrastructure in potential hazard areas. Standards for residential and commercial properties weed and debris abatement also can act as a hazard mitigation technique. The community addresses severe weather through emphasizing weatherization techniques and managing the stormwater drainage system in line with development, which can reduce exposure of residents to high-risk situations.

Standard and Specifications

The Toquerville Standards of Specifications (2020) describe the conditions and instructions for infrastructure improvements in the city. Standards include the use of irrigation ditches for storm water flows, drainage control requirements, storm drainage and culvert design, description of allowable development in floodplains, and allowable locations of public water mains to address flooding.

Parks Master Plan

The Toquerville Parks Master Plan (2016) describes Natural Hazards in the park aesthetics, location, and features in the community. Steep slopes are described as being integrated into community amenities, including an amphitheater and in other cases are described needing vegetation, trees, and rock mulch to be added to the steep slopes for aesthetic purposes. Flooding is described as a risk to many parks in their current condition, and potential future growth needs. Actions in the plan describe needs for assessment & mitigation in flood prone areas near parks, the potential for flooding on creeks and

streams damaging park improvements, and integration of stormwater detention basins into park amenities.

Water Conservation Plan

The Toquerville Water Conservation Plan (2019) addresses the need for water conservation programs and practices to meet future water needs in the community, considering rapid growth in the state of Utah. Drought is the only natural hazard addressed in this plan. Action for water conservation include addressing outdoor water use locally, recommending that residents use drought resistant vegetation and trees in landscaping.

Capital Facilities Plan

The Toquerville City Capital Facilities Plan (2020) describes the essential facilities needed to support the resident population and the volumes of visitors to the area which use community infrastructure, includes the need to plan for future uses of facilities. Water pipes, streets, storm drainage, trails, parks, and other facilities are described in this plan. Some of the critical facilities included in the plan include steep slopes which could be made more aesthetically pleasing by adding vegetation, tree, and shrub planting, extending storm drain infrastructure on local roads, and adding beautification features to a stormwater detention pond in a local park.

Transportation Plan

The Toquerville City Transportation Master Plan (2018) seeks to identify the transportation network to successfully plan for future needs, development, and growth. The plan highlights certain environmental concerns which the city may be exposed to, which include problem soils and flooding challenges and describes certain transportation “enhancements” which would include water runoff mitigation, which could be a mitigation tactic for severe weather and flooding events.

Risk Assessment

Toquerville is at risk to several natural hazards addressed in this Natural Hazard Mitigation Plan. Five County has worked with the Toquerville planning team to develop a ranking the highest risk hazards based on probability, and local exposure of the hazard. Table 350 describes the relative risks of hazards in the community.

Table 1: Toquerville Risk Assessment Summary

HAZARD	RISK
DROUGHT	1. High
FLOOD	2. High
SEVERE WEATHER	3. Moderate
WILDFIRE	4. Moderate
EARTHQUAKE	5. Moderate

LANDSLIDE	6. Moderate
RADON	7. Low
PROBLEM SOIL	8. Low

A detailed description and mapping of each of the natural hazards that impact Toquerville can be found in this chapter, concluding with a mitigation strategy for the community. The mitigation strategy aims to reduce the risks and vulnerabilities in the community to natural hazards described in this plan and has been developed by the local planning team.

Five County assessments for Hurricane include reviewing the exposure that critical facilities, residential parcels, parks, and roads have to the natural hazards that impact the area. Critical facilities include schools, medical facilities, fire stations, and police stations and law enforcement facilities.

Wildfire

Toquerville is a town marked by its access to outdoor recreation and open spaces. The urban community is considered a gateway to the recreation opportunities in southeastern Washington County, including Zion National Park. There are also roadway and water assets in the community which may be vulnerable to wildfire, including Ash Creek and I-15.

Figure 314 maps the wildfire risk using data obtained from the Oregon Department of Forestry on the Utah Wildland Risk Assessment Portal. Mapping completed by the Five County AOG describes those areas in and surrounding Toquerville that are at moderate to extreme risk to wildfire. The metrics used to determine risk rating can be found in the Hazard Identification section of this plan.

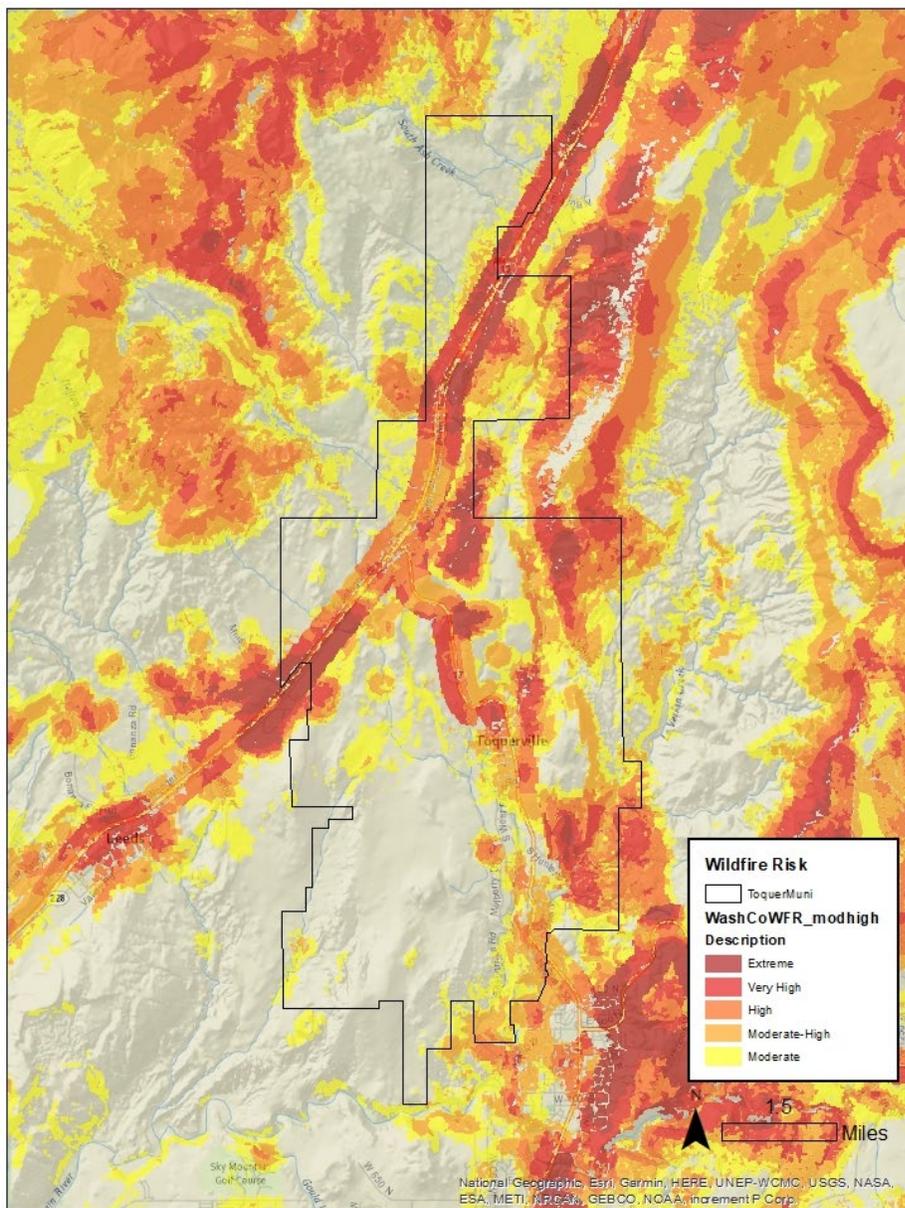


Figure 4: Toquerville Wildfire Risk

Source: Oregon Department of Forestry, AGRC.

Table 351 further describes Toquerville’s risk by measuring assets that fall in identified wildfire risk areas. Exposure to wildfire risk areas of moderate or greater ranking impacts critical facilities, parcels, and miles of roadway in Toquerville, which could damage property, impact public health and safety, or impact local economies. Almost all commercial and residential parcels are exposed to wildfire risk areas in Toquerville, which can have an impact on local economies and access to goods and services for residents, in addition to endangering life and personal property. Forty-three percent of the road miles in the community are at moderate to extreme wildfire risk, which can challenge response and recovery and the travel of people and goods. All Toquerville critical facilities are exposed to moderate or greater wildfire risk, which can impact response, equipment, and facilities essential for community function.

Table 2: Toquerville Wildfire Risk

Toquerville Exposure to Wildfire Risk						
Critical Facilities	Parcels			Road Miles	Rail Miles	Parks
	Commercial	Residential	Total			
100.0%	100.0%	86.5%	86.7%	43.8%	N/A	N/A

Source: Oregon Department of Forestry, Washington County Assessor, Utah AGRC.

Hazard History

Several agencies track and manage wildfire data, leading to some differences in the record. This plan references the Utah Wildfire Info database, which records recent, large wildfires from 2017 to present and fires designated under Fire Mitigation Assistance Grant program from FEMA. In addition to these sources, this plan references previous documentation from the 2016 NHMP and news articles. Table 352 summarizes the wildfire events which have impacted Toquerville.

Table 3: Toquerville Wildfire Record

Fire Name	Year	Acres Burned	Description
Anderson Junction Fire	2020	350	Caused by dragging chains on the roadway. Resulted in the evacuation of several homes.
Sandy Fire	2020	Unknown	Caused by lightning strike. Closed a campground and guard station due to fire danger.

Source: Utah Fire Info

Utah Fire Info reported a 2020 fire which was started by a lightning strike and endangered a campground/guard station near Toquerville. Another fire which was started in 2020 was caused by chains dragging by a vehicle on the roadway, which sparked a brushfire which consumed 500 acres and evacuated homes. Other fires may have occurred near Toquerville but were not documented on the sources used. Fires elsewhere in the county or region may have also impacted Toquerville with secondary impacts.

Wildfire impacts air and water quality and can affect public health through airborne ash and smoke. Individuals with respiratory disease, athletes, or people using outdoor spaces can be impacted by smoke and ash in the air. This ash settles on the ground and riparian areas, affecting water quality for a region. Riparian areas and drinking water assets can be at risk to settling debris from burning.

Wildfire can have economic impacts through damage to infrastructure and structures. In this area of Southern Utah, where public lands are an asset to a local economy, damage in these spaces can impact industries for several seasons, including tourism.

Wildfires can also cause and have heightened risks depending on other ongoing climate, weather, and geologic conditions. Wildfires can cause or exacerbate flash flooding, landslides, debris flows as burned area does not have vegetation to secure the soil, allowing it to wash away in a flood or landslide.

Drought hazards can contribute to conditions which lead to heightened wildfire risk, with excessively dry vegetation and low water levels. Changing climate conditions will also contribute to wildfire risk long-term as dry conditions are expected to continue. Drought, flash flooding, and landslides all pose risks to Hildale, and it is essential to be aware of the interrelated nature of these hazards.

Segments of the Hurricane Fault have been identified in the Toquerville City limits, and impacts community assets, as described in Table 353. Faults are generally identified on the eastern portion of the community, and interact with one critical facility, multiple commercial properties, and several residential properties, which can impact personal safety, property, and emergency response during a ground shaking or earthquake event. Road miles have the greatest exposure to quaternary faults, at approximately 30.3% of the asset within a quarter mile of identified faults.

Table 4: Toquerville Exposure to Quaternary Faults

Toquerville Exposure to Quaternary Faults						
Critical Facilities	Parcels			Road Miles	Rail Miles	Parks
	Commercial	Residential	Total			
50.0%	75.0%	47.4%	47.7%	30.3%	N/A	N/A

Source: UGS, Garfield County Assessor, AGRC

Another identified vulnerability to earthquakes in the region includes structures built before 1975, when seismic code requirements were adopted by the State of Utah. Many of these structures are built using unreinforced masonry construction, which does not have steel reinforcements in the structure to protect it during a shaking event. Structures built in this style can collapse and see increased damages to the structure during a shaking event. According to Washington County Assessors data, 92 Toquerville structures were built before the adoption of seismic code requirements, approximately 18.3% of the total structures in the city boundaries. Southern Utah has a pride in the pioneer history of the region, which often includes preservation of historic buildings. Preservation should include retrofitting of structures to ensure the safety of those inside and outside of structures made from unreinforced masonry during a shaking event. Such preservation will also improve the safety of people inside and outside of the structure during a shaking event.

Liquefaction

The Utah Geological Survey has completed mapping of liquefaction susceptibility for southern Washington County, which includes Toquerville. Liquefaction is a secondary hazard that can occur following strong shaking, where the soil loses its structure and becomes fluid, which can be a risk to structures and property on susceptible soils. Figure indicates that Springdale has areas of moderate to very high susceptibility to liquefaction hazards.

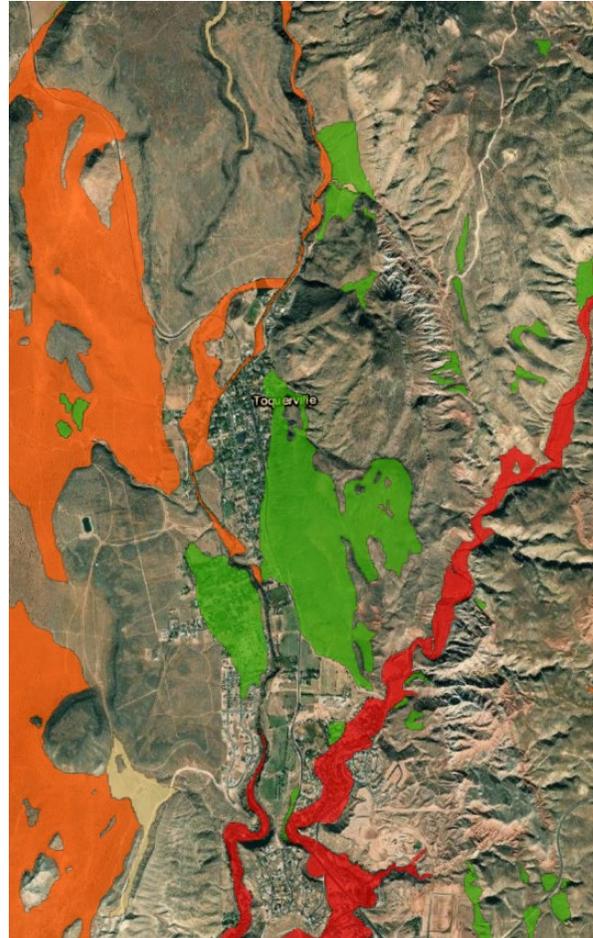


Figure 6: Toquerville Liquefaction Susceptibility

Source: Utah Geological Survey

Hazard History

The University of Utah Geology Departments and the US Geological Survey document seismic history, which has been used for this plan. To focus on severe earthquake events, Five County includes earthquakes with magnitudes of 4.0 or greater. The University of Utah and USGS sources documented magnitude differ slightly in their measurement.

No earthquake epicenters or faults are identified in the municipal boundary, although an earthquake epicenter is identified in the Zion National Park, 4.5 miles from Springdale. Earthquakes elsewhere in the county may have been felt and caused impacts in Toquerville, including the 1992 5.8 magnitude earthquake with an epicenter in Washington City. This earthquake caused impacts from Flagstaff, AZ to Richfield, Utah and from Las Vegas, NV to Escalante, UT. (Peterson) Impacts from this event included damages to building walls as the shaking loosened plaster and walls cracked throughout the region.

Earthquakes are generally not triggered by other natural hazard events prevalent in the Southwest, although they can be caused by human activities like drilling or mining or volcanic eruptions. Several hazards can be caused by earthquakes, including flooding, landslide, and wildfire.

Flood

Flooding events are common in the southwest, especially flash flooding as severe summer thunderstorms produce rapid downfalls of rain. Dams in the region contribute to potential flooding hazard as failure could inundate an area downslope. Figure 317 depicts the mapped 100-year floodplain, dam inundation, and riverine erosion exposure in Toquerville. The Virgin River seems to be primary corridors for flooding potential.

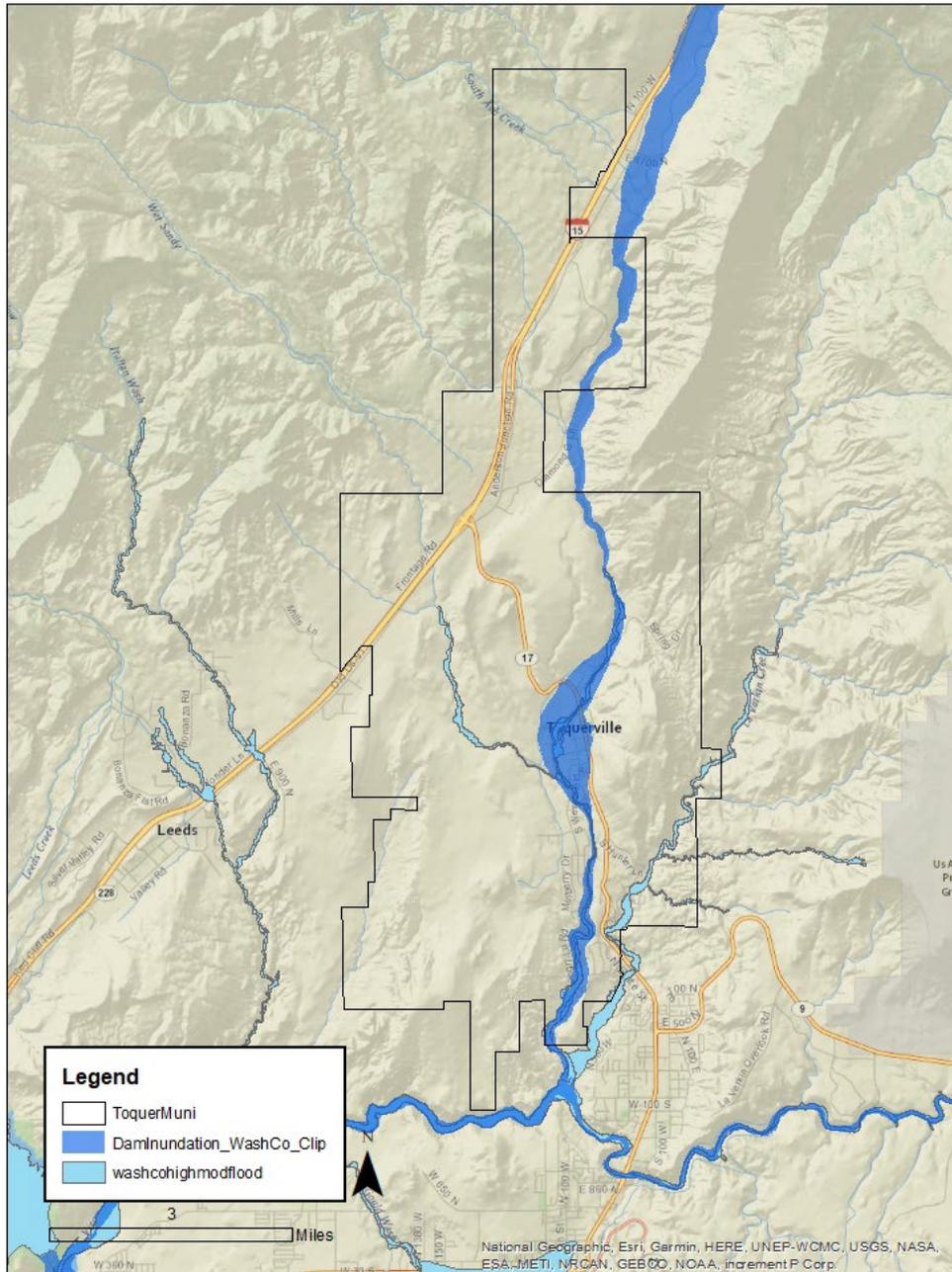


Figure 7: Toquerville Floodplain and Dam Inundation Exposure

Source: Flood Insurance Rate Map, AGRC

Table 354 describes the Toquerville community assets exposed to dam inundation, and the 100-year floodplain zones. Residents, visitors, and personal property may be vulnerable to flooding impacts. Commercial parcels and critical facilities are also identified in flood risk areas. Businesses can see loss of inventory, delay in providing services, and costs to recover from flood impacts. Damages can take significant time and cost to repair following a flood. All the community’s critical facilities are exposed to flood risk areas. Impacts from flood on a critical facility may result in delays in service, damage, or loss of equipment, among other potential outcomes.

Table 5: Toquerville Exposure to Floodplain and Dam Inundation

Critical Facilities	Parcels			Road Miles	Rail Miles	Local Parks
	Commercial	Residential	Total			
100.0%	75.0%	44.7%	45.0%	14.7%	N/A	N/A

Source: Floodplain Map, Washington County Assessor, UDOT, AGRC.

National Flood Insurance Program

Toquerville property, assets, and homes outside of the mapped zones are not free of flooding risk. Since the inception of the National Flood Insurance Program (NFIP), approximately 25% of all paid claims were not located in a special flood hazard area. (Insurance Information Institute, 2020) The National Flood Insurance Program has provided flood related assistance in rebuilding and repairing structures following flood damages since 1978. Communities must participate in the NFIP for their residents and businesses to purchase insurance. This involvement requires certain policies and practices for the floodplain. Participation in the NFIP can reduce the cost of recovery following flooding.

Table 6: Toquerville NFIP Participation and Claims Paid

Total Premium	V-Zone	A-Zone	# Policies	Total Coverage	Claims since 1978	Total Paid since 1978
\$5,058	0	3	11	\$3,520,000	1	\$0

Source: FEMA NFIP Insurance Report, Repetitive Loss/BCX Claims, and Community Status Book Report; accessed July 23, 2020.

Toquerville participates in the NFIP and had a Flood Insurance Rate Map (FIRM) developed in 2009. Table 355 describes the number of flood insurance policies, and dollar value insured and claimed since participation began. No repetitive losses have been reported for Toquerville. A Community Assistance Contact and a Community Assistance Visit were completed in 2019 and 2011 respectively.

Hazard History

The National Oceanic and Atmospheric Administration (NOAA) collects data about reported flooding and severe weather, which is used for this plan. Monsoon rains occur in the late summer and fall, which bring a rapid and heavy rainfall and can lead to flooding events, damaging structures, overwhelming existing infrastructure, and moving debris throughout the town. Table 356 describes the flooding events which have impacted Toquerville and the surrounding area.

Table 7: Toquerville Reported Flood Events 1997-2020

Date	Damage/Injury	Description
9/6/2002	\$20,000	One inch of rain fell in less than ten minutes, causing flooding of a field and a barn, resulting in \$10,000 in property damage and \$10,000 in crop damage.

10/20/2004	\$25,000	A severe storm caused significant flooding in Southwestern Utah. High waters from creeks damaged bridges in Toquerville.
8/19/2012	None Reported	Thunderstorms produced flash flooding in Southern Utah.
8/26/2014	None Reported	Flash flooding on La Verkin Creek in Toquerville had an observed increase in the rain gauge to 800 CFS.
7/17/2018	None Reported	I-15 near Leeds was closed due to flash flooding.

Source: NOAA Storm Database

Other flooding events may have impacted Toquerville but were not reported or did not describe impacts to the community in their report. Referencing the flood history from other communities or Washington County may provide additional context to Toquerville's flood history or potential.

Flood risks can be increased by certain natural hazards, like wildfire or drought, which can burn or kill vegetation, reducing the amount of water absorbed by the ground, which can in turn result in landslides or debris flows. Long-term climate trends indicate that severe weather events are expected to become less frequent but increase in magnitude, which will influence flooding locally.

Landslides

The landscape in Southwestern Utah, marked by mesas, cliffsides, and valleys can see landslides and rockfall over time. Landslide and rockfall activity can be observed on slopes and cliffsides throughout the area and become a risk when events interact with the built environment and human activity. Figure 318 Figure 8 maps the landslide and rockfall susceptible areas are observed in Washington County, with Toquerville highlighted.

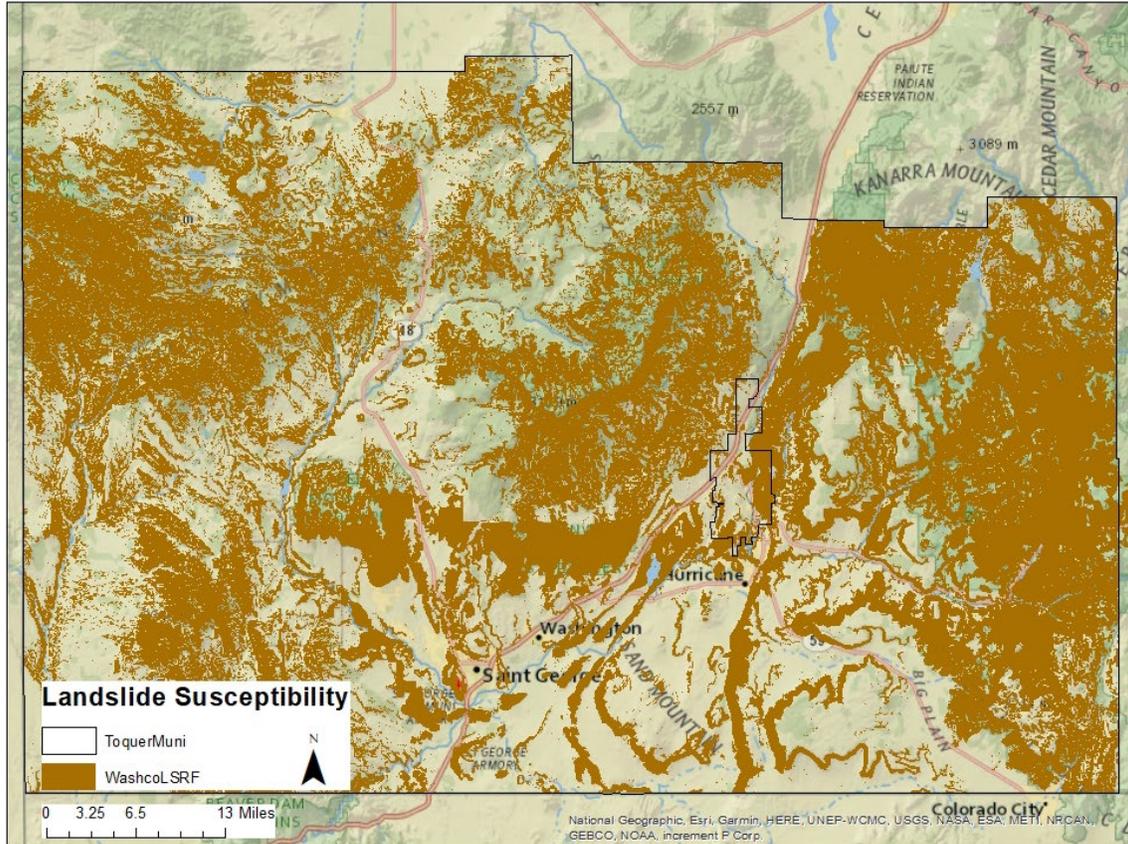


Figure 8: Toquerville Landslide Susceptibility

Source: Utah Geological Survey

Toquerville is exposed to landslide susceptible areas throughout the community, especially along hills and cliffsides. Table 357 describes the exposure of community assets to landslide susceptible areas. At least half of critical facilities, commercial parcels, and road miles are also exposed to landslide and rockfall susceptible areas, which can impact life, property, and essential infrastructure. Landslides can block or damage roadways, causing delays and access challenges within a community. Without proper planning, future growth could place development in landslide risk areas, increasing risk of landslide impacts.

Table 8: Toquerville Landslide Susceptibility Exposure

Toquerville Exposure to Landslide Susceptible Areas						
Critical Facilities	Parcels			Road Miles	Rail Miles	Parks
	Commercial	Residential	Total			

50.0%	62.5%	29.4%	29.8%	56.5%	N/A	N/A
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Source: Utah Geological Survey, Washington County Assessor, AGRC.

Hazard History

The southwest landscape was developed through landslide events, which are common throughout the region. There have been no landslides described for Toquerville in data accessed from news reports, the US Geological Survey, Utah Geological Survey, and other sources. Landslides and rockfall are common to the southwest and although an event has not been reported in the past, a landslide in Toquerville is still possible.

Several factors contribute to the potential or increased risk of landslides. Earthquake, drought, flooding, wildfire, and severe weather can cause or worsen landslide events as the soil content and vegetation destroyed during these events. Landslide events can trigger or be triggered by other natural hazard events. Landslides can lead to flooding as ground materials can block or change flood and drainage areas.

Drought

The Five County region has recorded seven instances of extended drought conditions since 1895 that have impacted the region. The hazard history is described in the Hazard Identification and County section of this plan, as Drought is a regional hazard. The southwest is no stranger to drought, however as the region continues to grow, extended drought can have greater negative impacts. Utah entering an extended period of drought, with 2020 being the driest year on record, there are implications from this natural hazard on the regional economy and people in the area.

Both tourism and agriculture economies would be impacted by a drought event, which can create dry, hot conditions. Drought may also impact the local water supply, for the town includes wells and spring water. Tourism and related industries are portions of the economy in Washington County. A University of Colorado report indicated that perceived risk of hazards from visitors can influence their selection of a destination. Perceptions included low water for river trips or wildfire risk, both of which are influenced by drought.

Drought conditions create visibility and air and water quality concerns as well. Dry soils can blow in the wind, increasing dust in the air which people breathe in. Increased wildfire risks can also lead to more smoke and ash in the air. Dust, smoke, and ash impact water quality.

Drought is connected to other natural hazards, primarily wildfire. Dry fuels can increase the severity of wildfire risk and wildfire events. Changes in the vegetation in an area due to lack of water can lead to invasive species and bare soils which can result in flooding, debris flow, and landslide events when water does flow on drought impacted areas.

Radon

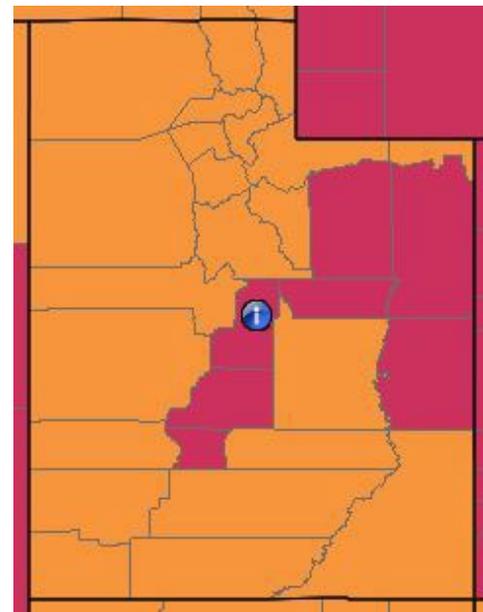
Radon is a leading cause of lung cancer and is the natural hazard that kills more people in the State of Utah. Indoor radon concentrations are common throughout the State of Utah, especially in homes, where people spend most of their time in the day. The Environmental Protection Agency has identified that Southwestern Utah is expected to have an average indoor level between 2.0 and 4.0 pCi/L of air, illustrated by Figure 321. At this level, mitigation is recommended, although mitigated indoor levels below 2.0 are difficult to achieve. There is no known level at which radon concentrations become more or less of a risk, as there is no safe level of radon exposure.

Occurrence and concentrations of radon depend on the soil content, structures foundation, and time spent in a space. Radon is a gas emitted from uranium deposits underground. Radon gas travels through the ground to the surface and can enter homes, become trapped and concentrating. Concentrations of radon gas are unhealthy for humans. Outdoor spaces are not a risk as the airflow dilutes radon.

Radon is not healthy at any level and is annually the natural hazard that kills the most people in Utah. Despite this indicator, few people are aware of radon risks and consequences. Increased public information about radon and reported at home testing results can help to inform the public and residents. Mitigation can be affordable, especially when completed in pre-construction phases.

While radon occurrence data can be difficult to acquire for communities, a 2019 report from the Utah Department of Environmental Quality describes short term radon testing by zip code and County. It is important to understand that testing and mitigation are site specific, based in part on the location and geology, but also the age and quality of the structure (Division of Radiation Control, 2019). The data from this report should not be used to determine where testing or mitigation should or should not be applied.

Table 358 describes the reported findings from short term radon testing across Washington County. The countywide average test result is 2.2 pCi/L of air. While this average is within the radon estimate for the region, radon tests with high levels of radon in the air have been reported which would require mitigation for human occupation of a space. The takeaway from this data is that radon gas has been identified in structures in the County and that testing, and information is necessary to understand and reduce risk.



Radon

Radon Data

- Zone 1: Counties with predicted average indoor radon screening levels greater than 4 pCi/L
- Zone 2: Counties with predicted average indoor radon screening levels from 2 to 4 pCi/L
- Zone 3: Counties with predicted average indoor radon screening levels less than 2 pCi/L

Figure 9: Estimated Indoor Radon Level Zones- Utah

Table 9: Washington County Short Term Radon Testing Reported

Percent of tests with levels <4 pCi/L	Percent of tests with levels \geq 4 pCi/L	Maximum Radon Level Reported	Average Radon Level Reported	Number of Tests
88.3%	11.7%	31.9 pCi/L	2.2 pCi/L	797

Source: Utah Department of Environmental Quality, Division of Radiation Control 2019.

There is not a hazard history for radon beyond the testing record, with even less being available at the town level. Increased testing and reporting would improve the understanding of radon risks and vulnerabilities for home and property owners. While estimates of radon levels in the County can be helpful to describe the problem, individual testing is the only way to understand the potential risk and exposure of radon gasses for a residence or structure. Testing and mitigation of radon should be done with the consultation of a Radon mitigation specialist.

Severe Weather

Severe weather often affects a region or county at large and can be difficult to accurately document, as coverage often relies on local documentation and reporting to NOAA or other weather agencies. There is not GIS data to show where or how severe weather will impact Toquerville, however our analysis assumes that severe weather events will impact the whole of the community, residents, facilities, infrastructure, businesses, and property.

Toquerville sees summers marked by high heat, dry weather, and rapid downfalls of monsoon rains. Thunderstorms frequently impact Washington County, which can produce hail, high winds, rain, and lightning. Winters in the high elevation areas can experience snow and rain fall.

Hazard History

NOAA reports that there have been 451 severe weather events reported for Washington County between 1950 and 2020. Toquerville has several reported severe weather events which have impacted the area. Severe winds and thunderstorms are common to Washington County and can damage structures and economic assets, delay traffic, and block roads. Extreme heat is also a challenge throughout the Southwest, two such events are described in Table 359. While the deaths reported during the 2013 events did not occur in Springdale, the area likely saw extreme heat during these events which could cause impacts on residents and visitors. Outdoor recreators, unhoused persons, and outdoor workers, are vulnerable to these extreme temperatures.

Table 10: Toquerville Severe Weather Record

Date	Damage/Injury	Description
8/30/1999	None Reported	A heavy rainstorm produced two inches of rain fall in an hour in Toquerville.
10/16/1999	None Reported	Strong winds with gusts of 50 MPH recorded in Toquerville.
3/28/2006	None Reported	Rain fall of 1.60 inches was reported in Toquerville.
7/16/2012	None Reported	A thunderstorm in in Toquerville produced hail over Hurricane.
7/4/2013	3 deaths	Hot temperatures contributed to the death of three hikers in Garfield and Kane Counties.
7/21/2013	1 death	Hot temperatures killed a hiker in Kane County.

Source: NOAA Storm Database

Thunderstorms and associated impacts including hail, rain, and high winds impact Toquerville. Hundreds of severe weather events have been reported for Washington County. There may have been events reported for the County or other nearby communities which impacted Toquerville but did not have described impacts for the community. Community members should reference these sections of the plan for further information.

Severe weather is frequently occurring throughout the region and can cause damages to structures and infrastructure. Severe weather events have the potential to trigger other natural hazards in the area, which can include flooding or landslide from severe rain, fires from lightning strikes, and blowing sand with high winds, for example.

Problem Soils

Communities throughout the southwest have experienced challenges to construction and development attributed to problem soils, which can impact structures and infrastructure, as soil moisture and other environmental factors cause the soil stability to change. These soil types and their characteristics are further described in the Hazard Identification Section. Figure 320 illustrates where the Utah Geological Survey has mapped problem soils in, and surrounding Toquerville. Expansive soils are mapped in the southwestern portion of the community.

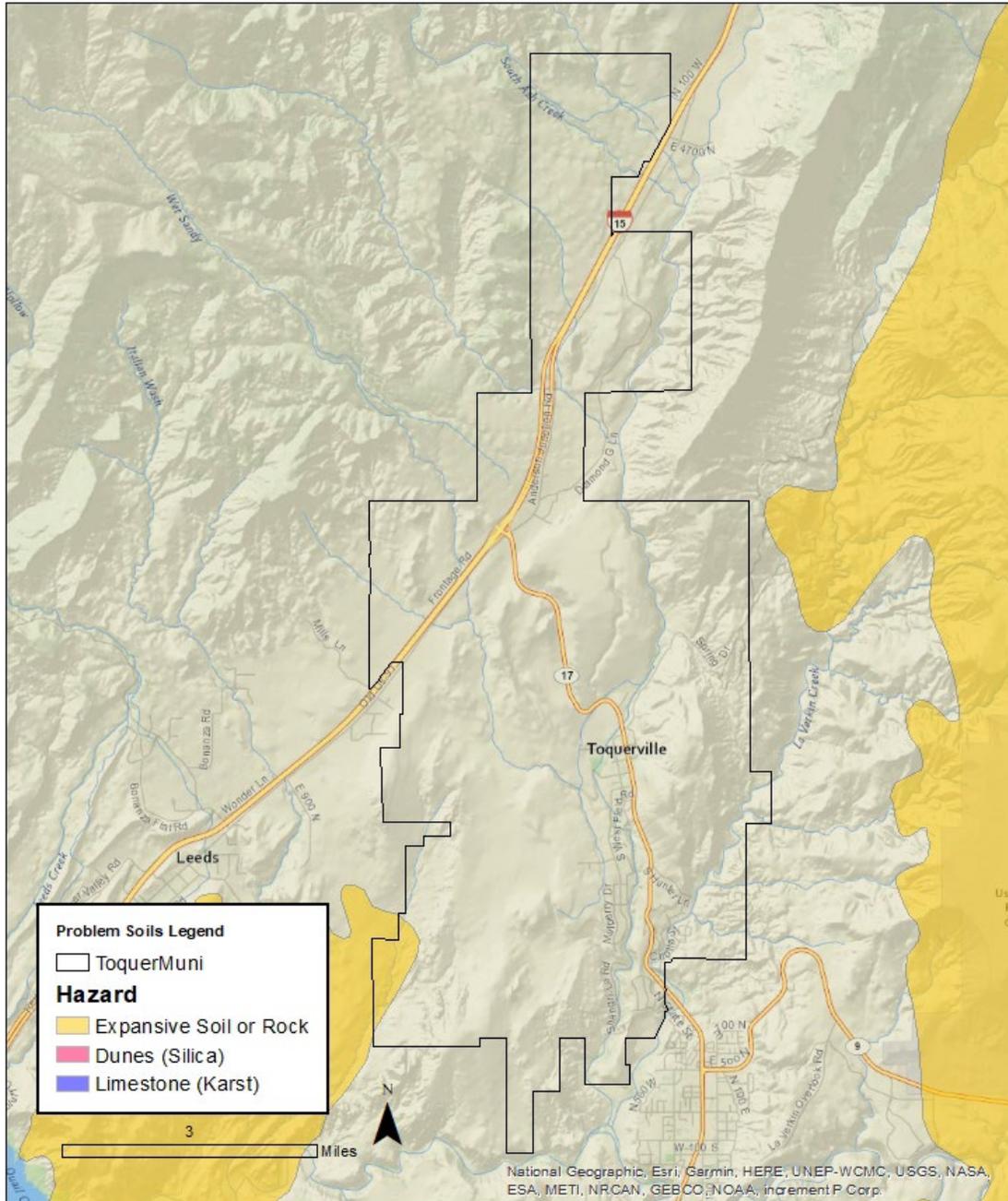


Figure 10: Toquerville Problem Soils Map

Source: UGS, AGRC

Community assets, infrastructure, and property are exposed to problem soils, with the greatest exposure being in road miles, as described in Table 360. Problem soils are often challenging to structures and infrastructure, as when the soils dissolve or expand and contract, they can damage or impact structures that are on top of the changing soil structure. Only a small portion of road miles are exposed to problem soils, identified as expansive problem soils. Roads and infrastructure under a road can be damaged by soil changes and homes and structures can have foundation stability issues.

Table 11: Toquerville Problem Soil Exposure

Critical Facilities	Parcels			Road Miles	Rail Miles	Local Parks
	Commercial	Residential	Total			
0.0%	0.0%	0.0%	0.0%	1.6%	N/A	N/A

Source: Utah Geological Survey, Washington County Assessor, UDOT

The Utah Geological Survey has developed updated mapping for some communities in the region, which provides greater detail about the susceptibility and potential for problem soils and the types prevalent to the region. Toquerville is included in this mapping study area for caliche, collapsible soils and rock, expansive soils and rock, karst features, piping and erosion susceptible soil, shallow bedrock, soluble soil and rock, and wind-blown sand. Figure 321 through Figure 328 map the identified problem soils for the area in greater detail. The updated mapping is available in an online format only and was not used for GIS analysis. Table 360 does not reference the identified soils or extent from the updated mapping.

Caliche



Figure 11: Toquerville Caliche Susceptibility

Collapsible Soil

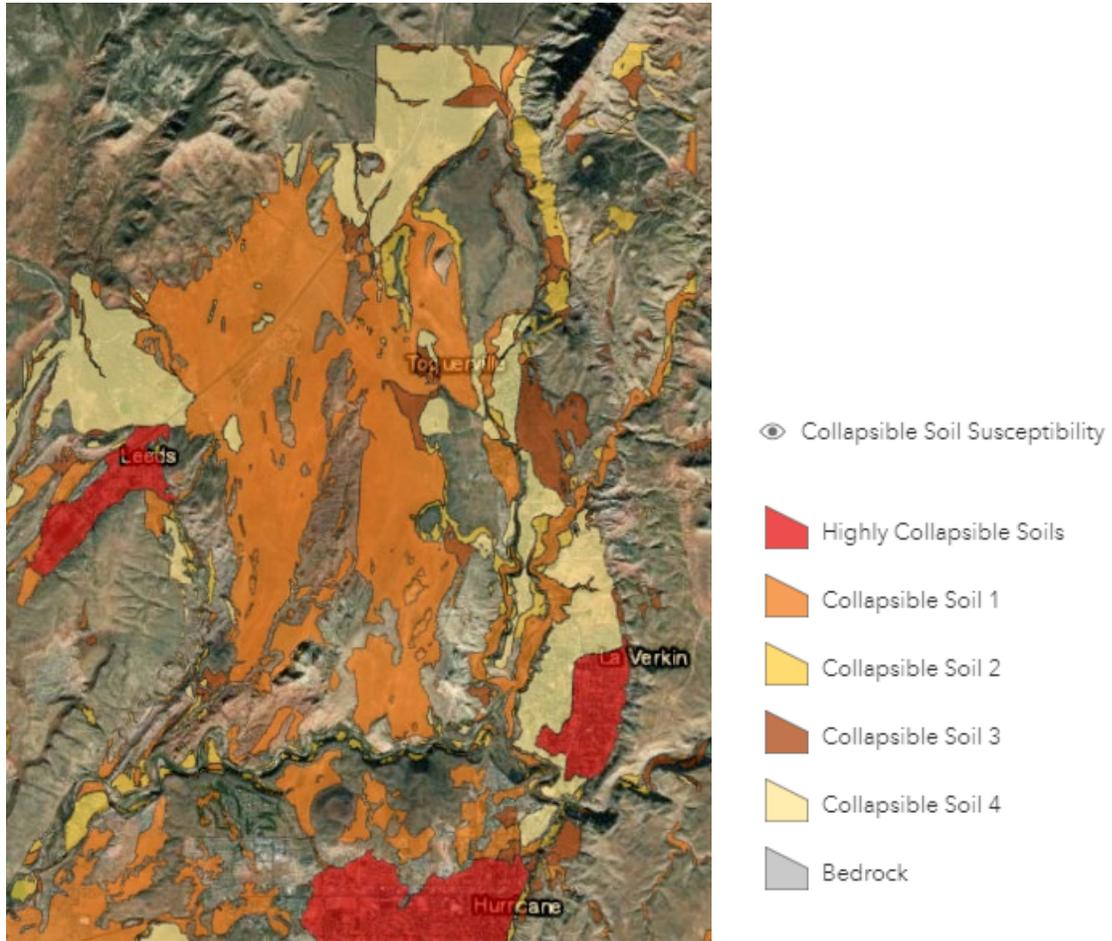


Figure 12: Toquerville Collapsible Soil Susceptibility

Expansive Soil and Rock

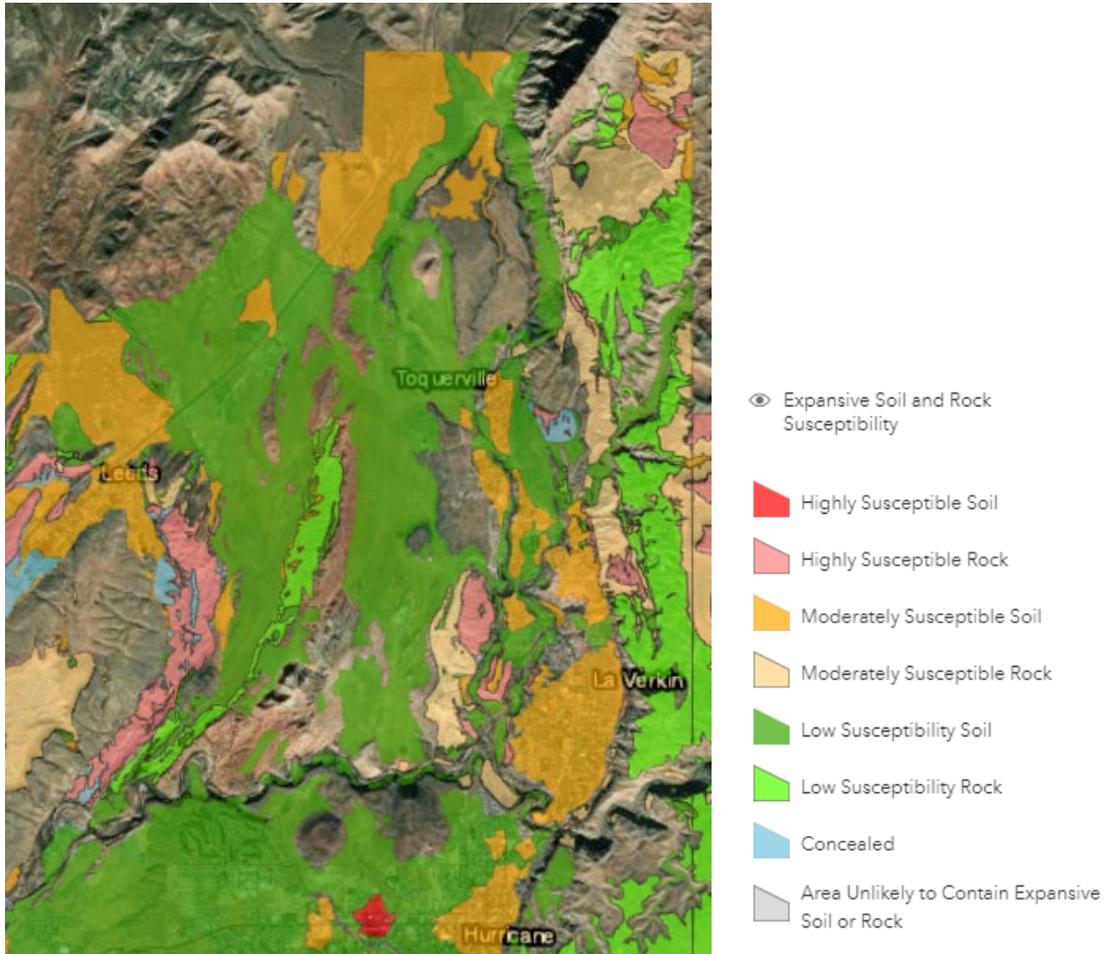


Figure 13: Toquerville Expansive Soil and Rock Susceptibility

Karst Features

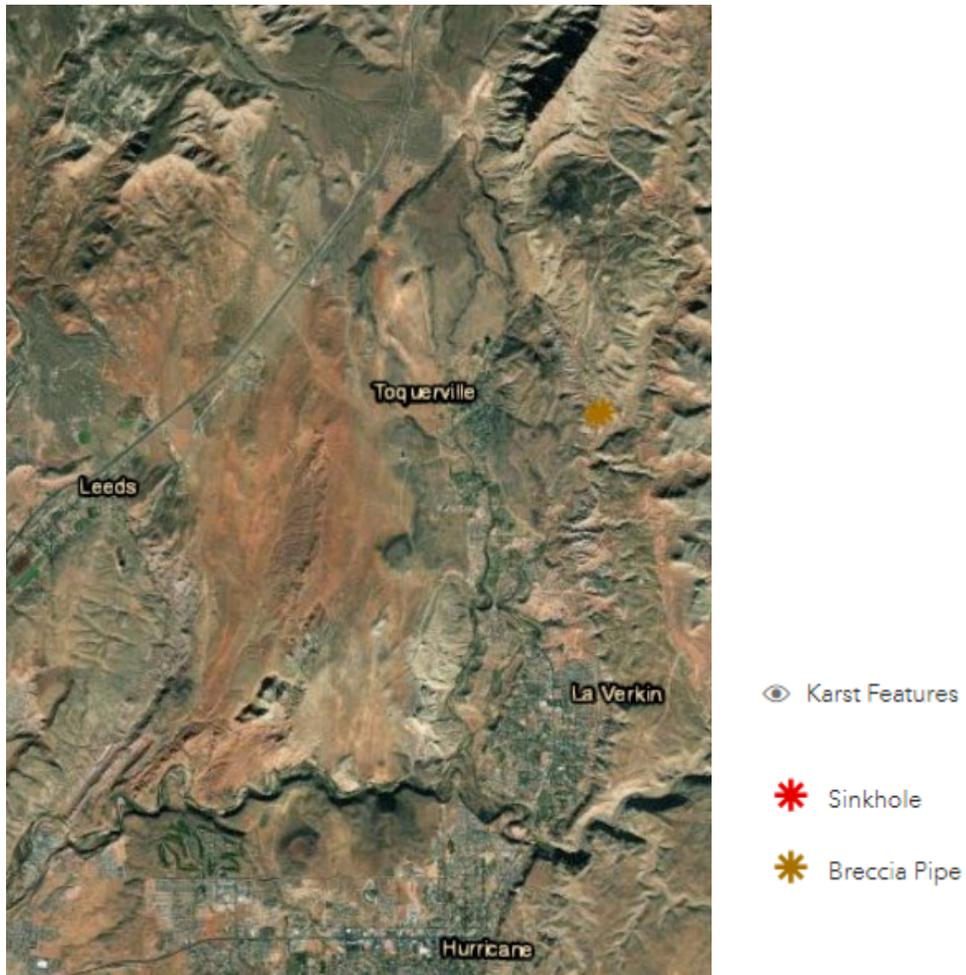


Figure 14: Toquerville Karst Features

Piping and Erosion

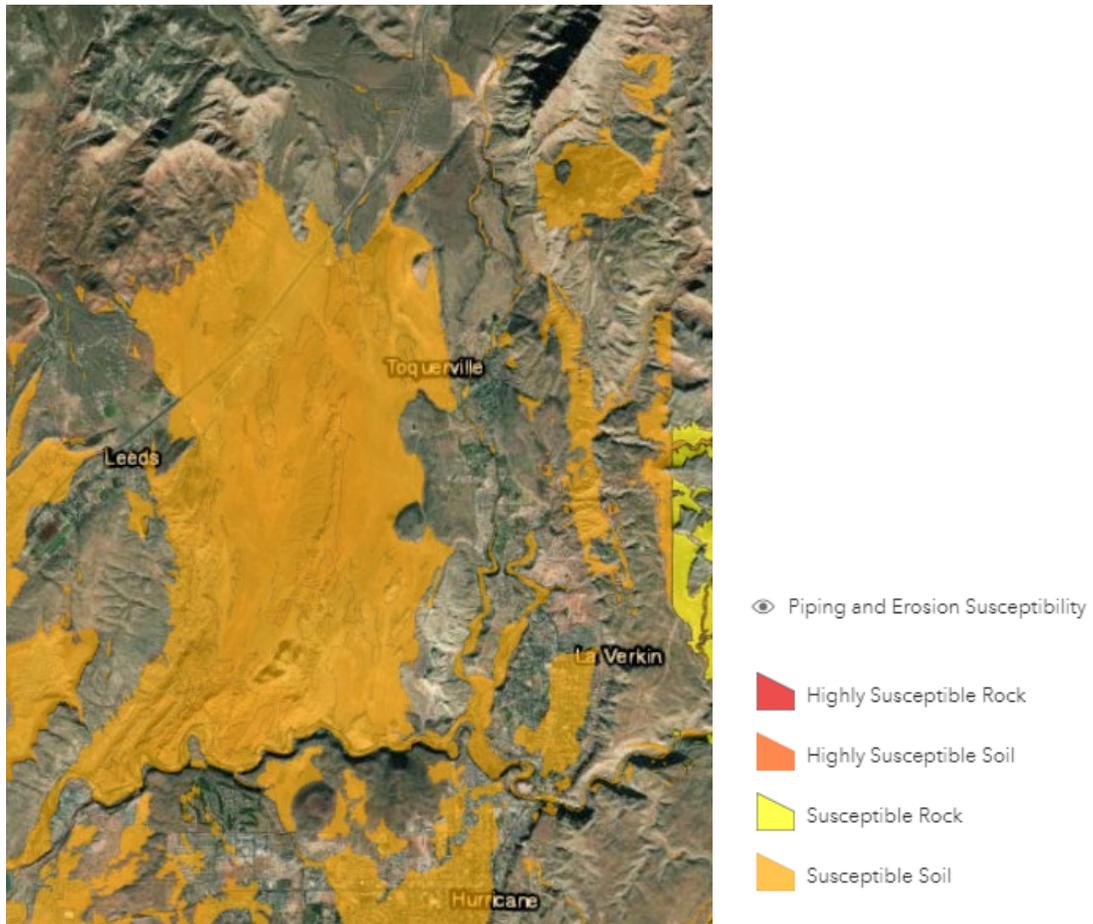


Figure 15: Toquerville Piping and Erosion Susceptibility

Shallow Bedrock Potential

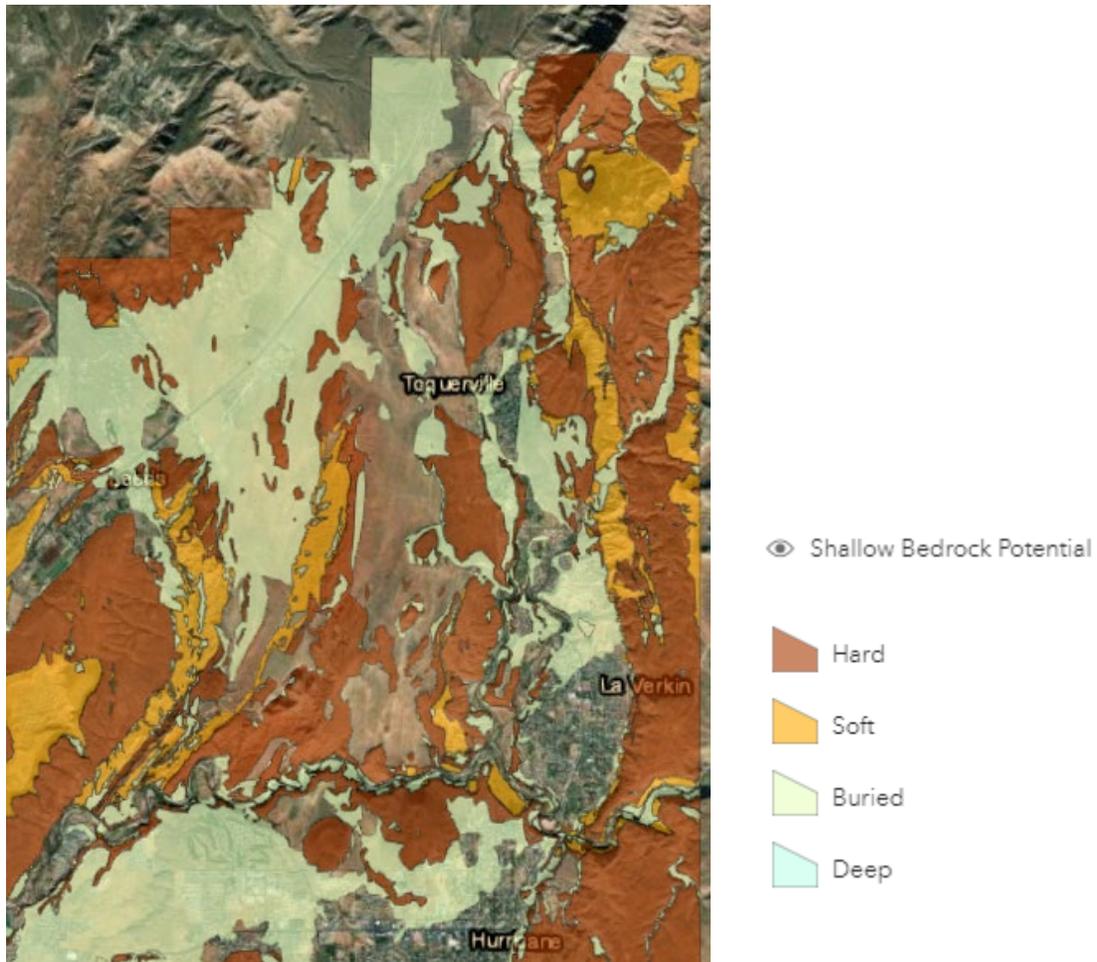


Figure 16: Toquerville Shallow Bedrock Potential

Soluble Soil and Rock

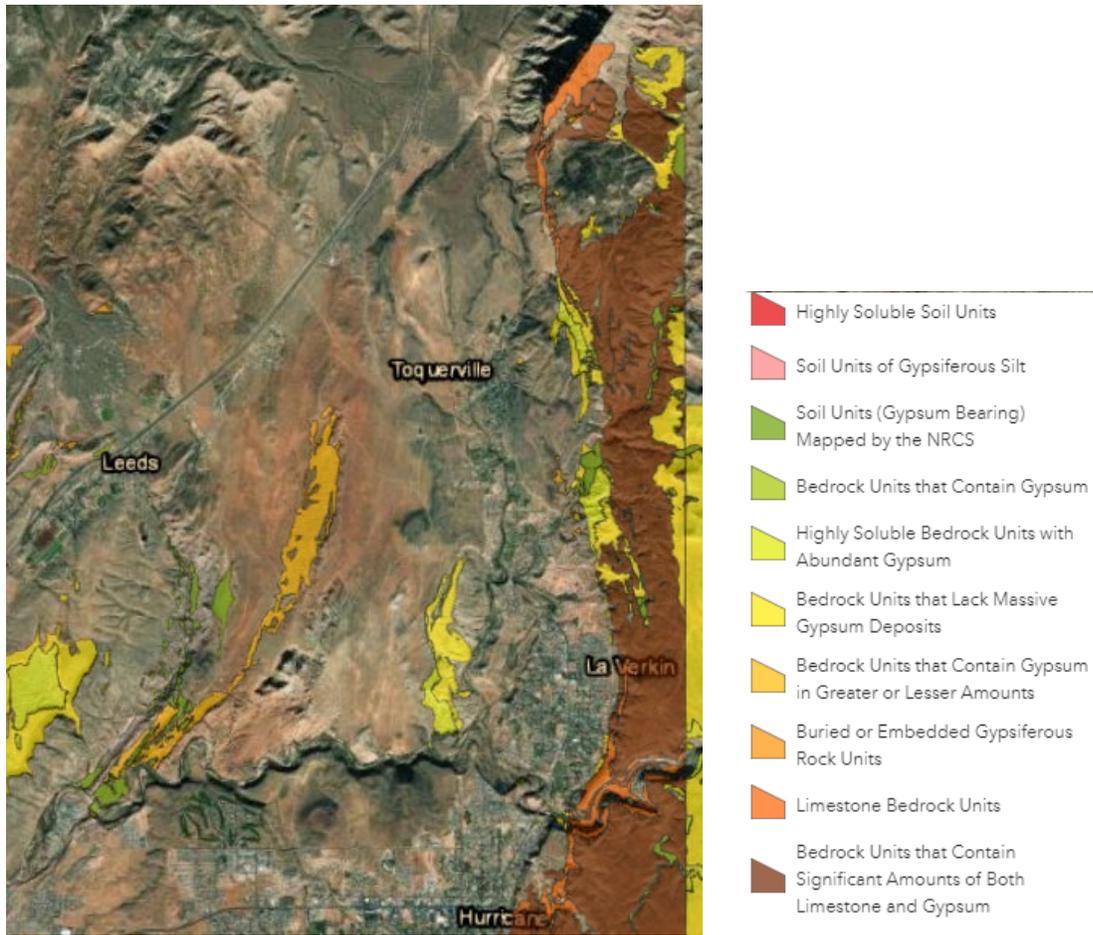


Figure 17: Toquerville Soluble Soil and Rock

Wind-Blown Sand

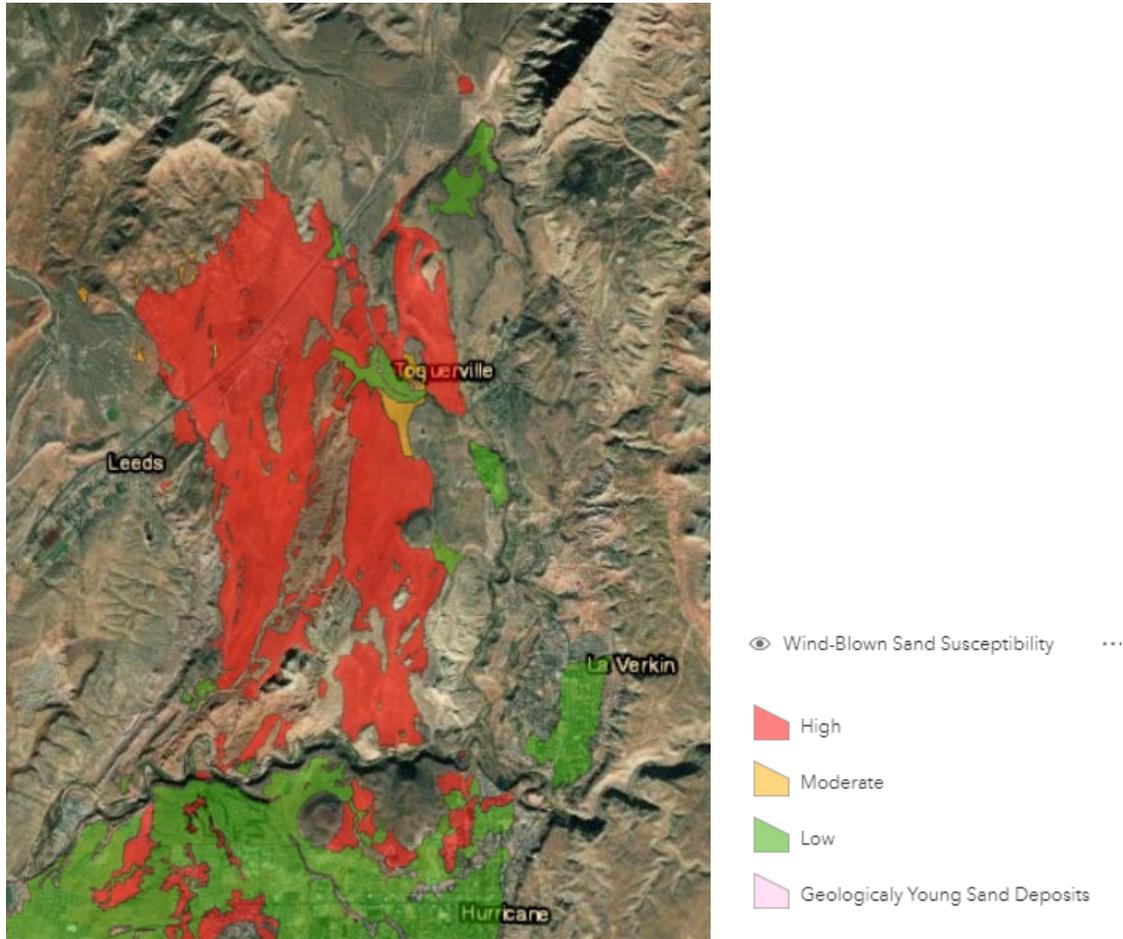


Figure 18: Toquerville Wind-Blown Sand Susceptibility

The new mapping indicates that Toquerville is highly susceptible to windblown sand and is exposed to all the other soil types. Soil types vary across the community, whether near the Virgin River, cliff and hillsides, or valley areas.

The community and the county do not have a record of problem soil impacts, although building permits should identify where studies were required, whether problem soils have been discovered on a site and what types of mitigation were completed.

Risk Assessment Summary

Toquerville is at risk to wildfire, landslides, earthquake, flooding, drought, severe weather, problem soils, and radon. Residents are at risk to injury and property damage from several natural hazards. Toquerville critical facilities are vulnerable to severe weather, landslide, flood, earthquakes, and wildfires. Impacts from these natural hazards can impact an organizations capacity to respond to an emergency event.

Transportation routes have been impacted by historic natural hazard events and are exposed to several natural hazard susceptible or risk areas. I-15 and SR-17 are the primary access road to the community

and impacts on this road can cause traffic delays locally, impact access to the community, and delay the transportation of goods, depending on the extent of the impacts.

Commercial and residential parcels are likewise exposed to several natural hazards, which can result in loss of property, life, damages, and economic impacts if damages delay regular business operations or transportation routes.

Mitigation Strategy and Actions

Toquerville has participated in previous iterations of the Five County Multi-Jurisdictional Natural Hazard Plan and identified strategies to mitigate natural hazard risks. Table 361 describes progress made on Toquerville mitigation strategy as detailed in the 2016 iteration of the Natural Hazard Mitigation Plan.

Table 12: 2016 Toquerville Mitigation Strategy

Hazard	Objective	Action	Timeline	Funding Source	Progress
Flood/ Drought #1	Prevent flood waters from subverting bridge structures. Maintaining dam water levels.	Clear willows and other debris from Ash Creek.	Semi-Annual	Toquerville Operating budget (water Budget) Partnered with the Water District, La Verkin, and Hurricane	

Source: 2017 Five County Association of Governments NHMP

To address the risks and vulnerabilities identified in this chapter, Springdale has assembled several actions, addressing each of the natural hazards that the community is at risk to. These actions are detailed in Table 362, which also identifies a timeline, potential funding source, and responsible parties to support implementation of these actions.

Table 13: Toquerville 2022 NHMP Mitigation Strategy

Hazard	Objective	Action	Timeline	Funding Source	Responsible Agency

Source: Local Planning Team

The following actions are examples based on the AOG staff’s understanding of the risks identified in the Springdale risk assessment. The Toquerville planning team will review this list and work with the AOG to specify, select, or identify actions and develop a timeline, potential funding source, cost estimates, and responsible parties to move the strategy forward.

Radon

- Provide radon risk, testing, and mitigation information to residents.

Flood

- Limiting the percentage of allowable impervious surface within developed parcels.

- Increasing drainage or absorption capacities with detention and retention basins, relief drains, spillways, drain widening/dredging or rerouting, logjam and debris removal, extra culverts, bridge modification, dike setbacks, flood gates and pumps, or channel redirection.
- Working with utility companies to raise utilities, utility infrastructure, or other mechanical devices above expected flood levels.

Drought

- Encourage permeable driveways and surfaces to promote groundwater recharge.
- Preserve economic stability during a drought by encouraging agricultural interests to obtain crop insurance to cover potential losses due to drought.
- Expand water storage capacity for municipal water.
- Replace unused grass areas with native vegetation on town owned property.
- Establish drought policies with tiered actions to implement at different severities of drought conditions.
- Plan for and build in redundancies in the water system.
- Incentivize or recommend gray water system use in compliance with local health department requirements and updated 2020 Utah Graywater System Rules.

Earthquake

- Requiring bracing of generators, elevators, and other vital equipment in hospitals and clinics.
- Require the anchoring rooftop-mounted equipment (i.e., HVAC units, satellite dishes, etc).
- Using flexible piping when extending water, sewer, or natural gas service.
- Installing window film to prevent injuries from shattered glass.
- Developing an outreach program about earthquake risk and mitigation activities in homes, schools, and businesses.
- Requiring new masonry chimneys greater than 6 feet above a roof to have continuous reinforced steel bracing.
- Educating homeowners on safety techniques to follow during and after an earthquake.
- Inventory structures in the County that are constructed with unreinforced masonry and plan for retrofit of structures for the safety of occupants.

Severe Weather

- Educate residents and visitors of the dangers of extreme temperatures (hot and cold) and severe weather events and the steps they can take to protect themselves during an event.
- Produce a map of cooling locations where visitors and residents may go during daytime hot temperature events.
- Developing a lightning brochure for distribution by recreation equipment retailers or outfitters.
- Installing and maintaining surge protection on critical electronic equipment.
- Ensuring the development and enforcement of building codes for roof snow loads.
- Require or encourage wind engineering measures and construction techniques.
- Anchor bolts, Laminated or impact-resistant glass, Reinforced pedestrian & garage doors, Window shutters, Waterproof adhesive sealing strips, Interlocking roof shingles, etc.

Landslide/ Rockfall

- Applying soil stabilization measures, such as planting soil stabilizing vegetation on steep, publicly owned slopes.
- Coordinate with local fire authority to plan for revegetation following a fire event to mitigate landslides and flash flooding.
- Using debris-flow measures that may reduce damage in sloping areas, such as stabilization, energy dissipation, and flow control measures.
- Establishing setback requirements and using large setbacks when building roads near slopes of marginal stability.
- Pursue funding for acquisition of property and homes at greatest risk to landslide and rockfall.

Problem Soils

- Inventory locations where problem soils have caused damages to properties.

Wildfire

- Adopt the Wildland Urban Interface Code.
- Using zoning and/or a special wildfire overlay district to designate high-risk areas and specify the conditions for the use and development of specific areas.
- Encouraging the use of non-combustible materials (i.e., stone, brick, and stucco) for new construction and renovations in wildfire hazard areas.
- Protecting propane tanks or other external fuel sources.
- Coordinate with local utility providers to mitigate hazardous fuels around utility infrastructure.

Multi Hazard

- Providing educational materials to local businesses/hotels for visitors use to understand natural hazard risks while recreating.

Consider acquiring land in identified natural hazard risk area for public open space use.