Multi-Jurisdictional

Natural Hazard Mitigation Plan

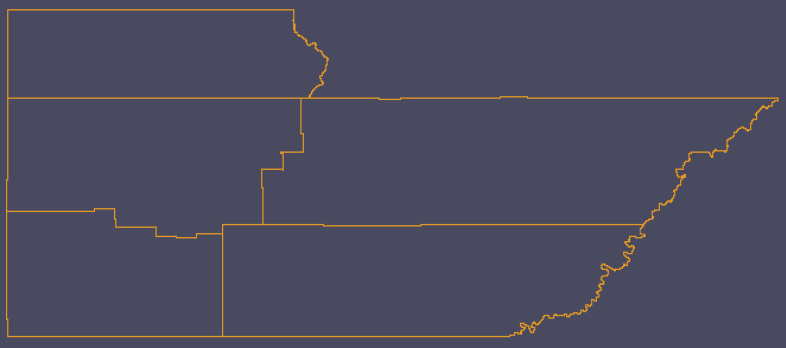






Five County Association of Government

Five Year Plan 2016 - 2020



Beaver • Garfield • Iron • Kane • Washington

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SYMBOL KEY


Demographics


Drought


Radon


Severe Weather


Problem Soils


Landslide


Wildfire


Flood


Earthquake


Five Counties


Beaver County


Garfield County


Iron County


Kane County


Washington County

ACKNOWLEDGMENTS

County Commissioners

Beaver County
Michael F. Dalton, Chair
Mark S. Whitney
Tammy Pearson

Garfield County
Leland F. Pollock, Chair
Dell LeFevre
David Tebbs

Iron County
Dale Brinkerhoff
Casey Anderson
Alma Adams

Kane County
Dirk Clayson, Chair
Lamont Smith
Jim Matson

Washington County
Alan D. Gardner, Chair
Victor Iverson
Zachary D. Renstrom

Mayors

Beaver County Mayors
Craig Wright, **Beaver City**
Ward Dotson, **Minersville**
Nolan Davis, **Milford**

Garfield County Mayors
Shannon Allen, **Antimony**
Bill Muse, **Boulder**
Shiloh Syrett, **Bryce Canyon**
Jeff Stock, **Cannonville**
Jerry Taylor, **Escalante**
Ronald K Riggs, **Hatch**
David Roberts, **Henrieville**
Eric Houston, **Panguitch**
Waylon Brinkerhoff, **Tropic**

Iron County Mayors
H.C. Deutschlander, **Brian Head**
Maile Wilson, **Cedar City**
Geoffrey Chestnut, **Enoch**
Galen Allred, **Kanarraville**
Constance Robinson, **Paragonah**
Donald Landes, **Parowan**

Kane County Mayors
Dustin Cox, **Alton**
David Schmuker, **Big Water**
Danny Spencer, **Glendale**
Merlin Esplin, **Orderville**
Robert Houston, **Kanab**

Washington County Mayors
Rick Moser, **Apple Valley**
Lee Bracken, **Enterprise**
Phillip Barlow, **Hildale**
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Kerry Gubler, **LaVerkin**
Wayne Peterson, **Leeds**
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NHMP Planning Team - Beaver County
Tammy Pearson, **Commissioner**
Scott Albrecht, **County Administrator**
Kyle Blackner, **County Zoning Administrator**
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Paul Bittmenn, **Cedar City Manager**
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Kelly Stones, **Parowan Public Works Director**
Brett Howser, **Brian Head Town Manager**

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Bert Harris, **County Roads**
Barbara Hansen, **County Flood Plains-Building Department**
Allan Alldredge, **County Emergency Response**
Earl Lavenger, **County Fire**
Dave Owens, **County IT**
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Tom Avant, **T&C Engineers**

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Ron Whitehead, **County Public Works Director**
Robert Ford, **Rockville Planning Commission**
Peter Kuhlman, **County Emergency Management**
Jay Sandberg, **St. George City**
Wes Jenkins, **St. George City**
Zac Renstrom, **County Commission**
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Levi Roberts, **Senior Planner**

EXECUTIVE SUMMARY

WHAT IS A NATURAL HAZARD MITIGATION PLAN?

Natural hazard mitigation is any sustained action taken to reduce or eliminate the long term risk to human life and property from hazards. Mitigation activities may be implemented prior to, during, or after an incident. However, it has been demonstrated that hazard mitigation is most effective when based on comprehensive, long term planning that is developed before a disaster occurs.

The Disaster Mitigation Act of 2000 (DMA 2000) (P.L. 106-390) provides an opportunity for States, Tribes, and local governments to take a new and revitalized approach to mitigation planning. The DMA 2000 amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act (the Act) by repealing the previous Mitigation Planning section (409) and replacing it with a new Mitigation Planning section (322). This new section emphasizes the need for State, Tribal, and local entities to closely coordinate mitigation planning and implementation efforts. It continues the requirement for a State mitigation plan as a condition of disaster assistance, and creates incentives for increased coordination and integration of mitigation activities at the State level through the establishment of requirements for two different levels of State plans: "Standard" and "Enhanced." States that demonstrate an increased commitment to comprehensive mitigation planning and implementation through the development of an approved Enhanced State Plan can increase the amount of funding available through the Hazard Mitigation Grant Program (HMGP). Section 322 also established a new requirement for Local Mitigation Plans, and authorized up to 7% of HMGP funds available to a State to be used for development of State, Tribal, and Local Mitigation Plans

Each mitigation plan is a representation of each jurisdiction's commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources toward reducing the effects of natural hazards. Local plans also serve as the basis for the State to provide technical assistance and to prioritize project funding. Generally, these regulations promulgate the following goals: to fulfill federal, state, and local hazard mitigation planning responsibilities; to promote natural hazard mitigation measures, short/long range strategies that minimize loss of life, and damage to property resulting from natural hazard occurrences to which public/private constituents are exposed; and to eliminate or minimize conditions which would have an undesirable impact on our citizens, the economy, environment, and the well-being of the Five County region.

This plan provides a set of action items to reduce risk from natural hazards through education, outreach programs, the development of partnerships, and the implementation of preventative activities. This plan also aims to thwart disaster casualties for Drought, Earthquake, Flood, Landslide, Problem Soils, Radon Gas, Severe Weather, and Wildfire, through mitigation practices. It comprehensively addresses hazard identification, risk assessment, vulnerability analysis, mitigation actions, and implementation schedule for the region.

WHY DEVELOP A NATURAL HAZARD MITIGATION PLAN?

Across the United States, natural hazards cost communities billions of dollars, taking a toll on human life, the built environment, and the local economy. The Five County region of Utah is no exception. Since its settlement in the mid-1800s, the region and its residents have been subject to financial loss and property damage from flooding, landslides, wildfires, and severe weather. Though it is hard to predict when disasters may occur, it is fair to conclude that natural hazards will continue to impact the region.

Southwest Utah is vulnerable to natural hazards that have the possibility of causing serious threat to the health, safety, and welfare of our citizens. The cost of response to and recovery from natural disasters is decreased when attention is turned to preventing and/or mitigating their impacts and effects. This Natural Hazard Mitigation Plan (NHMP) is a fundamental step in identifying natural hazards and the impacts they may have on the residents of Southwest Utah. In addition a mitigation plan seeks to provide resources, information and strategies for risk reduction, while helping to guide and coordinate mitigation activities.

WHO ARE THE PARTIES INVOLVED?

In 2000, FEMA issued the Disaster Mitigation Act of 2000, commonly known as DMA 2000. Under this Act, states, communities, and tribal governments must complete FEMA approved natural hazard mitigation plans to be eligible for certain federal assistance programs, such as the Hazard Mitigation Grant Program (HMGP).

Five County Association of Governments (FCAOG) has undertaken the Natural Hazards Mitigation Plan in an effort to substantially reduce the vulnerability of communities, within the region, to natural hazards. The plan is intended to promote sound public policy designed to protect citizens, property, critical facilities, and infrastructure. This can be achieved by increasing public awareness, documenting resources for risk reduction and loss-prevention, and identifying activities which enable the development of safer communities.

This Natural Hazard Mitigation Plan is comprehensive in nature and addresses all jurisdictions

within the Five County Region, including all rural unincorporated communities. While this Plan is non-regulatory in nature, it provides a framework for all local jurisdictions to plan for natural hazards. The resources and information provided herein pertain to all areas of the Five County Region. It is the sincere hope of the authors of this plan, that each respective jurisdiction use the information contained herein to adopt appropriate regulations which will provide the legal authority for hazard risk analysis and mitigation efforts at the local level.

Each county and community can utilize the structure and data herein and add additional details to refine the understanding and treatment of various natural hazards specific to their communities. The resources and information within the mitigation plan establish: a foundation for coordination and collaboration among agencies and the public in the region and prioritize future mitigation measures; and, assist in meeting qualifications for federal assistance programs

HOW TO USE THE PLAN?

In an effort to ensure that the mission of this Natural Hazard Mitigation Plan is met, the participants in the development of this plan defined and established a list of goals, which are directly related to accomplishing the mission. Mitigation plan goals are more specific statements of direction that public/private constituents alike can take while working to reduce the risk associated with natural hazards. Goals form a bridge between the broad mission statement and particular action items.

The plan contains a discussion on the purpose and methodology used to develop the plan, a profile on communities within the Five County region, as well as a hazard identification study and a vulnerability analysis of nine hazards. To assist in the explanation of the above-identified contents each County within the region is analyzed separately. The benefit of this separation is that each County is provided with a separate and distinct hazard identification, vulnerability analysis, and mitigation measures. Ultimately, this framework provides a streamlined plan which will afford additional readability and implementation.

This plan contains county-level geographic and demographic information, together with a risk and vulnerability assessment and mitigation strategies. The Plan details goals, objectives, and specific tasks or actions to reduce risk. Natural hazards to be addressed in the Plan were determined through an evaluation of risk and probability of those hazards being significant to the counties within the region; namely: Drought, Earthquake, Flood, Landslide, Problem Soils, Radon Gas, Severe Weather, and Wildfire.

Drought

Drought is a level of digression from the average of precipitation or some other climatic variable over a period of time.

- Drought conditions are mostly cyclical over the last 120 years. However trend lines display exasperating drought conditions.
- Population projections are expected to continue growing which means that more people than ever will be effected by drought
- 870,062 acres of water related land uses in the region are susceptible to drought.

Radon

Radon is a cancer causing naturally radioactive gas released from rock and soil that can build up to dangerous levels inside any structure.

- Radon is the second leading cause of lung cancer next to smoking.
- The average number of homes tested in Garfield, Kane, and Washington Counties between 2010-2014 are less than 0.2%, Beaver County is slightly higher at 1.26%.
- The percent of radon tests over 4 pCi/L (picoCuries per liter) are as follows Beaver-74.0%, Garfield-40.9%, Iron-12.6%, Kane-29.4%, and Washington-12.3%.
- The EPA recommends mitigation action when levels reach 4pCi/L.
- There are 286 schools, libraries, and hospital in the region that should undergo radon testing. Other structures that should be tested are high occupancy building, rest homes, and penitentiaries, to name a few.
- Most of the counties in the region have not done enough radon testing to determine the extent of radon within each county.

Severe Weather

Severe weather is a meteorological event that has the potential to cause damage, disrupt commerce or any other anthropological activity.

- Severe weather is difficult to predict, can span vast amounts of land, and can cause other natural disasters such as flooding, and landslides.
- There have been more than 500 severe weather disturbances in the Five County Region with an estimated eight deaths, fourteen injuries, over $2,000,000 of property damage and more than $300,000 of crop damage
- The disasters that severe weather create are often more damaging than the weather event itself.
- Disruptive weather events are increasing at nearly the same pace as population growth.

Problem Soils

Problem soils are a geologic hazard that have the potential to damage structures. Common problem soils in Southern Utah are expansive soils, collapsible soils, karst terrain, gypsiferous soils, and soils that are subject to piping.

	Total Structures at Risk		**Other Information**
	Market Value	Number of Structures	
B	$0	0	Due to a lack of quality mapping, detailed geologic study needs to be done to determine full extent of Problem Soils.
G	$35,831,276	366	Due to a lack of quality mapping, detailed geologic study needs to be done to determine full extent of Problem Soils.
I	$1,155,185,483	7,331	Due to a lack of quality mapping, detailed geologic study needs to be done to determine full extent of Problem Soils.
K	$16,652,957	201	Due to a lack of quality mapping, detailed geologic study needs to be done to determine full extent of Problem Soils.
W	$1,451,207,210	7,962	The four areas in Washington County that have detailed soils studies are the SR 9 corridor, St. George-Hurricane metro area, Zions National Park, and Hurricane City



Landslide

Landslide is a gravity fed movement of rock and earth on an over-steepened slope. Landslides include a range of ground movement including Rock Fall, Debris Flow, and Slide.

	Total Structures at Risk		Medium-High Landslide Susceptibility in Sq. Miles
	Market Value	Number of Structures	
B	$18,487,580	195	627.9
G	$28,463,573	270	2,454.8
I	$312,023,170	1,906	807.7
K	$214,671,752	1,476	1,743.6
W	$1,678,247,300	7,300	1,340



Wildfire

Wildfires are uncontrolled fires that can spread quickly. Major contributors to wildfire are drought, warm temperatures, high winds, and an excess of dried vegetation.

	Total Structures at Risk		Number of Communities at Risk	Acres of Wildfire Risk Moderate-Extreme
	Market Value	Number of Structures		
B	$145,663,912	1,526	11	778,244
G	$82,770,232	689	21	312,624
I	$996,926,764	5,948	22	1,021,567
K	$145,673,097	1,334	20	325,853
W	5,706,792,700	24,507	37	778,244

Flood

A flood is an inundation of water from an existing water way onto a normally dry area.

	Total Structures at Risk		# of Floods 1960-2015	# of High Hazard Dams	NFIP Repetitive Flood Claims
	Market Value	Number of Structures			
B	$0	0	9	5	0
G	$46,995,704	556	85	3	0
I	$412,401,193	2,490	47	8	0
K	$45,847,303	374	135	3	0
W	$2,064,394,640	9,124	206	18	0

Earthquake

Earthquakes occur when blocks of earth slip releasing energy in the form of ground movement.

	Damage Scenario from an earthquake on the Anderson Segment of the Hurricane Fault-7.2 Mag scenario.
B	Beaver City suffers from very light damage
G	Panguitch suffers from very light damage
I	The Cedar City suffers up to light damage
K	Kanab City is suffers Light Damage
W	The populated areas suffer moderately heavy to very heavy damage

We hope that through timely collaboration and effective use of scarce resources that this Plan is and will be relevant for years to come. This plan is intended to be a living document that evolves and improves as conditions, resources and understanding changes. All goals and strategies provided herein should be effective, realistic, and achievable.

Five County Association of Governments met the regulations set forth by FEMA in completing the plan. Regulations, including future monitoring, evaluating, updating and implementing, will take place as new incidents occur and/or every five years.

Introduction

The Five County Association of Governments NHMP incorporates a variety of citizen input representing a diverse cross-section of our regional population. To this end, the following planning process was developed:

1. Development, coordination, and implementation of County level NHMP Planning Teams;
2. Soliciting information from citizens through public meeting involvement.
3. Conducting stakeholder interviews to target the specialized knowledge of individuals working with populations in areas at risk from natural hazards. Within these planning process parameters, 10 steps are identified and outlined below.

DOCUMENTATION OF THE PLANNING PROCESS

This plan was prepared in the offices of the Five County Association of Governments (FCAOG) by appointed staff members: Gary Zabriskie, Community and Economic Development Planning Manager; Nathan Wiberg, Community Planner; Jay Aguilar, Mobility Manager; Dave Demas, Transportation Engineer/Planner; student interns; and was supported by Brad Bartholomew of the Utah Division of Emergency Management. Past FCAOG contributors are Darren Janes, Community Planner; and Ken Richards, GIS Intern. Other local agencies that aided in the process include: City and county GIS departments, elected officials, local officials, emergency managers, police and fire staff members, planning departments, County Emergency Managers, and other local governmental agencies. The planning process included the following steps:

STEP 1: ORGANIZE RESOURCES

Five County Association of Governments established, coordinated, and implemented County level NHMP Technical Advisory Planning Teams. The planning teams, shown in the table below, were the constituents of the planning process and provided guidance/direction from inception to eventual plan adoption. For the list of individuals contacted from each jurisdiction please see Appendix H.

NHMP County-level Technical Planning Teams	
Beaver County NHMP Planning Team	
Tammy Pearson	Commissioner
Scott Albrecht	County Administrator
Kyle Blackner	County Zoning Administrator
Les Whitney	County Fire District #2

Michelle Barton	Milford Memorial Hospital
Nolan Davis	Milford Mayor
Garfield County NHMP Planning Teams	
David Tebbs	County Commission
Leland Pollock	County Commission
Justin Fischer	Planning
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Brett Howser	Brian Head Town Manager
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John Max	Washington County GIS
Todd Edwards	County Engineer
Kurt Gardner	Building Inspector
Dave Black	Dixie State University-Geology Instructor, Rosenberg Associates-Geotechnical Engineer
Five County Region NHMP Planning Team	
Nathan Wiberg	Five County Association of Governments
Gary Zabriskie	Five County Association of Governments
Dave Demas	Five County Association of Governments
Jay Aguilar	Five County Association of Governments
Nathan Osborn	Southern Utah University GIS Lab

STEP 2: PUBLIC OFFICIALS OUTREACH

To ensure the planning process had support from elected officials, a member from each County Commission, or their assign, was appointed to their respective County NHMP planning team. The intent of this appointment is that it establishes the need for the NHMP and focuses on how it can better help the communities within each respective County.

STEP 3: COORDINATION WITH COUNTY EMERGENCY MANAGERS

Each County NHMP planning team consisted of an emergency manager. These individuals proved to be valuable members of each planning team because of their overall interest and technical expertise in mitigation planning.

STEP 4: DATA ACQUISITION

Five County AOG employed geographic information system (GIS) interns to collect data and generate mapping sufficient to quantitatively assess regional natural hazards. Contact was made with applicable personnel in each city and county to access GIS data available at the local level. Further, current GIS data was retrieved from the State of Utah Automated Geographic Reference Center (AGRC) website: http://agrc.its.state.ut.us/ and other hazard geographic data sites. Data layers were generated which included some or all of the following: local roads, plot maps, county assessor's tax assessment data, hazard data, flood maps, topographic data, aerial photographs, and land development data. The GIS software then quantified the number of units and total

market value for all structures located within each defined hazard area. In addition to GIS data, Five County AOG utilized numerous resources/data to craft this NHMP. These data resources are found in the References and Works sited section of this document.

STEP 5: HAZARD RISK IDENTIFICATION AND ANALYSIS

This step was conducted by gathering data on the hazards that occurred in each respective County. This information was gathered from local, state, and federal agencies and organizations, as well as from newspaper and other local media accounts, state and local weather records, conversations, surveys, interviews, and meetings with key informants within the planning area. Maps were generated using GIS and hazard data, the maps were then presented to the NHMP planning teams in each County. The aforementioned resources resulted in a comprehensive, quantitative hazard risk identification and analysis.

STEP 6: RISK ASSESSMENT

This step was conducted through a review of local base maps, topographical maps, floodplain maps, and other data. Through utilization of GIS, a detailed vulnerability analysis was completed for each county. GIS layers were created to determine vulnerability to hazards including: problem soils, landslides, wildfire, flood, earthquake, severe weather, drought, and radon. GIS was used as a tool to complete the hazard analysis. The paramount goal of the risk assessment is to estimate the number of structures vulnerable to each hazard and assign a dollar value to this built environment. With the information available in spatial form, the task was to overlay the natural hazards with county assessor's tax assessment data to extract the desired information. This is to say, the GIS software joins County Property Tax data as it relates to structures located with a defined hazard area. The values shown are based upon utilizing the *market value* for structures in each defined severe weather hazard area. The GIS software quantifies the number of units and total market value for all structures located within each defined hazard area, relative to specific hazards, in order to assess vulnerability. Other methods of assessing the risk included analyzing population data, evaluating critical facilities, analyzing frequency of events and severity past events, and other measures.

STEP 7: COMMUNITY GOALS ASSESSMENT

This step was conducted through a review of the governing documents of the planning area, as well as, conversations, interviews, and meetings with key individuals within the planning area. This step identified what goals are already established and adopted for the planning area and whether or not they promote or deter mitigation activities.

STEP 8: MITIGATION STRATEGY DEVELOPMENT

Developing the mitigation strategies was a process in which all of the previous steps were taken into account. Specifically, through performance of the vulnerability assessment a total market value of structure loss was determined for each respective hazard. The resulting mitigation strategies were listed in accordance to their respective natural hazard, and presented in an effort to provide macro-level risk reduction. Although each mitigation measure is important and achievable, they were prioritized and listed in order of:

1) Respective amount of potential loss of life/property value as a result of a natural hazard occurrence (as quantified through GIS analysis); and
2) Implementation priority through utilization of the STAPLEE process (as explained in Mitigation Strategy and Methodology section of this Plan and in FEMA 386-3).
3) Meet with key local leaders to evaluate past mitigation strategies and add new strategies.
4) Request all Mayors, City/Town Manager, County Commissioners, and County Emergency Managers to review past mitigation, and make appropriate updates to mitigation strategies, and add additional strategies to the document.

STEP 9: PRIORITIZATION OF MITIGATION STRATEGIES

The Disaster Mitigation Act of 2000 requires that a NHMP demonstrate how mitigation strategies were evaluated and prioritized. Each jurisdiction in the Five County Region will prioritize under the premise of total loss as it relates to each natural hazard. The underlying reason for this approach is based upon the fact that it is impossible to predict the future location, intensity, and severity of damage of any specific natural hazard. This being said, the total market value of structure loss for each respective natural hazard will be used by the jurisdictions to prioritize mitigation strategies; ultimately the jurisdictions should prioritize the mitigations strategies by addressing which hazard contains the highest amount of total market value of structure loss first with subsequent hazards following. Each Jurisdiction in the region may be effected differently by natural hazards, for this reason each jurisdiction will use this method to determine which mitigation strategy will benefit them the most. Further information regarding prioritizing mitigations is found in the Mitigation Strategy and Methodology section.

The STAPLEE method, explained in the FEMA *Blue Book* (July 2008), provided a technique for identifying, evaluating, and prioritizing mitigation actions based on existing local conditions; namely, Social, Technical, Administrative, Political, Legal, Economic, and Environmental. In terms of mitigation strategy implementation, careful attention was afforded to those mitigation strategies that have the highest likelihood of being implemented over the course of the next 5 years. It is the intent of the authors of this Plan to provide mitigation strategies that will reach the greatest amount of people despite scarce funding resources.

STEP 10: ADOPTION

The plan went through a public adoption process on (Dates to Be inserted) and was adopted by formal resolution by:

- Beaver County jurisdictions:
  - Insert Jurisdictions that adopt this update in 2016
- Garfield County jurisdictions:
  - Insert Jurisdictions that adopt this update in 2016
- Iron County jurisdictions:
  - Insert Jurisdictions that adopt this update in 2016
- Kane County jurisdictions:

    - Insert Jurisdictions that adopt this update in 2016
- Washington County jurisdictions:
    - Insert Jurisdictions that adopt this update in 2016

PUBLIC INVOLVEMENT

Public involvement opportunities were available throughout the design and completion of the NHMP. This involvement is through notification of public meetings involving the public, County Hazard Planning team members, the Five County staff, and the County Emergency Managers. The meetings are advertised at the Utah Public meeting Notice website (www.pmn.utah.gov), and at www.hazardmitigationplan.org. In addition the public can read the plan and make comments anytime at www.hazardmitigationplan.org. These meetings will provide the public and local leaders opportunities to be involved in the process and to provide direct comments and feedback. Copies of the Plan will be accessible to all members of the public; they will be cataloged and kept at each respective jurisdiction's public offices. These public involvement opportunities resulted in valuable guidance/direction in crafting the NHMP. As a whole, broad and diverse representations from each County constitute the planning process. The intent is that this public representation affords the opportunity for a greater segment of the population, and its unique interests, to be represented herein.

At the Plan draft review level, comments were formally elicited from public and private constituents a like. Five County staff formally requested draft level review of the Plan by appearing before each of the five southwestern Utah County Commission's at their monthly commission meetings. Additionally, press releases were submitted to newspapers of general circulation in each of the five southwestern Utah counties. Lastly, a Draft NHMP was made available at the offices of Five County Association of Governments and an electronic copy was made available on the Five County website. The comments generated from these efforts were carefully addressed and incorporated into this Plan accordingly.

Integrating public participation during the development of the Five County Association of Governments Natural Hazard Mitigation Plan has ultimately resulted in increased public awareness. Through citizen involvement, the mitigation plan reflects community issues, concerns, and new ideas and perspectives on mitigation opportunities and plan action items.

PLAN MAINTENANCE PROCESS

The plan maintenance process includes an annual scheduled meeting which gives an opportunity for the Five County Association of Governments Steering Committee to talk about local hazard mitigation developments within each county, it also allows for the plan to be revised every five years. Five County will integrate public participation throughout the plan maintenance process. This section also includes an explanation of how Five County intends to incorporate the mitigation strategies outlined in this Plan into existing planning mechanisms such as: County comprehensive land use plans, capital improvement plans, and building codes. Due to the high number of ever evolving communities in the region that this plan umbrellas, and the constantly changing local governmental positions, some communities may wish to add hazard mitigations at a later time.

For this reason an appendix is at the end of the document that will allow communities to make an amendment to ad additional hazard mitigations to the document throughout the next five years.

COORDINATING AND IMPLEMENTING THE PLAN

The success of the Five County Natural Hazard Mitigation (NHMP) depends on how well the outlined action items are implemented. Periodic monitoring of the plan is required to ensure that the goals and objectives are kept current and mitigation efforts are being carried out. In an effort to ensure that the activities identified are implemented, the following steps will be taken. Each participating jurisdiction will formally adopt and promulgate the NHMP. From here, each jurisdiction will have overall responsibility for ensuring that the plan is being implemented accordingly. In so doing, they will gain eligibility for Flood Mitigation Assistance, Hazard Mitigation Grant Program and Pre-Disaster Mitigation program funds.

Each participating jurisdiction addresses planning goals and legislative requirements through its comprehensive land use plan and associated zoning regulations, capital improvement plans, and building codes. The NHMP is non-regulatory in nature and provides a series of recommendations; many of which are closely related to the goals and objectives of existing planning programs. The intent of the NHMP is that each jurisdiction will incorporate the recommended mitigation actions into existing programs and procedures. This will help address land-use planning goals which are developed to protect life and property. Ultimately, the NHMP can be used as an avenue to update their associated planning documents to address natural hazards.

Many of the mitigation strategies provided herein are directly related in context to the built environment. This being said, it will become very important for each respective county building, planning, and engineering departments to be diligent in their administration/enforcement of applicable building standards. Another significant opportunity for proliferation of hazard mitigation efforts is at the capital improvement level. Jurisdictions should use the planning, research, and mapping materials provided herein, in their capital improvement due-diligence efforts. This continued diligence will undoubtedly enable risk reduction measures to be implemented at the time of development, which is the most optimal time for natural hazard mitigation.

Ultimately, this Plan shall serve as the impetus for jurisdictions to further evaluate natural hazards within their respective community. Ideally, this evaluation will translate into more stringent legislative actions being adopted which will provide the legal authority for hazard risk analysis and mitigation efforts.

Five County Association of Governments is dedicated to involving the public directly in the continual reshaping and updating of the Hazard Mitigation Plan. The financial and personnel resources for an extensive public involvement process make this endeavor extremely difficult. Nevertheless, every five years, during the process of updating the plan, Five County staff will enable opportunities for the general public to be involved with the Plan. The Plan includes the address and phone number of Five County Association of Governments, who will keep track of public comments and concerns with regard to the Plan. In addition, public participation is encouraged at city and/or town council meetings, and county commission meetings during the adoption of the final draft of the NHMP.

WHO WILL BENEFIT FROM THIS MITIGATION PLAN?

All mitigation occurs at the local level, and the primary responsibility for development and implementation of risk reduction strategies and policies lies with the local jurisdictions. This Natural Hazard Mitigation Plan affects the jurisdictions in the Five County region, including all rural, unincorporated communities. While this Plan has no direct influence over the affiliated jurisdictions, it provides the framework for planning for natural hazards in the region. The resources and information provided pertain to all areas within the region and the recommendations can lay groundwork for localized mitigation plans and partnerships.

Mitigation Strategy & Methodology

BACKGROUND

This chapter provides a description of how the mitigation strategies identified in this Plan will be prioritized, implemented, and administered by participating jurisdictions. Ultimately, the Plan will be implemented through existing planning mechanisms (existing plans, programs and policies); such as, County comprehensive land use plans, capital improvement plans, and building codes. The success of this Plan will be measured on how well the outlined mitigation strategies are implemented. This will be accomplished by participating jurisdictions by:

1. Formally adopting the plan.
2. Conducting further natural hazards evaluations within the respective community.
3. The evaluation will translate into more stringent legislative actions being adopted which will provide the legal authority for hazard risk analysis and mitigation efforts.

The theoretical assumption made in prioritizing mitigation strategies herein rests upon the premise that a natural hazard creating the highest amount of possible financial loss would also possess a higher probability of death. Further, using the assumption that a natural hazard occurred at maximum levels of destruction (intensity and range); we can also assume that the benefits of conducting mitigation actions to prevent said losses would be a top priority. Lastly, the assumption was made that the strategies which carry a smaller price tag have a higher degree of achievability; thus having a higher degree of benefit. This being said, implementation of a mitigation strategy which requires a minimal financial contribution carried a higher weight, resulting in a higher priority. The resulting mitigation strategies for each respective county-level hazard will be prioritized by each jurisdiction with these attributes in mind.

ECONOMIC ANALYSIS

Determining the economic feasibility of mitigating natural hazards provides decision makers with an understanding of the potential benefits and costs of a mitigation strategy, as well as a basis upon which to compare mitigation strategies. Financial resources are scarce for

each of the jurisdictions in the Five County region; nonetheless, the burden of planning and implementing site-specific projects rests upon the respective jurisdiction.

FEMA's methods of identifying the costs and benefits associated with natural hazard mitigation strategies fall into two general categories; benefit-cost analysis and cost-effectiveness analysis. Conducting benefit-cost analysis for a mitigation strategy assists in determining whether a strategy is worth undertaking now, and avoiding disaster related damages later. Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal.

This section is intended to:

1. Raise benefit-cost analysis as an important issue.
2. Provide some background on how economic analysis can be used to evaluate mitigation projects.
3. Having an instructive benefit-cost comparison aids in making an objective decision to pursue or not pursue various mitigation strategies.

Benefit-cost analysis: is a key method used by FEMA and other state and federal agencies in evaluating hazard mitigation projects. FEMA Publication 386-5, *Using Benefit-Cost Review in Mitigation Planning (May 2007),* outlines approaches for conducting economic analysis of natural hazard mitigation projects. It describes the importance of implementing mitigation activities, different approaches to economic analysis of mitigation strategies, and methods to calculate costs and benefits associated with mitigation strategies. Benefit-cost analysis is used in natural hazards mitigations to illustrate if the benefits to life and property protected through mitigation efforts exceed the cost of the mitigation activity.

The mitigation strategies provided in this Plan were proliferated through a process that emphasized a review of costs and benefits of each respective strategy. This process resulted in a streamlined Prioritization process using the principle that those mitigation strategies which carry a smaller price tag have a higher degree of achievability, and thus easier to implement. To assess the measurable and non-measurable benefits and costs associated with each mitigation strategy provided in this Plan, the Review Tools illustrated in FEMA Publication 386-5 were utilized.

PRIORITIZATION

Mitigation strategies reduce the cost of disasters by minimizing property damage, injuries, and the potential for loss of life which would otherwise be incurred in the event of a natural disaster. Evaluating natural hazard mitigation provides decision makers with an understanding of the potential benefits and costs of an activity, as well as a standpoint to compare alternative projects.

Evaluating mitigation strategies is a complex and difficult process which is influenced by many variables. First, natural disasters affect all segments of the community, including citizens, businesses, and public services. Second, while some of the direct/indirect costs of natural disaster damages are measurable, some of the costs are non-financial; therefore, they are difficult to financially quantify. Third, many of the impacts associated with a natural disaster have

compounding effects on the community, which in turn increases social and economic impacts a disaster may have.

Because each Jurisdiction within the five county region is unique in regards to geographic location, population, economic resources, and public services; individual municipalities should consider the following prioritization methods when determining the relative importance of the mitigation strategies provided for their pertinent county.

1) Each natural hazard is evaluated at the respective community/county level.
2) A natural hazard with the highest amount of possible financial loss should be considered before those with lesser financial loss.
3) The mitigation strategies should be prioritized with those requiring a minimal financial contribution first, and those with higher funding requirements or unknown funding requirements prioritized last.

Normally used to evaluate alternative mitigation strategies for a single identified problem, the STAPLEE process should be used as a rational basis to determine the Prioritization of each mitigation strategy. Each respective County level NHMP Planning Team believes that using the STAPLEE provided a reasonable and objective means to determine relative priority of the mitigation strategies identified in this plan. The STAPLEE process allows for a review of each strategy based upon the following considerations:

- **Social**- Is the proposed action/project socially acceptable to the community and does it unfairly affect one segment of the community?
- **Technical**- Is the action/project feasible from a technical standpoint? Can it be accomplished using available engineering practices?
- **Administrative**- Is there adequate staffing, funding and maintenance available for the proposed mitigation project?
- **Political**- Is there political support for the proposed action/project?
- **Legal**- Does the jurisdiction possess the appropriate legal authority to undertake the action/project?
- **Economic**-Are there sources of funding to accomplish the action/project? What benefits does the action/project provide and are the estimated costs in line with the benefits the action/project would provide?
- **Environmental-**Will the proposed action/project have an adverse effect on the environment (land, water, endangered species) and will the action/project comply with applicable environmental laws?

CHANGES IN PRIORITIES

The prioritization method has not changed. However, who prioritizes the mitigations have changed. The authors of the previous plan prioritized each mitigation based on the above prioritization methods. This update puts the priotization in the hands of each individual jurisdiction because each community is unique in geography, geology, climate, and infrastructure. For this reason each jurisdiction may be effected differently by natural hazards, which means a mitigation high in

priority in one community may be low in another.

IMPLEMENTATION & ADMINISTRATION

This Natural Hazard Mitigation Plan is non-regulatory in nature and provides a series of recommendations, many of which are closely tied to existing planning mechanisms. The Goal is that each participating jurisdiction will incorporate the recommended mitigation strategies into existing programs and procedures. The police powers afforded to jurisdictions enable the protection/ preservation of health, safety, and welfare within the community. This plan serves the purpose of accomplishing these goals by protecting life and property from natural disasters and hazards. This Plan provides an inventory of known areas of natural hazards in an effort to encourage development to be limited by the degree to which the natural hazard occurs within the areas of proposed development. Additionally, the jurisdiction can use this Plan as a resource in their development of a Natural Hazards element in their jurisdictional general plan, which will in turn precipitate more stringent zoning regulations and/or planning documents.

Many of the mitigation strategies provided herein are directly related in context to the built environment. This being said, it will become very important for each respective jurisdictions building, planning, and engineering departments to be diligent in their administration/ enforcement of applicable building standards. Another significant opportunity for proliferation of hazard mitigation efforts is at the capital improvement level. This Plan provides planning, research, and mapping materials, which can be used in a jurisdictions capital improvement due-diligence efforts. This continued diligence will undoubtedly enable risk reduction measures to be implemented at the time of development, which is the most optimal time for natural hazard mitigation.

Ultimately, this Plan shall serve as the impetus for jurisdictions to further evaluate natural hazards within their respective community. Ideally, this evaluation will translate into more stringent legislative actions being adopted which will provide the legal authority for hazard risk analysis and mitigation efforts.

Repetitive losses: properties are defined as those for which two or more losses of at least $1,000 each have been paid under the National Flood Insurance Program (NFIP) within any 10-year rolling period since 1978. FEMA has paid nearly $3.5 billion to loss properties, and it continues to be one of the largest draws on the fund. As of Oct/15/2015 the Five County region has not received assistance with the Repetitive Flood Claim program, or the Severe Repetitive Loss program. (FEMA.gov)

PREVIOUS GOALS AND STRATEGIES INCORPORATED IF RELEVANT

The Goals and Mitigation Strategies found in the previous plan were reevaluated and incorporated into this plan only if they were still relevant. Goals and Strategies which were determined to be non-relevant were not incorporated into this document.

This Plan contains a few mitigation strategies that apply to all jurisdictions within the Five County

region, including radon gas, drought, severe weather and any hazards that cross jurisdictional boundaries. Other mitigation strategies are specific to individual jurisdictions.

UPDATING THIS PLAN IN THE FUTURE

The Five County Association of Governments Community and Economic Development staff will be prepared to provide staff expertise to prepare the next required update of the Natural Hazard Mitigation Plan in consultation with the State of Utah Hazard Mitigation Officer. The Five County Association of Governments provides professional staff expertise to local elected and appointed officials for the purpose of aiding in the development and implementation of effective decision-making process. The mission of the Five County Association of Governments is to Plan, Prepare and Partner with federal, state and local governments to strengthen the role of local officials in the execution of state and federal programs at the local level. The overall purpose of the Association is to provide a forum to identify, discuss, study, and resolve area-wide planning and development concerns.

REGIONAL NATURAL HAZARD MITIGATION PLANNING AND LOCAL LAND USE ORDINANCES

This document is a guide to local jurisdictions, but it does not, nor can it, provide regulations enforceable in those jurisdictions. Under the State of Utah land use enabling legislation, each jurisdiction has the sole authority to adopt and enforce local land use ordinances. This document encourages local entities to enact appropriate local land use and hazard mitigation ordinances.

Identifying Hazards



PROCESS

The Five County Natural Hazard Mitigation Plan compiles data for eight natural hazards and establishes mitigation goals and activities that should be revisited annually, permitting that funds are available. Updating the Plan allows for the introduction of new data and technical resources, and maintains strong ties between cooperating agencies, organizations, non-profits, and governments. The continuous integration of new knowledge improves the assessment of each of the hazards in this plan, and improves the region's ability to plan for, and withstand, the impacts of natural hazard events.

Conducting a hazard risk assessment can provide information on the potential location of a hazard, the value of existing property, and an analysis of risk to life within the potential hazard area.

The hazard risk assessment will include:

- Description of the hazards
  - -A description of the location
  - -The extent, previous occurrences, and probability of future events

- Identify Community Assets
  - - Community assets are broadly defined by four categories: People, Economy, Built environment, and Natural environment. Each risk assessment addresses one or more of these categories.

- Analyze Risk
  - - The analysis depicts the potential impacts and potential losses for each hazard.

- Summarize Vulnerability
  - - This information is presented for communities to better understand significant hazard risks and vulnerabilities. It should communicate findings to elected officials and other stakeholders to support their decision making.

Hazard assessments are subject to the availability of hazard specific data. Gathering of data for a hazard assessment requires a commitment of resources on the part of participating organizations and agencies. Each hazard specific section of this Plan includes a section on hazard identification using data and information from county or state agency sources.

In addition the assessments were conducted using GIS software to join County Property Tax data as it relates to buildings located with a respective hazard area. This analysis was based upon the most recent County Property Tax data provided by each County Assessor's office. The values shown are based upon utilizing the market value for structures in each defined hazard area. The GIS software then quantified the number of units and total market value for all structures located within each defined hazard area.

CATASTROPHIC & CHRONIC NATURAL HAZARD EVENTS

Catastrophic events do not occur with the same frequency as chronic hazards, but can have devastating consequences. Earthquakes and volcanoes are two types of catastrophic hazards. These types of natural hazards are difficult to predict, affect a wide geographic area, and can severely impact entire regions.

Chronic hazards occur with some degree of frequency and include flooding, landslides, severe weather, wildfires, problem soils, drought, and radon gas. These hazards impact communities with devastating economic consequences. The following is a summarization of natural hazard events occurring in the Five County region.

In addition, this section is designed to aid in identifying catastrophic and chronic natural hazard events that occur within the five county region. Each hazard described here is intended to be broadly defined; following this chapter every hazard will be identified and related to the risk assessment as it pertains to each county and/or the region as a whole.



Problem Soils

Geologic and climatic conditions in southwestern Utah provide a variety of both localized and widespread occurrences of problem soils. They occur in a variety of geologic settings and are some of the most widespread geologic hazards. Some materials, such as expansive soil and limestone, cover large areas, whereas others, like active dunes, are of limited extent. The most extensive problem soils found in the region are expansive soil and rock.

As development encroaches on less suitable terrain, damage from problem soil and rock has, and will increase. Detailed Geotechnical studies are needed in areas of problem soil and rock to identify and mitigate potential problems, and avoid costly corrective measures. Six types of problem soil and rock are present in southwestern Utah.

Expansive soil and rock - is the most common type of problem deposit in southwestern Utah. In particular, the Jurassic-age Arapien and Cretaceous-age Tropic Shale's, and the Triassic-age Chinle and Moenkopi Formations are sources for expansive materials. Expansive deposits contain clay minerals that expand and contract with changes in moisture content. Clays absorb water when whetted, causing the soil or rock to expand. Conversely, as the material dries, the loss of water between clay crystals or grains causes the deposit to shrink. Development in areas with expansive clays in the Chinle Formation have been damaging to structures. Common problems are cracked foundations, floor slabs, and basement walls. In addition failure of wastewater disposal systems, sidewalks and roads are particularly susceptible to damage.

Collapsible Soil - Collapsible soil is common in Holocene alluvial-fan and debris-flow deposits in southwestern Utah. Soil and rock containing gypsum are also susceptible to subsidence. Collapse occurs when susceptible soils are wetted to a depth below that normally reached by rainfall, destroying the clay-bonds between bands. Collapsible soil is present in geologically young materials such as Holocene-age alluvial-fan and debris-flow sediments, and in some wind-blown

silts.

Limestone and Karst Terrain - Karst terrain is characterized by closed depressions (sinkholes), caverns, and streams that abruptly disappear underground. Most karsts terrain in southwestern Utah is relict and relates to moist climates during the Pleistocene, or may have been created by ground water prior to the rock being uplifted and tilted during basin and range faulting. Additionally karsts ground-water systems have little filtering capacity, contamination of ground water is a major concern.

Gypsiferous Soil/ Rock deposits - are subject to settlement caused by the dissolution of gypsum, which creates a loss of internal structure and volume within the deposit. Gypsum is also a weak material with low bearing strength, which can cause problems when loaded with the weight of a structure. In addition, gypsum dissolved in water forms sulfuric acid and sulphate, which react with certain types of cement and weaken foundations. Gypsiferous soil and rock deposits are common in southwestern Utah. Gypsum in these deposits can cause damage to foundations, and induce land subsidence and sinkholes similar to those seen in limestone and Karst terrain.

Soils subject to Piping - Piping is subsurface erosion by ground water that moves along permeable, non-cohesive layers in unconsolidated materials and exits at a free face, usually along a stream bank or cliff that intersects the layer. Deposits susceptible to piping are common in the southwestern part of the state. Holocene-age alluvial fill in canyon bottoms is the most common material susceptible to piping in Utah. Road construction can contribute to the piping problem by disturbing natural runoff and concentrating water along paved surfaces, allowing greater infiltration and potential for pipes to develop. Piping can cause damage to roads, bridges, culverts, agricultural land and any structure built over soils subject to piping. Earth-fill structures such as dams may also be susceptible to piping.

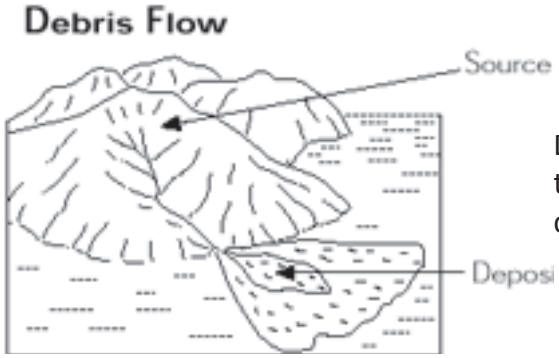
Sand Dunes - are common surficial deposits in arid areas where sand derived from weathering of rock or unconsolidated deposits is blown by the wind into mounds or ridges. In areas where development encroaches on dunes, inactive or vegetated dunes may be reactivated, allowing them to migrate over roads and bury structures. Migration of dunes across roads and burial structures are common problems in areas where active dunes are present. Avoidance of dunes is the best way to prevent damage to structures. However, active dunes usually are a maintenance problem only and do not preclude development.



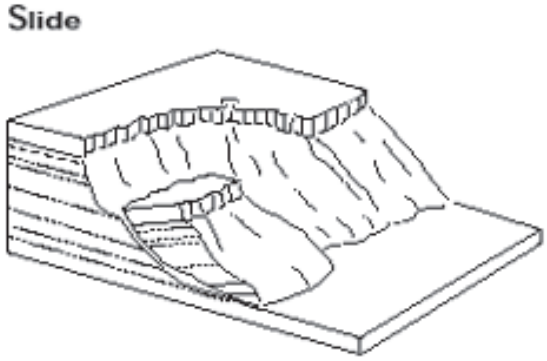
Landslides

The principal landslide is gravity fed movement of rock and earth on an over-steepened slope. However, landslides include an extensive range of ground movement including Debris Flow, Slide, and Rock Fall.

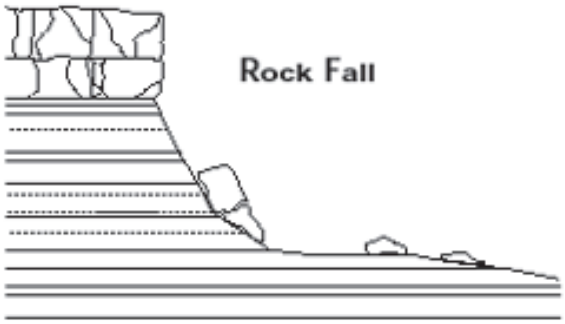




Debris Flows - Consist of sediment-water mixtures that flow down a stream bed or hillslope, commonly depositing sediment at canyon mouths.



Slide - are downslope movements of soil or rock on slopes.



Rock Fall - consist of rock(s) falling from a cliff or cut slope.
(Utah Geological Survey)

Rock fall needs further addressing because it is one of the most common types of landslides in South Western Utah.

> "Rock fall is a natural mass-wasting process that involves the dislodging and downslope movement of individual rocks and small rock masses. The combination of steep slopes capped by well-jointed, resistant bedrock formations such as the Shinarump Member of the Chinle Formation and numerous Quaternary basalt flows, makes rock fall the most common slope-failure type in the St. George – Hurricane metropolitan area. Rock falls pose a hazard because a rolling boulder can cause significant damage to property, roadways, and vehicles and thus pose a serious safety threat. Rock-fall hazards are found where a source of rock exists above slopes steep enough to allow rapid downslope movement of dislodged rocks by falling, rolling, and bouncing. Rock fall is also the most common type of slope failure caused by earthquakes. Earthquakes as small as magnitudes 4.0 have

triggered rock falls. Additionally, slope modification such as cuts for roads and building pads or clearing of slope vegetation for development can increase or create a local rock-fall hazard". (Utah Geological Survey)

Landslides transpire in every state in the union, and the Five County Region is no exception. Some of the factors that cause landslides in this region are over steepened slopes, excess weight, accumulation, duration, and intensity of precipitation, earthquakes, wildfire history, and man-made structures like roads and buildings that put additional stress on slopes, or undercut slopes. In addition areas typically susceptible to landslides are:

- Existing landslides.
- Steep natural slopes, particularly in weak geologic materials.
- Steep construction-related cut or fill slopes.
- Areas in or at the mouths of drainages (such as canyons)
- Slopes below leaking canals or ponds.
- Developed hillsides where septic-tank soil-absorption systems are used and landscapes are irrigated.

(Utah Geological Survey)



Wildfire

When discussing wildfires it is important to remember that fires are part of a natural process and are needed to maintain a healthy ecosystem. Since the regions settlement in the mid-1800s, residents have been subject to the annual threat of wildfire. Lightning is a major cause of wildfire in the Five County region. However, the potential risk for human caused fires increases as urban land grows, causing the wildland development areas to increase.

There are many factors that affect wildland fires and how they will impact human development and settlement. The wildfire assessment includes data regarding Wildfire Risk. This factor includes many complex elements that will be discussed in this section. In addition the assessment is designed to give a better understanding of the risk and threat that faces the regions settlements.

This document is not an in depth wildfire study of the Five County Region and should not be used as an end for determining property safety. The wildfire elements are intended to inform decision makers that wildland fires pose a significant risk to the region and aid with decisions and policies. For further information, or for an in-depth study of a specific area, please contact the Utah Department of Natural Resources Forestry Division.

Data and Definitions are provided by the *Oregon Department of Forestry



- **Wildfire Risk -** Is the possibility of loss or harm occurring from a wildfire. Wildfire Risk combines the likelihood of a fire occurring (Threat), with those areas of most concern that are adversely impacted by fire (Fire Effects), to derive a single overall measure called the wildfire Risk Index. The Fire Effects Index identifies those areas that have important values that could be adversely impacted by a wildfire and also might be in areas where fire suppression activities are difficult. Values Impacted include Wildland Development Areas (WUI), Forest Assets, Riparian Assets, Drinking Water Importance Areas (watersheds) and Infrastructure Assets.
- **Wildfire Threat -** Is a number that is closely related to the likelihood of an acre burning. The Fire Threat Index is derived from historical fire occurrence, landscape characteristics including surface fuels and canopy fuels, percentile weather derived from historical weather observations and terrain conditions.



- **Suppression Difficulty -** Reflects the difficulty or relative cost to suppress a fire given the terrain and vegetation conditions. This combines the slope steepness and the fuel type characterization to identify areas where it would be difficult or costly to suppress a fire due to underlying terrain and vegetation.
- **Wildland Development Areas (WUI) -** Is an area where structures and other human improvements meet and intermingle with wildland or vegetative fuels. This data set defines areas where people and homes are threatened by fire burning in wildland fuels.
- **Forest Assets -** Are the prioritization of landscapes reflecting forest assets that would be most adversely affected by fire. This includes forested lands categorized by canopy height, canopy cover, and susceptibility, or response to wildfire.
- **Riparian Assets -** Are riparian areas characterized by functions of water quantity and quality as well as ecology. This identifies riparian areas that are important as a suite of ecosystem services, including terrestrial and aquatic habitat, water quality, water quantity, and other ecological functions.
- **Drinking Water Importance Areas (DWIA) -** A Drinking Water Importance Area is a watershed and within that watershed is the measure of quality and quantity of public surface drinking water.**Infrastructure Assets -** Is a measure of the effects or potential wildfire impacts to infrastructure assets such as schools, airports, hospitals, roads and railroads.

The fire history tables and maps in each county section represent Bureau of Land Management fires only. There are many other agencies such as the forest service that have wildland fires as well, and should not be disregarded because they have not been reported in this document. The tables and maps are designed to inform people that fires are a real threat in Southern Utah and should and not be used as a complete history of wildfires in the area.

* As part of a West Wide Wildfire Assessment that covers seventeen Western States the Utah Department of Natural Resources (Utah DNR) has partnered with many other western states organizations to prepare thorough wildfire assessments throughout the Western U.S. In addition the proper citation from documents provided by the Utah DNR Wildfire Risk Assessment Portal is “The Oregon Department of Forestry”

Color Country Fuels Committee's Communities at Risk Assessment Background - In the Southwest Utah Regional Wildfire Protection Plan (October 2007), the Color Country Fuels Committee (CCFC) compiled data that included standardized internal and external risk assessments, digital photos, maps, and other information to prioritize hazardous fuels target areas and to aid in suppression efforts. Each Community at Risk (CAR) was given a score ranging from 0 (no risk) to 12 (extreme risk) based on the sum of multiple risk factors (e.g., fire history, local vegetation, firefighting capabilities) analyzed in every area. The scoring system allows Utah's fire prevention program officials to assess the relative risk in a given area of the state and open communication channels with these communities to help them better prepare for wildfire. Each CAR is highlighted within its respective county and given a score. All communities at risk and their score can be found in their respective county chapter.

Flood

In the southwest, as elsewhere, flooding, erosion, and sediment discharge are responsible for loss of life, land, and infrastructure, along with damage to reservoirs and natural habitats. Flooding is a temporary overflow into an area not normally deluged with water. Understanding the different types of floods that can occur in an area can greatly contribute to mitigation efforts. Some of the flood types in the Five County area defined by the National Weather Service-National Oceanic and Atmospheric Administration (NOAA) are:

Flash Flood - is a rapid and extreme flow of high water into a normally dry area, or a rapid water level rise in a stream or creek above a predetermined flood level, beginning within six hours of the causative event (i.e., intense rainfall, dam failure, ice jam).

River Flooding - occurs when river levels rise and overflow their banks or the edges of their main channel and inundate areas that are normally dry.

Burn Scars/Debris Flow - Wildfires burn away the vegetation of an area, leaving behind bare ground that tends to repel water. When rain falls, it runs off a burn scar towards a low lying area, sometimes carrying branches, soil and other debris along with it. Without vegetation to hold the soil in place, flooding can produce mud and debris flows.



Ice/Debris Jams - A back-up of water into surrounding areas can occur when a river or stream is blocked by a build-up of ice or other debris. Debris Jam: A back-up of water into surrounding areas can occur when a river or stream is blocked by a build-up of debris

Snow-melt - Flooding due to snow-melt most often occurs in the spring when rapidly warming temperatures quickly melt the snow. The waters runs off the already saturated ground into nearby streams and rivers, causing them to rapidly rise and, in some cases, overflow their banks.

Dry Wash - When heavy rain falls over extremely dry land, the water rushes towards low-lying areas, which may include dried up canyon or river beds. This can quickly turn a dry channel into a raging river.

The Location of historic floods provided in each counties flood analysis is not the complete geographic extent of the flood, but provides a location that was severely affected by the event.

Dam Breaks/Levee Failure - A break or failure can occur with little to no warning. Most often they are caused by water overtopping the structure, excessive seepage through the surrounding ground, or a structural failure.

R655-10-5. Hazard Classification.
Hazard classification of a dam places the dam into a category based upon the consequences of failure of the dam. The State Engineer is the ultimate authority on the hazard classification designation for a given dam.

R655-10-5A. Hazard Classification -- Criteria.
The hazard classification analysis should include a determination of the threat to human life and property damage in the event of the failure of a dam. In some cases the classification can be assigned by observance of the downstream development in relationship to the location of the dam. In other cases it will be necessary to prepare inundation maps to determine the downstream consequences of failure. When using maps for hazard classification determination, the inundation boundary, as well as the depth and velocity of flow, will be considered. In preparing the inundation maps, the following criteria relative to the dam should be used.

1. No concurrent flooding conditions exist.
2. The reservoir level is at the spillway crest.
3. The low level outlet is discharging at capacity.
4. The breach times and geometric parameters used to simulate the dam failure should be acceptable to the State Engineer and consistent with accepted practices.
5. The inundation study should be carried downstream to a point that the breach flows are contained within the banks of the natural channel or a downstream reservoir.
(Utah Department of Administrative Services Division of Administrative Rules, R655-10-5, R655-10-5A)

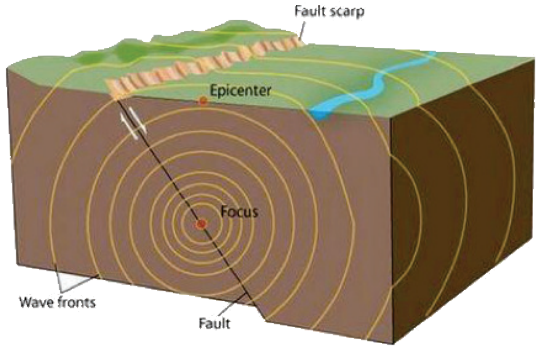


Earthquake

Earthquakes are unpredictable and occur when blocks of earth slip releasing energy. The initial point of rupture takes place at what is called the Focus. The focus is on the fault and is usually miles below ground surface. The epicenter is the surface point directly above the Focus. Ground shaking or ground movement is caused from seismic waves, which discharge outward from the focus.

There are hundreds of earthquakes each year in Southern Utah, many of which are two small to be noticed. Earthquakes are regional hazards affecting multi-county areas, and because almost the entire area could experience a seismic event, all communities contain some degree of risk. Because ground shaking can proceed miles from the fault, an earthquakes can trigger additional

risks and hazards such as ground shaking, structure failure, soil liquefaction, surface fault rupture, slope failure, and flooding.



Ground shaking is generally the most destructive aspect of an earthquake because the seismic waves move both vertically and horizontally. Structural damage usually varies depending on the distance from the epicenter, size of the earthquake, and the type of sediment.

When discussing potential structural damage, vulnerability of structures was determined based on the age of construction. Utah building codes began to address seismic design as early as 1976; although, the state did not adopt building codes that full address seismic safety until 1989, they continue to update the codes about every three years. It is fairly safe to assume that structures constructed prior to 1976 will not perform in an earthquake as well as structures built following 1976. However this should not be the basis for determining whether a structure is safe or not. A trained professional should be contacted to further assess a structure to determine building safety. FEMA also provides an earthquake safety guide for homeowners on their website. (www.fema.gov) In addition, the number of structures in each county built before 1976 within the American Community Survey and the county tax data contain a significant margin of error. The purpose of using structure age data helps to better understand that a significant population might be more vulnerable to a large earthquake than those living in a structures built to seismic standards.

Liquefaction is a major cause of earthquake damage. During an earthquake the soil loses its strength and ability to hold the weight of structures. Liquefaction usually occurs in water-saturated soils, loose grained soils, and areas where ground water is less than or equal to 50 feet. In general liquefaction does not occur with earthquakes less than a magnitude five. Some of the adverse affects structures are subject to during liquefaction are: Foundation Cracking, Buildings tipping, underground structures such as septic tanks can become buoyant, and liquefied soils and overlying materials may move down gentle slopes. Structures that are sensitive to liquefaction are: building with shallow foundations, railways lines, highways, bridges, buried structures, dams, canals, retaining walls, and utility poles and towers.

Fault rupture is significant ground movement that causes blocks of earth to be uplifted and downthrown. This movement creates fault scarps and has the potential to cause tectonic subsidence.

Earthquakes can cause debris flow, rock fall, and landslides. In some instances the landslides can become natural dams for streams which will ultimately cause flooding.

The 2011 plan included a dollar amount and count of all taxed structures within 1,000 feet of Quaternary faults, which will no longer be in the report. The 1000 ft. buffer around faults in the previous plan were used to help identify the risk of community assets and threat to the general population. Such buffers should not be used to determine the properties at risk. FEMA's

recommended procedure to determine such risks are to use ShakeMaps. These maps use ground movement from worst case earthquake scenarios based upon specific fault segments. Five Counties Association of Government is working with the state to generate reports from a ShakeMap so they can provide better hazard mitigation strategies to communities in the future.

Recommendations for the following two paragraphs are from Guidelines for Evaluating Surface-Fault-Rupture Hazards in Utah. (Christenson, Batatian, & Nelson 2003) These guidelines are from 2003 and a qualified geologist should be consulted for the most up to date setbacks and recommendations.

When building or developing might cross a fault, the Utah Geological Survey recommends that in-depth special-studies be conducted along faults that have not already had special studies conducted. Study limits along well defined faults on the upthrown side should be conducted at 250 ft., and along the downthrown side it should be administered at 500 ft. If it is a buried fault, or the location is approximated, the study should be conducted 1,000 ft. on either side of the fault. That being said, the fault investigation should be conducted by a geologist who is qualified to perform such investigations. (Guidelines for Evaluating Surface-Fault-rupture Hazards in Utah 2003)

According to the Guidelines for Evaluating Surface-Fault Ruptures in Utah (UGS 2003), after the special-studies are complete critical facilities should have a setback of at least fifty feet from the exact location of the fault. Critical facilities include schools, hospital, fire stations, high-occupancy building, water treatment plants, and facilities containing hazardous materials. (Guidelines for Evaluating Surface-Fault-Rupture Hazards in Utah 2003)

The faults mapped in this document have 1,000 ft. buffers around them because many were originally mapped at 1:500,000 scale. A trained and qualified geologist should be contacted if there is any question the structure will be near a fault.

Most people are aware of the seismograph and have a basic understanding of what it does, but are unaware that there are currently several different methods to measure the size of an earthquake. The methods used to measure magnitude are:

- Local Magnitude (ML) - Uses relatively high frequency data from seismograph stations near the earthquakes. Local Magnitude is often called Richter Magnitude.
- Body wave magnitude (Mb) - Measures seismic waves that travel through the earth rather than measuring seismic waves that are near the earth's surface.
- Surface wave magnitude (Ms) - Measures seismic waves that are trapped near the earth's surface.
- Moment magnitude (Mw) - Is a uniform extension of the magnitude scale that was developed to produce very accurate size estimates of earthquakes. The Mw works is very accurate in determining the size of large earthquakes.

All of these scales have their own set of limitations and should produce approximately the same magnitude values. (United States Geological Survey)

The tables and maps in each respective county chapter displaying historic earthquakes were

recorded from University of Utah Seismograph Stations, using local magnitude (ML) to determine the size of each earthquake.

The most accurate historic earthquake data in Utah began between1962-1974 when there was less than ten stations. From 1974 to 1980 there began to be a denser network of high-gain telemetered stations, this allowed for more accurate size and location determination. After 1981 everything went digital improving accuracy.

Drought

Drought is a normal reoccurring event when precipitation is below normal, droughts span anywhere from a few month to several years. For this reason nearly every climate can experience drought, and each region undergoes drought differently. Because a drought is simply defined as below normal precipitation, the amount of annual rainfall that would be considered a drought in one climatic region might be completely different in another.

Precipitation is just one factor of a drought, other components include but are not limited to runoff, percolation, ground water recharge, temperature, wind, humidity, evapotranspiration, and streamflow into larger bodies of water. There are four main types of drought that take into account some of these factors. (National Drought Mitigation Center)

- Meteorological Drought: Meteorological drought is based on how dry conditions are compared to “normal” or average conditions of a specific region.
- Agricultural Drought: The circumstances where soil water deficits no longer meet the demands of a specific crop during all stages of development.
- Hydrological Drought: These droughts are tied closely to the amount of precipitation there is, but it is referred to on the hydrological system, which refers to streams, rivers, lakes, and reservoirs. A hydrological drought time period usually follows a meteorological, or agricultural drought by at least a few months.
- Socioeconomic Drought: Occurs when the amount or lack of precipitation negatively effects economic goods and resources.

Drought information in Southwest Utah is based upon the Palmer Drought Severity Index (PDHI) Chart. For 35 years “the Palmer drought index has proven to provide one of the best indications of drought for much of the United States. It is superior to other drought indices in many respects because it accounts not only for precipitation totals, but also for temperature, evapotranspiration, soil runoff and soil recharge.” (National Centers for Environmental Information)

Drought conditions cover wide swaths of land and are currently examined within geographical boundaries called climate divisions. The four climate divisions in Southwest Utah are the Western, Dixie, South Central, and Southeast Divisions. These divisions are closely related to Utah’s geographic regions and drainage basins.

Radon

Radon is a radioactive gas of geologic origin that is found in many buildings in sufficient concentrations to represent a health hazard to building occupants. Radon is an odorless, tasteless, and colorless radioactive gas which forms as a product in three radioactive decay series. Most common of these is the uranium-decay series. In nature, radon is found in small concentrations in nearly all rocks and soils. Potential radon-hazard areas in southwestern Utah are widespread, and are generally underlain by silicic igneous rocks of low-grade metasedimentary deposits.

Radon enters buildings through cracked foundations, cracked walls, gaps in suspended floors, gaps around service pipes, and many other open passageways. It can be at the highest concentrations in closed off areas such as basements

It is important to be aware of radon in buildings were people spend a great deal of time because long-term, and high exposure to radon can cause lung cancer, even among non-smokers. Although there is insufficient data for radon caused lung cancer in Southern Utah, The Utah Environmental Public Health Tracking system states that it is the second leading cause of lung cancer in the U.S. and odds of contracting lung cancer dramatically increase when someone is exposed to both tobacco smoke and radon.



Surveys conducted by the Utah Department of Environmental Quality/Division of Radiation Control indicate that 20% of homes in Utah are at concentrations above the U.S. Surgeon General's guidance of 4.0 pCi/L (pico-curies/liter), at which mitigation actions should take place. Radon gas remediation can be done, and testing is relatively easy and inexpensive ($8-250).

Radon potential maps can help to determine where indoor radon may exist. However, the only way to know if a building is subject to this hazard is by testing. Generally testing only takes 2-3 days, but some longer term tests take up to 90 days.

Installing a radon resistant system during the construction of a new home is not difficult, nor is it relatively expensive if a small amount of planning is done in advance. Furthermore, installing radon reduction systems during construction makes good sense and provides a healthy home for years to come; however, if a home is constructed without a radon reduction system there are many cost effective methods which can be implemented to minimize the hazards. The quickest way to test is with short-term tests. Short-term tests remain in the home for two days to 90 days,

depending on the device. For example, charcoal canister detectors are most commonly used for short-term testing and provide results quickly. For purposes of this document, citizens in the Five County region should be encouraged by local building officials to evaluate the radon levels associated with their homes.

Severe Weather

The term severe weather, as it pertains to this plan, is used to represent a broad range of weather phenomena which affect southwestern Utah, namely; downburst, lightning, heavy snowstorms, and tornadoes.

Tornado - is a violently rotating column of air extending from a thunderstorm to the ground. Most tornadoes have winds less than 112 miles per hour and zones of damage less than 100 feet wide. According to the National Weather Service, a total of 12 tornadoes have been observed in southwestern Utah. Of this amount, Iron and Beaver counties contain the highest amounts at 5 and 4 respectively.

Downburst - is a strong downdraft which causes damaging winds. A downburst can range in size and is described as either a microburst or a macroburst. A microburst can extend 2 1/2 miles, has winds that reach up to 168 MPH, and generally lasts between 5 and 15 minutes. A macroburst has winds extending more than 2 1/2 miles, has winds that reach up to 134 MPH, and generally between 5 and 30 minutes.

Lighting - is created when tiny ice crystals in cool air rub against water droplets in warm air creating static electricity. After the positive and/or negative charges in the storm clouds are strong enough the insulation in the air breaks down and creates lighting between two clouds, or clouds and the ground.



Heavy Snowstorms - According the National Weather Service and NOAA a heavy snow storm can immobilize a region and paralyze a city, stranding commuters, closing airports, stopping the flow of supplies, and disrupting emergency and medical services. The weight of snow can cause roofs to collapse and knock down trees and powerlines.

In an effort to guard against the negative effects of severe weather, the National Weather Service has designed the StormReady program. This program is a nationwide community preparedness program that uses an approach which helps communities develop plans to handle all types of severe weather. To be classified as a StormReady community several criteria must be met; however, the county Local Emergency Planning Committee (LEPC) is positioned well to satisfy the StormReady application/program guidelines. Ultimately the benefit of becoming formally

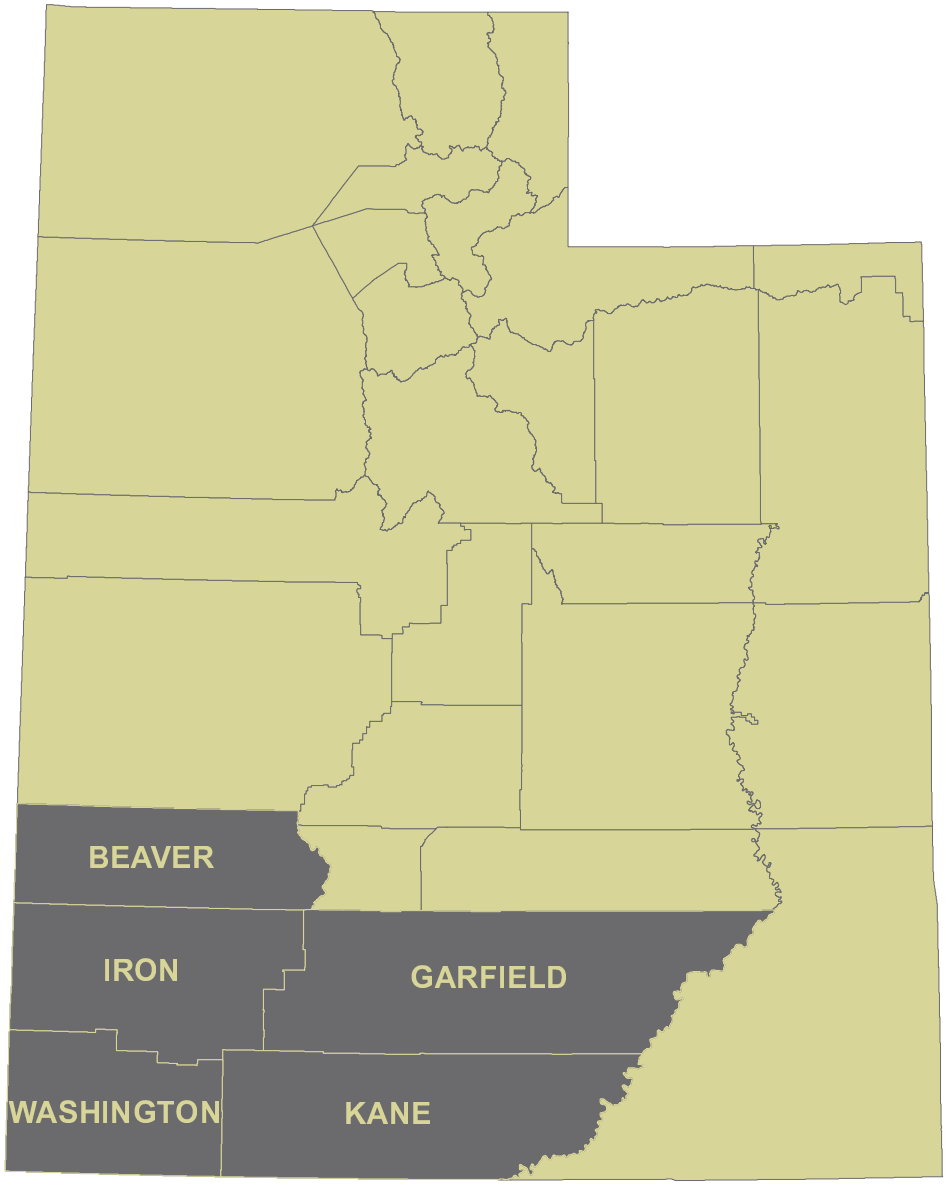
recognized as a StormReady community lies in the additional planning/preparation/preparedness for severe weather occurrences; however, some grant opportunities are available through the National Weather Service as well as possible adjustment to insurance rates through the Insurance Services Organization (ISO).



The Five County Region

THE FIVE COUNTY REGION

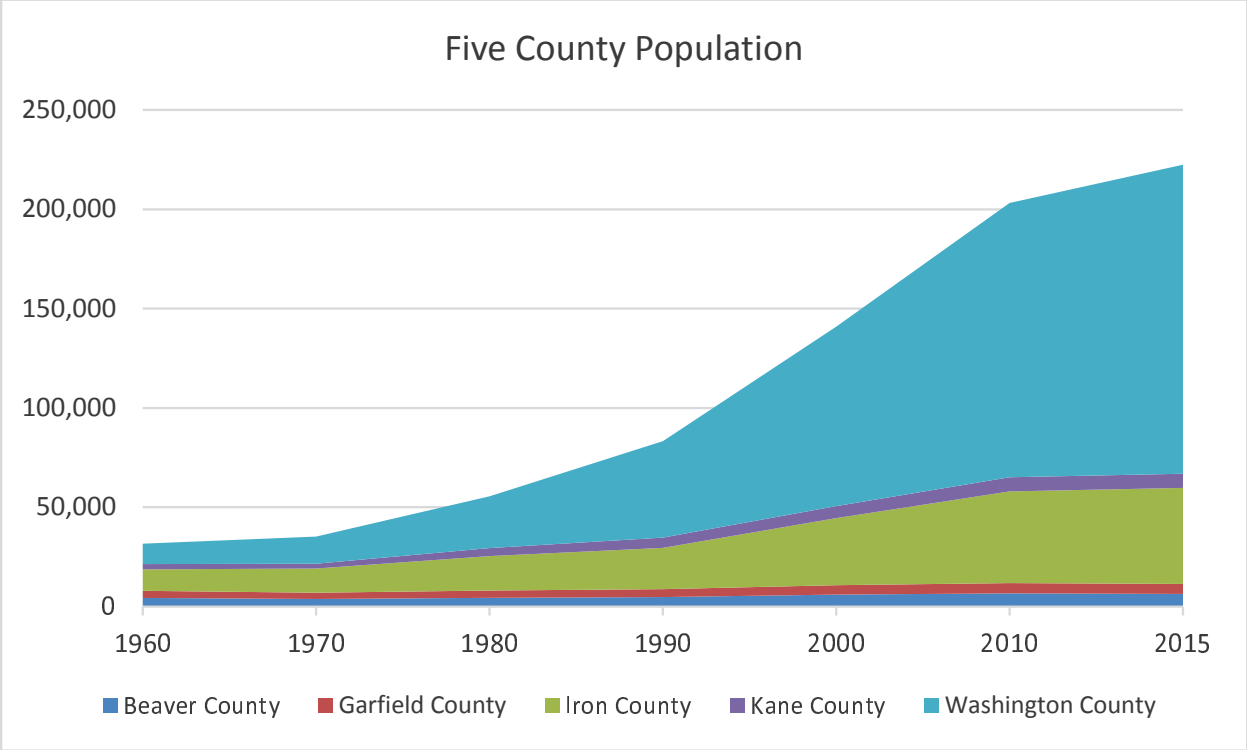
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Demographics

Over the last fifty years the Five Counties region has experienced a population increase of nearly 200%, and is projected to continue growing at a rate of 35.8% between 2010 and 2020. At this pace the region's population should be roughly 276,000. The growth of the Five County region has been attributed to many factors including industry and tourism.

Although the reasons behind the region's growth is important, the purpose here for analyzing population is to better inform decision makers about how many people could potentially be affected by a natural hazard.

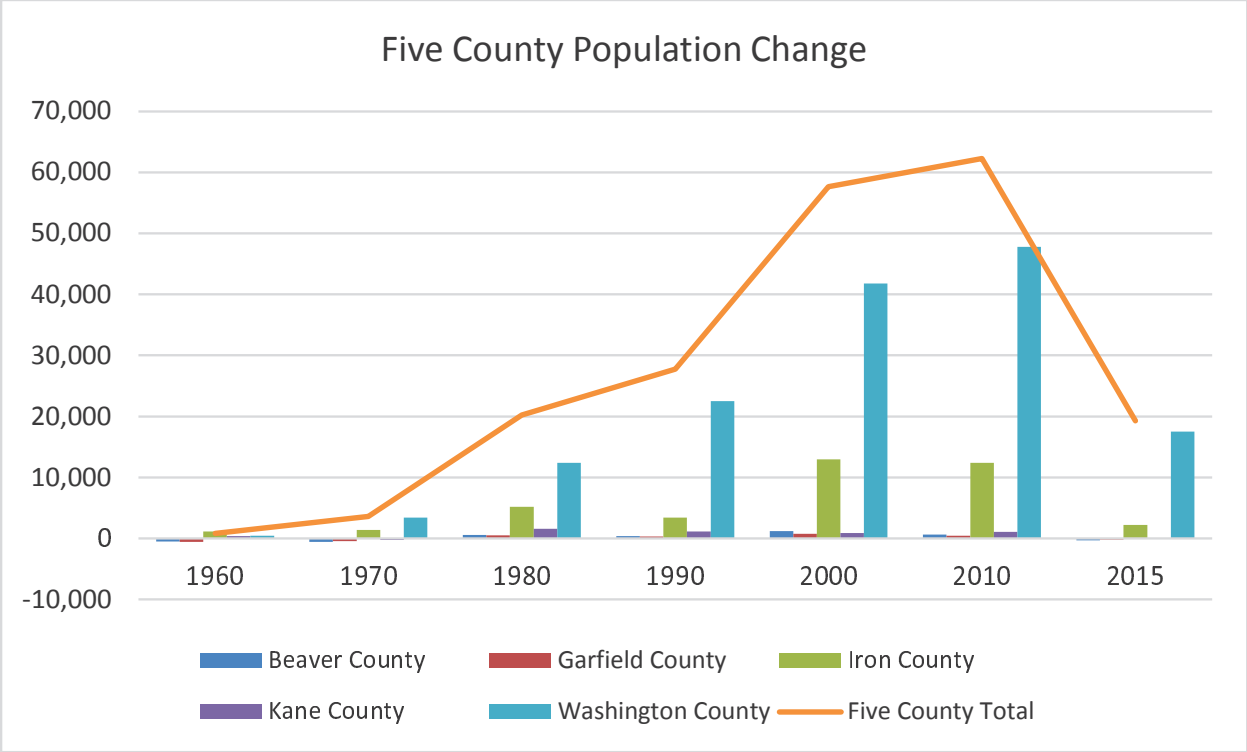


Five County Population							
Year	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2015**
Beaver County	4,331	3,800	4,378	4,765	6,005	6,629	6,354
Garfield County	3,577	3,157	3,673	3,980	4,735	5,172	5,009
Iron County	10,795	12,177	17,349	20,789	33,779	46,163	48,368
Kane County	2,667	2,421	4,024	5,169	6,046	7,125	7,131
Washington County	10,271	13,669	26,065	48,560	90,354	138,115	155,602
Five County Total	**31,641**	**35,224**	**55,489**	**83,263**	**140,919**	**203,204**	**222,464**

Source: U.S. Census Bureau, Compiled & Edited by Richard L. Forstall, 2015 American Community Survey

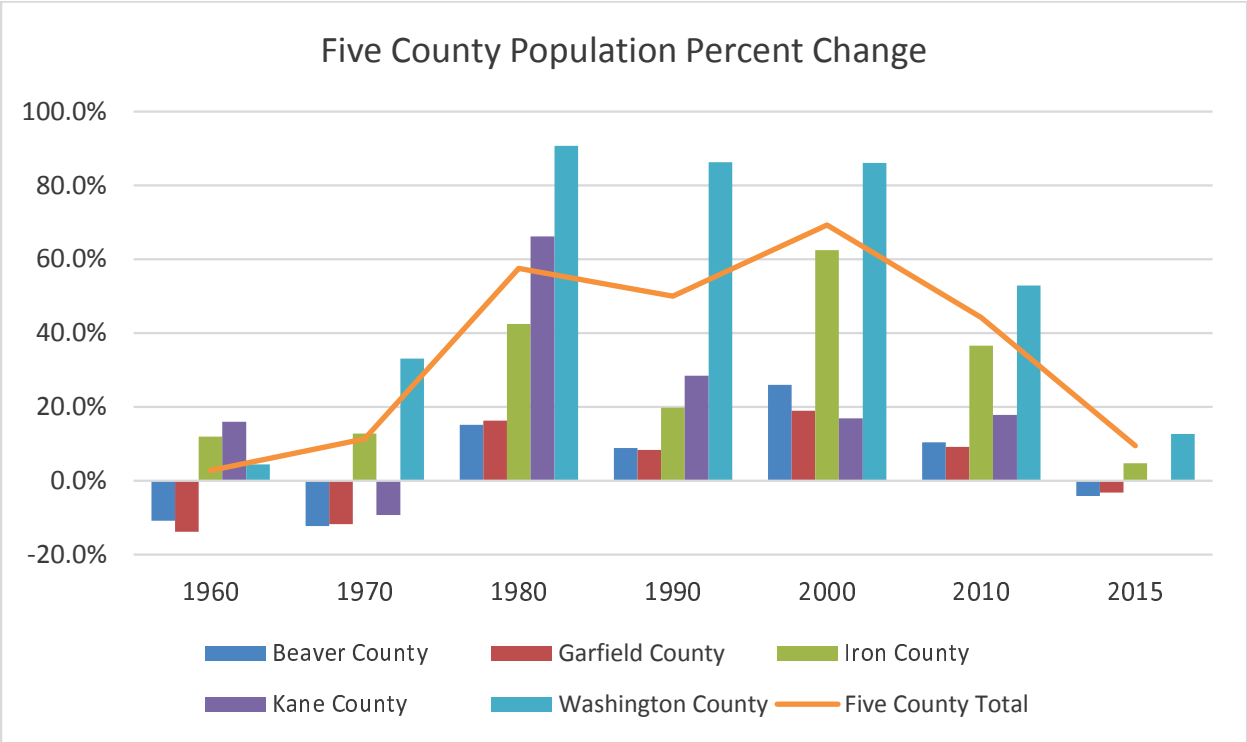
Washington and Iron counties have experiences the most growth over the last fifty years. Beaver,

Garfield, and Kane Counties have been growing up to 2010, but not enough to greatly contribute to the growth curve of the area. Between 2010 and 2015 Washington and Iron Counties have grown while Beaver and Garfield Counties have decreased in Population.



Five County Population Change							
Year	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2015**
Beaver County	-525	-531	578	387	1,240	624	-275
Garfield County	-574	-420	516	307	755	437	-163
Iron County	1,153	1,382	5,172	3,440	12,990	12,384	2,205
Kane County	368	-246	1,603	1,145	877	1,079	6
Washington County	435	3,398	12,396	22,495	41,794	47,761	17,487
Five County Total	**857**	**3,583**	**20,265**	**27,774**	**57,656**	**62,285**	**19,260**
Source: U.S. Census Bureau, 2015 American Community Survey							

The Population Change is describing the increase or decrease of the Five County population. With the exception of the sixties and seventies and between 2010 and 2015 the population of all five counties has increased over the last fifty years. A notable change is the decrease of population change that Iron and Washington County experienced between 2000 and 2015; and the decrease of population Beaver and Garfield Counties experienced between 2010 and 2015. Overall the Five County Region is growing, but not as fast as it has in the past.



Five County Population Percent Change							
Year	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2015**
Beaver County	-10.8%	-12.3%	15.2%	8.8%	26.0%	10.4%	-4.1%
Garfield County	-13.8%	-11.7%	16.3%	8.4%	19.0%	9.2%	-3.2%
Iron County	12.0%	12.8%	42.5%	19.8%	62.5%	36.7%	4.8%
Kane County	16.0%	-9.2%	66.2%	28.5%	17.0%	17.8%	0.1%
Washington County	4.4%	33.1%	90.7%	86.3%	86.1%	52.9%	12.7%
Five County Total	**2.8%**	**11.3%**	**57.5%**	**50.1%**	**69.2%**	**44.2%**	**9.5%**
Source: U.S. Census Bureau, 2015 American Community Survey							

The percent change is similar to the population change. The advantage of including the percent change with the population change is that it demonstrates the pace of growth for an entire population. For example, Kane County grew at 28.5% in 1990, that growth accounts for a total increase of 387 people. If a county of 50,000 grew at the same rate, they would have increased by over 14,000 people.

Because of the population boom of Washington and Iron counties during the last forty years, the percent change as whole region has followed the growth rates of those two counties. This trend will likely continue unless there is a major shift in population distribution.

FIVE COUNTY OVERVIEW

The geography and environment of a region play important roles in community planning. As towns, cities, and counties develop; planners must consider the "lay of the land" and the many environmental issues that come with it. The Five County region has many unique issues pertaining to its distinct geography and environment. As such, it is vitally important that we understand the land on which we develop, and its accompanying limitations and potential problems.

The Five County region is mostly semiarid and generally dry. The aridity in the region is accentuated by its lower latitude, which makes it warmer than most regions to the north. Much of this area is characterized by lower elevation, which also increases the mean annual temperature. Though scholars classify most of the region as "desert," only the areas with lower elevations are considered "hot" deserts, or regions where the winters average above 32 degrees Fahrenheit. This would include most of Washington County which usually does not have snow in the winter, and has extremely warm summers. The rest of the region, which consists of higher elevations, is considered to be a "cool" desert, with snowy winters and warm summers. Some exceptions exist over the highest elevations, mountainous regions such as Brian Head, which are classified as "undifferentiated highlands" since they experience cooler temperatures and higher humidity than the rest of the area. These mountainous regions generally have very cold, snowy winters and cool summers.

The nature of the climate in this region leaves it susceptible to a few severe weather occurrences. Although most of the country is subject to flash floods, they are particularly damaging in this region since the soil is dry, somewhat barren, and easily eroded. Threats to human life and property damage are not only a result of rapidly rising waters, but of catastrophic mud slides as well. Mountainous areas of the region possess a higher potential for blizzards, cold spells, and avalanches in the winter. The entire region is susceptible to natural and human caused wildfires.

The Five County region contains two major physiographic provinces. Most of Beaver, Iron, and Washington County lay within the Basin and Range province, which generally consists of north-south trending mountain ranges separated by broad arid valleys with interior drainage. Garfield and Kane counties are located in the Colorado Plateau, which consists of uplifted sedimentary rock strata. The soil in this area consists mostly of aridisols, an iron rich desert soil that can be quite productive if cultivated. Native to the valleys throughout most the region is a variety of grasses, junipers, and pinion pines, while xerophytes and desert scrub are native to the lower elevations.

The Five County region's economy may be vulnerable to natural hazard events if highways, streets and railroads become impassable due to flooding, landslides, wildfires, earthquakes or other natural hazard events. The southwestern portion of Utah is traversed by Interstate 15, U.S. Highway 89 and several State Highways. These roadways bring freight and visitors in and through the area, and provide access for residents. Employees would be unable to get to work while products and business inventory, including perishable foods, would be stalled along the way. The region's tourism industry would be impacted as well. As business and industry recover from inventory damage, transportation delays, disruption of communication and utilities, and

ultimately loss of customers in the wake of a natural hazard event, the entire region can suffer severe economic consequences.

HAZARDS ON A REGION WIDE SCALE

The following hazards are intended to be analyzed at the five county region scale, and not at the county level. Although all natural hazards do not adhere to political boundaries, drought radon, and severe weather will be assessed at the Five County Region level due to their inherent large geographic nature. In addition the mitigation strategies will be found within each respective hazard section.

Drought

HAZARD RISK ASSESSMENT

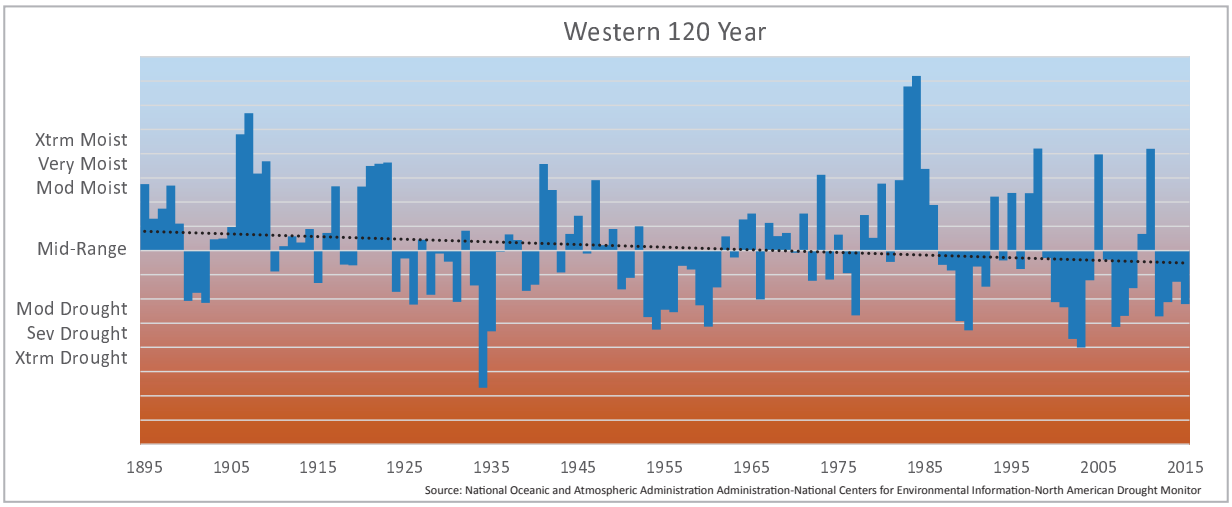
Drought throughout the U.S. is tracked and recorded using geographic zones called climate divisions, the four climate divisions represented in Southwestern Utah are Western, Dixie, South Central, and Southeast. The following charts display the average drought conditions for all four climate divisions in the Five County Region by year for the last 120 years.



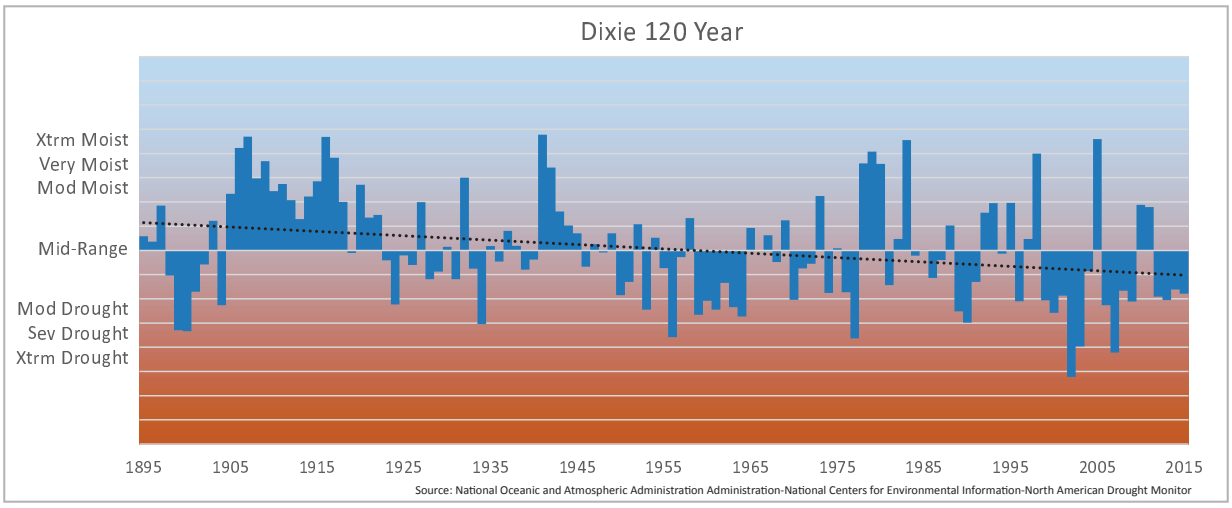
The method used to in determining drought severity is the Palmer Drought Index. The Palmer Drought Index normally displays drought as a negative number. But, for ease of use, the numbers on the charts have been replaced with their coinciding drought severity name, e.g. Moderate drought is -2.0 to -2.99 Likewise, moderately moist is 2.0 to 2.99

For more information regarding drought and the Palmer Drought index please see the drought section in the Identifying Hazards chapter.

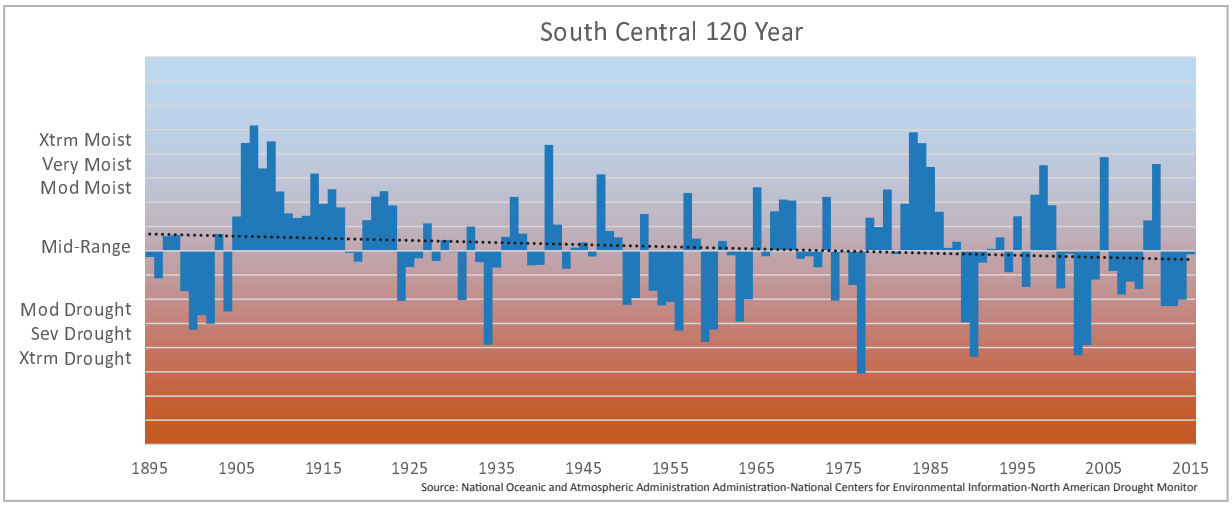
To better understand the historic nature of droughts in the four climate divisions this study uses the same criteria for notable drought guide lines from “Drought in Utah Learning from the Past-Preparing for the Future”. (The Utah State Water Plan 2007) “A drought must start with two consecutive years with values less or equal to -1.0, and end with two consecutive years with value above -0.5.



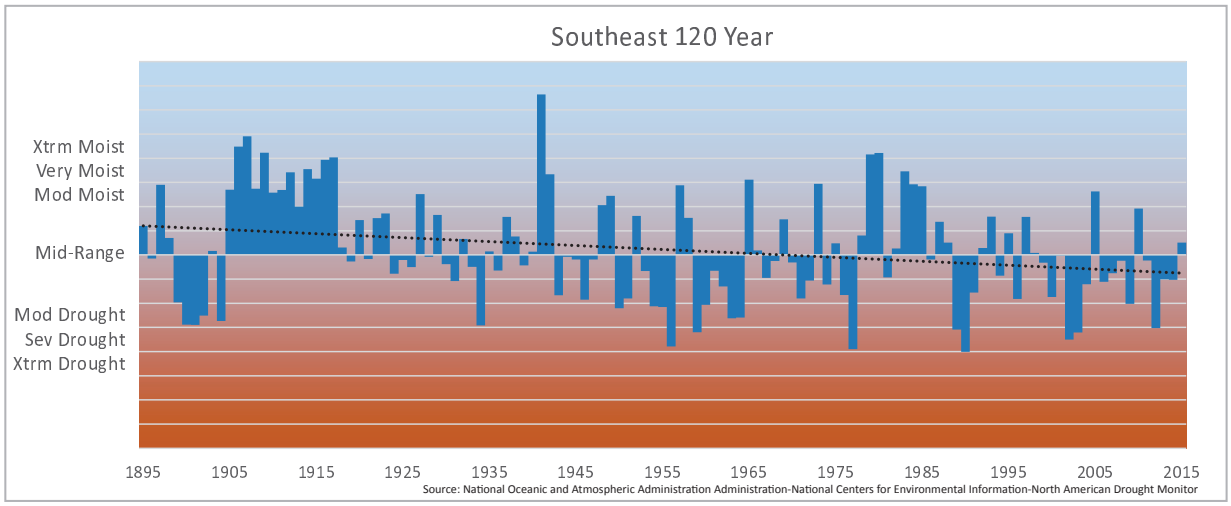
- **Western Division** - comprises 4,290 square miles or 24% of the total land area of the Five Counties, and is found in the western parts of Beaver, Iron, and Washington counties. Over the last 120 years there has been many droughts, however there were eight that met the above criteria. The longest spanning 12 years from 1950-1961. The last half of the documented period saw more long term droughts with fewer moist periods in between droughts. If drought continues to follow the trend line, then the Western Division will continue to have longer more frequent droughts.



- **The Dixie Division** - comprises 1,423 square miles or 8% of the total land area of the Five Counties, the majority is found in Washington County with a small portion found in Kane County. Dixie Division has had seven major drought periods varying in length since 1895. One of the more notable drought periods started in 1999 and went through 2009, reaching extreme drought conditions. Droughts in the Dixie Division have been occurring more frequently within the last sixty years than they did the first sixty years. If drought continues to follow the trend line, then the Dixie Division will continue to have longer more frequent droughts.



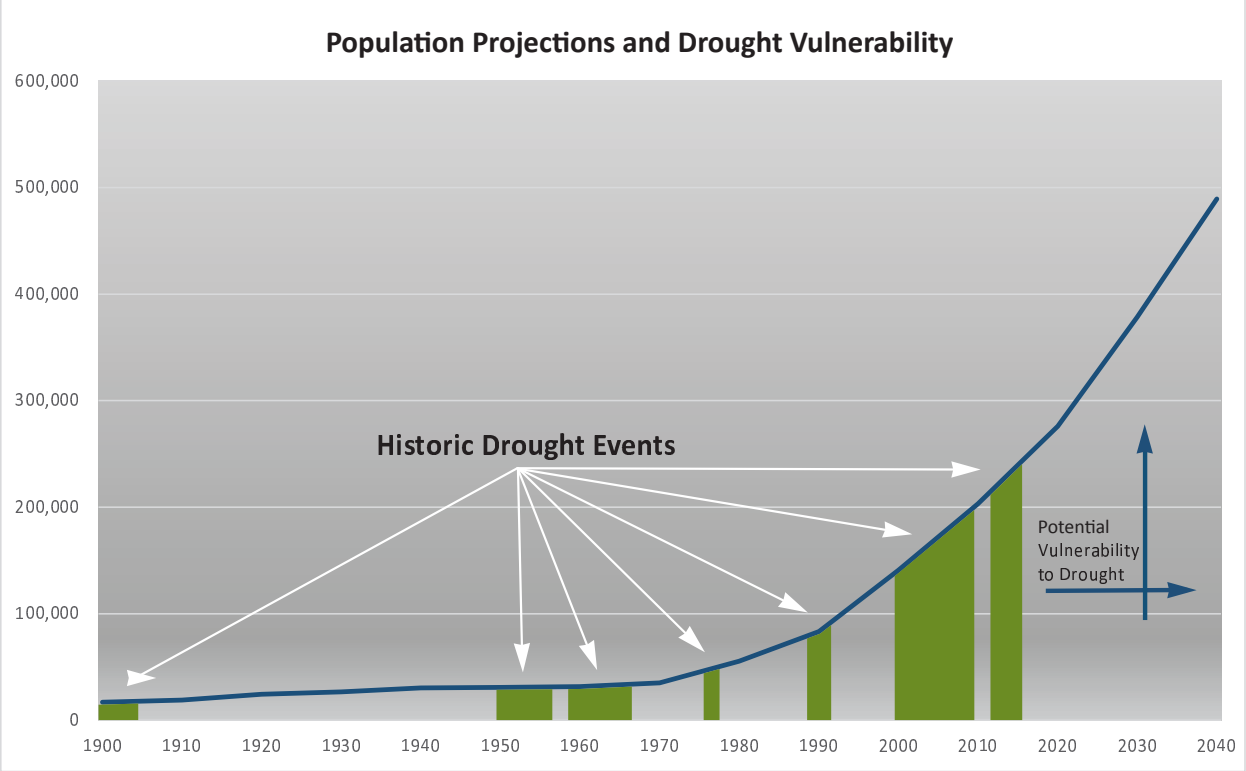
- **South Central** - comprises 9,097 square miles or 52% of the total land area of the Five Counties. The South Central Division is found in all five counties, mainly in the central part of the Five Counties area. Over the last 120 years there have been eight major droughts meeting the above criteria. If drought continues to follow the trend line, then the South Central Division will continue to have longer more frequent droughts.

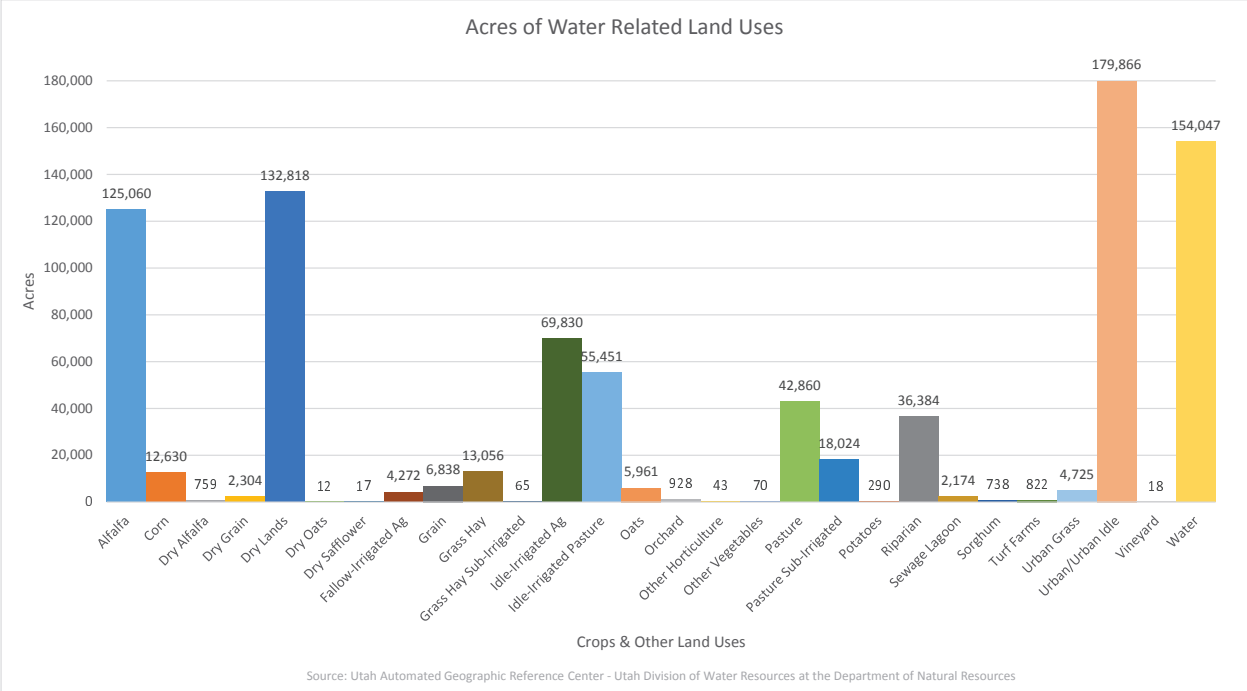


- **Southeast** - Division comprises 2,813 square miles or 16% of the total land area of the Five Counties. The Southeast Division is found in the eastern half of Kane and Garfield counties. This Division has had seven major droughts following a very similar pattern as the other three divisions. All of the notable droughts in this division reached severe to extreme conditions with the exception of the earliest drought at the turn of the Nineteenth Century. If drought continues to follow the trend line, then the Southeast Division will continue to have longer more frequent droughts.

The drought conditions in all four climate divisions follow very similar patterns. Each experienced wetter conditions in the earlier half of the twentieth century. With conditions changing from year to year, it may be hard to tell what is occurring on a larger scale. The trend line on each graph helps analyze what the climate has been doing over a period of time. Although each trend line is not exactly the same among the climate divisions, they all trend downward the last half of the reported period. If this trend continues, drought conditions will continue to get worse, creating longer, more severe droughts with fewer moist years between droughts.

With the region's population growing at an exponential rate, an extended period of drought could leave an enormous impact on people across all five counties. The table below represents the average notable droughts in relation to historic populations, and projected growth of the Five County Region. The seven historic drought events displayed in the chart are taken from the mean of all drought conditions from the four climate divisions in the region.





This table does not depict water usage by land use type; additional algorithms and study need to be performed in order to obtain that information. However, this table depicts the acres of water related assets that are vulnerable to extreme drought.

The amount of water used and the drought tolerance of plants will play an important role of water usage during an extended severe drought period. If a drought becomes too severe it may affect the socioeconomics of the region. In the instance that this happens, it is vital that local decision makers have planned for and understand how to allocate available water supplies to fit their community's physical, social, and economic needs.

SUMMARY

Over the past 120 years drought conditions have been cyclical throughout the region. However, the trend lines show drought conditions continually getting worse. With growing populations it is expected that more people than ever will be affected by drought.

Crop lands are a major contributing factor that affects people during a drought. There is currently 870,062 acres of water related land uses, including croplands that have the potential to be negatively impacted by drought.

MITIGATION STRATEGY

Water is a scarce resource in southwest Utah’s semi-arid climate. As the population continues to grow, the demand for water and potential strain on the water supply will also increase and likely intensify future drought impacts. By employing sound mitigation strategies, the future water demand of the region may be satisfied without increasing the current susceptibility to drought.

The impacts of drought can be comprehensively mitigated through cooperative partnerships and efforts of numerous and varied agencies. With this in mind, the following mitigation strategies are generalized in nature with the knowledge that drought is a macro-level risk. Ideally these mitigation strategies will provide the foundation for more specific, conservation, and locally determined drought mitigation projects

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Drought Mitigation Strategy #1 (All Jurisdictions)	
Objective:	To provide education to the general public with regard to drought and water conservation.
Action:	Action 1-County-level distribution of water conservation information via newsletter and/or website to affiliated constituents. Action 2-Water purveyors distribute water conservation information to affiliated constituents.
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	State and Federal grants; Local government operating budget; Water purveyors.
Responsible Agencies:	Local (all jurisdictions in southwestern Utah), jurisdictional level.
Plan Goals Addressed:	**Action 1**-Education/Outreach, Environmental Protection, Partnership/Coordination, Prevention **Action 2**-Education/Outreach, Environmental Protection, Partnership/Coordination, Prevention
Priority:	

Drought Mitigation Strategy #2 (All Jurisdictions)	
Objective:	To conserve water within the agricultural sector.
Action:	Develop/demonstrate water conservation practices for agricultural use.
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	State and Federal grants; Water purveyors.
Responsible Agencies:	Local (all jurisdictions in southwestern Utah with agricultural land use), jurisdictional level.
Plan Goals Addressed:	Education/Outreach, Environmental Protection, Partnership/Coordination, Prevention, Property Protection
Priority:	

Drought Mitigation Strategy #3 (All Jurisdictions)	
Objective:	Establish specific county-level water conservation measures.
Action:	County-level implementation of mitigation strategies identified in "*Drought in Utah- Learning from the Past-Preparing for the Future*." http://www.water.utah.gov/
Timeline:	3-5 years
Estimated Cost:	Unknown
Possible Funding:	State and Federal grants; Local government operating budget; Water purveyors.
Responsible Agencies:	Local (Beaver, Garfield, Iron, Kane and Washington counties), jurisdictional level.
Plan Goals Addressed	Environmental Planning, Partnership/Coordination, Prevention, Property Protection
Priority:	



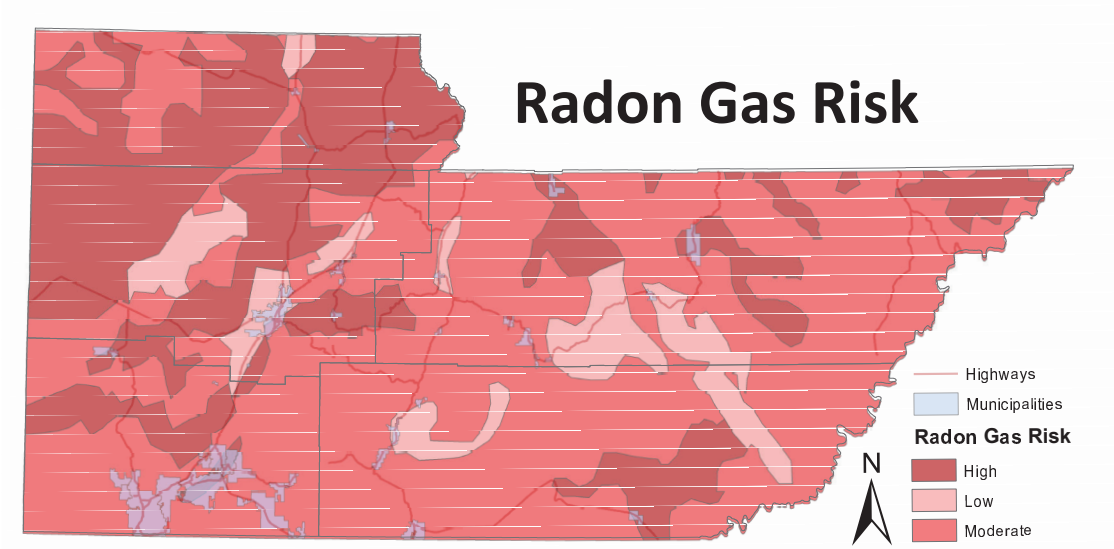
Radon

HAZARD RISK ASSESSMENT

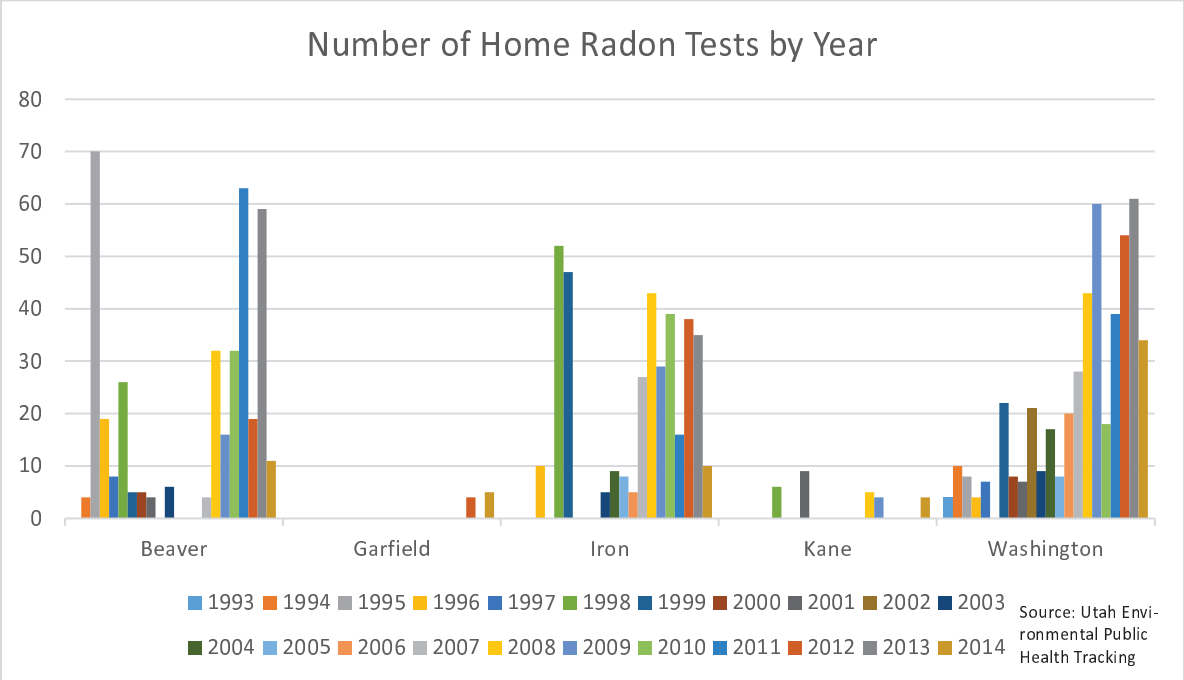
Radon is widespread through all five counties of the region. Many rocks contain some nuclear decay of uranium and radium, however the rocks and soils that contain a higher than normal amount of these substances contribute to higher radon levels. Geological mapping has helped to determine areas that might be more prone to radon than others (see Radon Risk Map below), in addition, the best radon maps available cannot accurately determine indoor radon levels, and should not be used to diagnose the amount of radon in a building. Because radon is one of the leading causes of cancer through out the United States, it is vital that the public not only know if the area they live in is vulnerable to high concentrations of radon, but they should also test places for radon where they spend a great deal of time.

The most accurate way to determine how much radon is inside a structure is to conduct radon tests. The EPA recommends that a radon test should be administered about every two years, or after home renovation. In addition to the geologic radon maps, data compiled from the number of tests done throughout an area greatly aids in the understanding of radon vulnerability of a region.

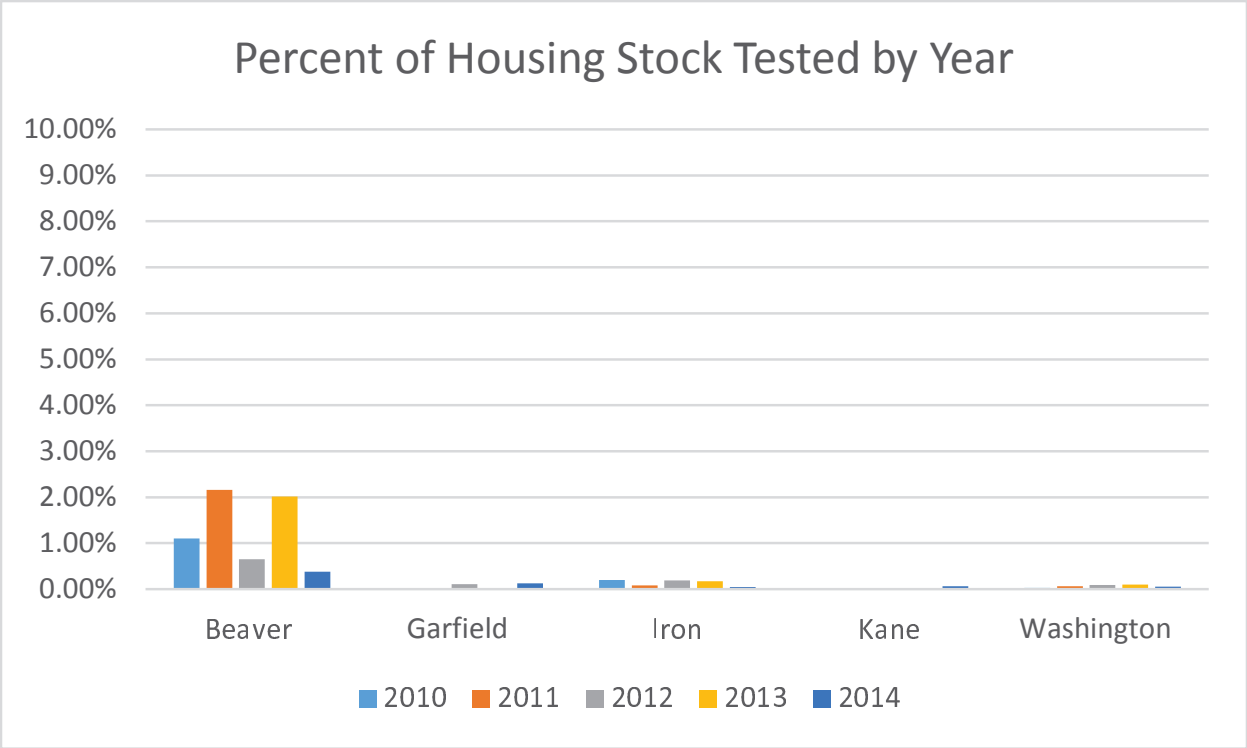




Source: Esri, HERE DeLome, USGS, Intermap, Increment P Corp., NRCAN, Esri Japan, METI Esri China (Hong Kong), Esri (Thailand), MapmyIndia, OpenStreetMap contributors, and the GIS User Community, Utah Automated Geographic Reference Center, Five County AOG, UGS



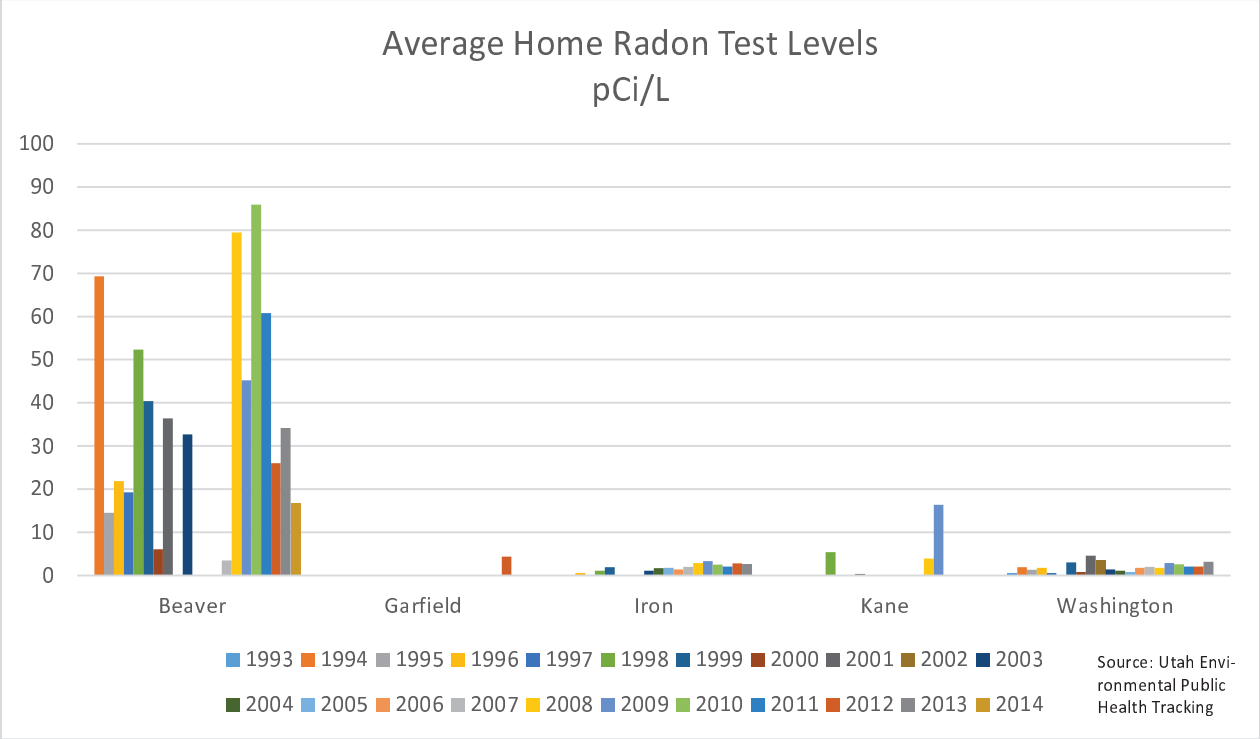
The table above displays the number of radon tests per year, by county that have been reported. Washington County has taken the most tests over the documented period. Beaver County has also had a strong number of tests reported, but Beaver County stands out because there is a greater percent of tests done per home than the other four counties.



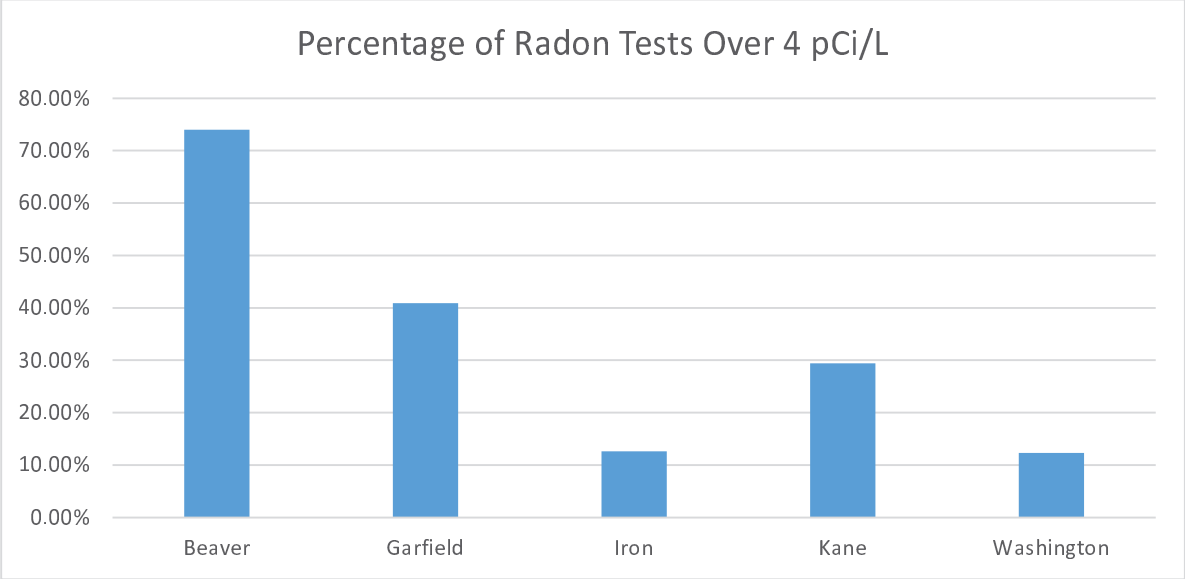
Housing Stock & Homes Tested for Radon						
	2010			2011		
County	Units Tested	Total Units	Percent	Units Tested	Total Units	Percent
Beaver	32	2,908	1.10%	63	2,923	2.16%
Garfield	0	3,726	0.00%	0	3,748	0.00%
Iron	39	19,667	0.20%	16	19,809	0.08%
Kane	0	5,815	0.00%	0	5,841	0.00%
Washington	18	57,734	0.03%	39	58,622	0.07%
	2012			2013		
County	Units Tested	Total Units	Percent	Units Tested	Total Units	Percent
Beaver	19	2,927	0.65%	59	2,925	2.02%
Garfield	4	3,763	0.11%	0	3,785	0.00%
Iron	38	19,838	0.19%	35	19,896	0.18%
Kane	0	5,853	0.00%	0	5,857	0.00%
Washington	54	59,395	0.09%	61	60,671	0.10%
	2014					
County	Unites Tested	Total Units	Percent			
Beaver	11	2,927	0.38%			
Garfield	5	3,818	0.13%			
Iron	10	20,083	0.05%			
Kane	4	5,866	0.07%			

Washington	34	62,434	0.05%
Source: Utah Environmental Public Health Tracking, U.S. Census Population Division			

In 2014 Washington County had 20 more homes tested than Iron County, However both counties only had 0.05% of homes tested. Both of these counties historically have had lower indoor radon levels, but with over 60,000 homes not tested in Washington County there is a good chance that many Washington County residents might have radon levels over 4 pCi/L in their homes.



The Radon levels from the total reported tests vary greatly in all five counties. Beaver has the highest number of tests over 4pCi/L at over 70%. Kane and Garfield Counties both have over 30%, but there is such a small sample of reported tests from both counties that it can not accurately portray radon levels within the counties. Based on past test results Washington, Beaver, and Iron Counties have a good probability that future tests will reflect similar numbers to past test results. Garfield and Kane Counties have not taken enough tests to make an accurate determination of how future tests will turn out.



Source: Utah Environmental Public Health Tracking

There is a good chance that Radon levels will remain the same in the future due to its geologic nature. The areas that are high should remain high and the area that are low should remain low.

Critical Facilities (Schools, Hospitals, Etc.)	
Critical Facilities	Number of Units
School Dist	5
Elementary School	50
Higher Education	12
High School	43
Middle School/Junior High	3
K-12	18
Other	19
Pre-K	5
Libraries	23
Health Facilities	108
High Occupancy Structures	Unknown
Total	286
Source: AGRC, Utah Department of Health, Utah Division of Emergency Management, Utah State Office of Education and the Utah Education Network (UEN).	

Because Radon does not destroy structures like many other natural hazards, it can often be difficult for people to take precaution in the home and in public facilities. There are many types of places that have to potential to have high radon risk. Generally places where people spend a significant amount of time should be tested. Schools, rest homes, hospitals, libraries, and penitentiaries are some of the places that should be considered to perform radon testing.

SUMMARY

High potential rates for indoor radon levels are spread throughout much of the Five County region. The radon potential map shows both Iron and Beaver Counties with a large portion of their land mass at a high potential for radon. The most populated areas of Iron County are mostly within low to moderate probability radon zones. Region wide radon tests that have been reported fall in line with the map as Washington, Kane, Iron, and Garfield Counties have a low percent of tests above 4 pCi/L reported. Beaver County's reported tests trend with the map as the majority of them require mitigation. For further information regarding radon please see the Radon section of the Identifying Hazards chapter. Other good sources for radon include http://www.radon.utah.gov/ https://www.epa.gov/radon http://www.radon.com/

MITIGATION STRATEGY

Despite that some areas of Southwest Utah have relatively high concentrations of radon gas, remediation is relatively simple and inexpensive. The radon gas mitigation strategies provided herein are simplistic in terms of implementation; however, they will enable significant risk reduction which will undoubtedly improve the health, safety, and welfare of citizens in the region.

Radon Gas Mitigation Strategy #1 (All Jurisdictions)	
Objective:	Promote radon gas reduction measures through non-structural improvements.
Action:	Increase public education related to radon gas hazards by distributing Utah Department of Environmental Quality informational brochures to County and City planning and engineering departments.
Timeline:	Ongoing
Estimated Cost:	Very Minimal: request Utah Department of Environmental Quality to deliver brochures; and/or download brochures directly from: http://www.radon.utah.gov
Possible Funding:	County and City operating budget; Utah Dept. of Environmental Quality operating budget.
Responsible Agencies:	Local (Beaver, Garfield, Iron, Kane and Washington counties), jurisdictional level.
Plan Goals Addressed:	Education/Outreach, Environmental Protection, Partnership/ Coordination, Prevention, Property Protection
Priority:	

Radon Gas Mitigation Strategy #2 (All Jurisdictions)	
Objective:	To reduce radon gas risk as it relates to the built environment.
Action:	Utilize the Radon Risk Map provided in this plan as a tool to assess radon gas risks as it relates to any building/subdivision proposals. If deemed necessary, jurisdiction should require the builder/ developer to conduct a site-specific radon hazard identification study and implement applicable control techniques.
Timeline:	Ongoing
Estimated Cost:	$25- $1,200 (per http://www.epa.gov/radon/)
Possible Funding:	Private funds/ developer; County or City government operating budget (where applicable).
Responsible Agencies:	Private property owner; Local (Beaver, Garfield, Iron, Kane and Washington counties), jurisdictional level.
Plan Goals Addressed:	Education/Outreach, Environmental Protection, Prevention, Property Protection
Priority:	

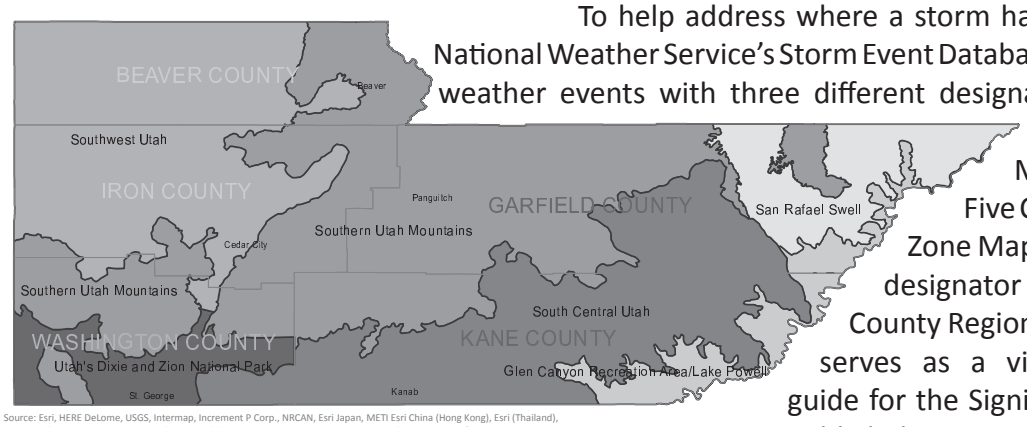
Radon Gas Mitigation Strategy #3 (All Jurisdictions)	
Objective:	Promote Radon awareness
Action:	Provide Radon brochures in every new home, promote and observe National Radon Action Month, address radon kits during the foundation permitting.
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	Local, state, and federal funds as available.
Responsible Agencies:	Local governments
Plan Goals Addressed:	Education/Outreach, Prevention, Property Protection, Partnership Coordination
Priority:	

Severe Weather

HAZARD IDENTIFICATION

Sever weather is a phenomenon that is incredibly hard to predict, and often is a cause of many natural hazards such as debris flows and flash floods. Along with being unpredictable, a weather event can be isolated, or can cover vast tracts of land making the assessment of location and extent very difficult.

Five County Forecast Zones



Source: Esri, HERE DeLorme, USGS, Intermap, Increment P Corp., NRCAN, Esri Japan, METI Esri China (Hong Kong), Esri (Thailand), MapmyIndea, OpenStreetMap Contributors, and the GIS User Community, Utah Automated Geographic Reference Center

To help address where a storm has occurred the National Weather Service's Storm Event Database tracts severe weather events with three different designators, (County/ Parish, Zone, Marine) The Five County Forecast Zone Map indicates each designator within the Five County Region. This map also serves as a visual reference guide for the Significant Weather Events table below.

Severe Weather Event Statistics 1950-2015					
Event Type	**Total Events**	**Deaths**	**Injuries**	**Property Damage**	**Crop Damage**
Blizzard	4	0	0	$0	$0
Cold/Wind Chill	7	0	0	$20,000	$100,000
Dust Devil	1	0	0	$1,000	$0
Dust Storm	1	0	0	$0	$0
Funnel Cloud	3	0	0	$0	$0
Hail	54	0	0	$90,000	$3,200
Heat	4	6	0	$0	$0
Heavy Rain	17	0	0	$8,500	$0
Heavy Snow	65	0	1	$20,000	$4,000
High Wind	93	0	0	$1,140,000	$212,200
Lightning	6	2	3	$18,000	$0
Strong Wind	1	0	0	$1,000	$0
Thunderstorm Wind	124	0	0	$164,000	$26,200
Tornado	15	0	0	$90	$0
Winter Storm	125	0	10	$767,000	$5,000
Winter Weather	1	0	0	$0	$0
Total	**521**	**8**	**14**	**$2,229,590**	**$350,600**
Source: NOAA- National Centers for Environmental Information-Storm Event Database					

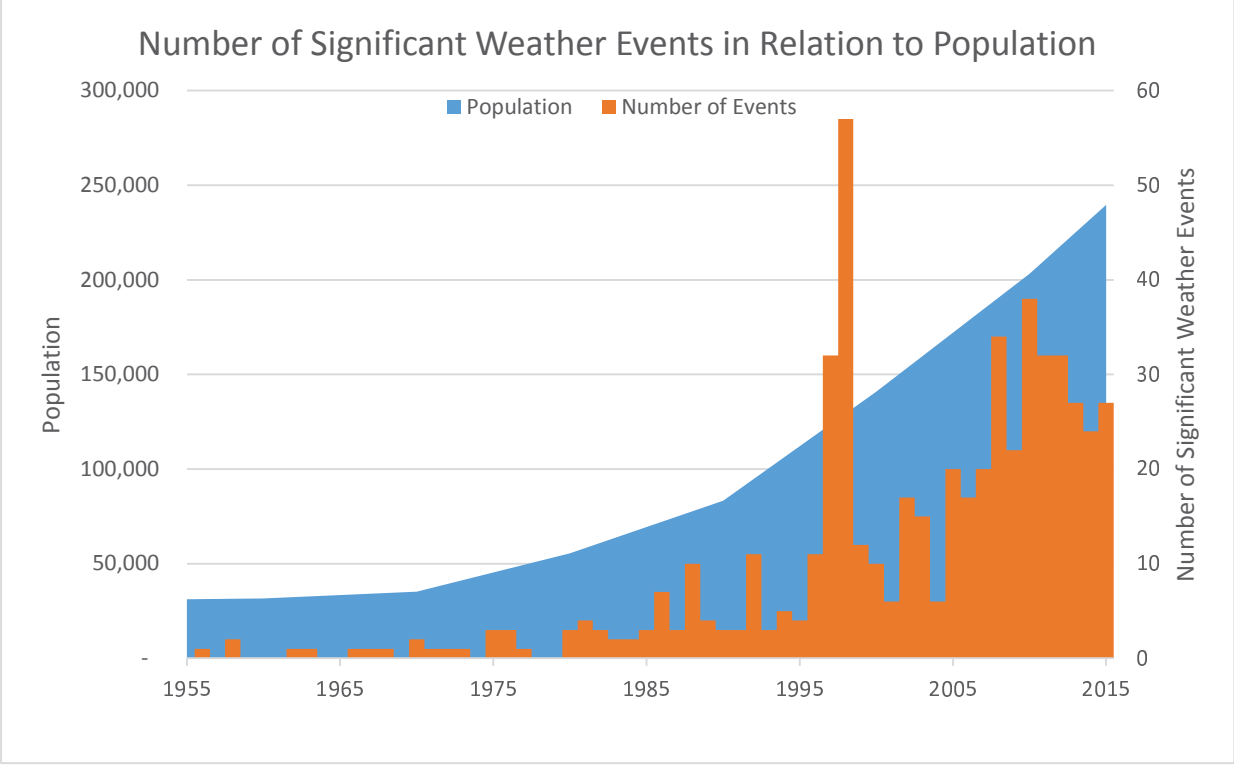
Vulnerable Infrastructure & Facilities	
State Facilities	814
*All Crop and Pasture Land	359,225 Acres
All Roads	23,858 Miles
Schools	155

Heath Care Facilities	108
Fire Stations	71
*Crop and Pasture land Include - Alfalfa, Corn, Dry Alfalfa, Dry Grain, Dry Oats, Dry Safflower, Fallow-Irrigated Ag, Grain, Grass Hay, Grass Hay Sub-Irrigated, Idle-Irrigated Ag, Idle-Irrigated Pasture, Oats, Orchard, Other Horticulture, Other Vegetables, Pasture, Pasture Sub-Irrigated, Potatoes, Sorghum, Vineyard	
Source: 2014 ACS 5 Year, AGRC-Local Government Partners, Utah state Hazard Mitigation Plan (2014), Utah DNR	

There may be some overlap between state facilities and other categories as the state owns many facilities such as public schools.

The table above is a list of some of the critical infrastructure and facilities that can be vulnerable to a severe weather event. Other items that can be listed are, but not limited to, water treatment plants, facilities containing hazardous material, penitentiaries, electric power infrastructure, phone lines, high occupancy buildings, and rail infrastructure.

This inventory of vulnerable infrastructure provides a good starting point for communities in Southwest Utah to begin preparing for severe weather events. Further, having a dollar amount could further such preparation. However, obtaining current and accurate dollar amounts is very difficult, and is often subject to change. As the regions population continues to increase, the more infrastructure the area will accumulate, making people and infrastructure more vulnerable to severe weather.



Source: NOAA-The National Centers for Environmental Information, Decennial Census

The tables and charts in this section is based on the best available data reporting the number of meteorological events leading to fatalities, injuries, damage, disruption to commerce. Significant storms such as tornadoes have been included in this data set whether they cause damage or not.

It is evident that as the population increases so do the number of damaging significant weather events. Assuming that older data is just as accurate as today's data, and that events were recorded and reported; the table indicates that as population increases so does the number of weather events that lead to disturbances. Because the Regions population is expected to continue to grow at an exponential rate it is safe to assume that destructive weather will increase at nearly the same pace.

SUMMARY

A quantitative vulnerability assessment is difficult based upon the simple fact that severe weather occurrences are difficult to predict. Several factors limit a determination of potential losses, they include: Limited data availability, lack of on site research, and most hazards are tied to weather that cannot easily be predicted with location Mitigation Strategy

Severe weather can spread across vast amounts of land and cause great disturbances in a short period of time. Severe weather has directly caused hundreds of thousands of dollars of damage in the Five County Region and has led to many other hazards such as flooding, fires and landslides.

Severe weather does not only effect infrastructure, it also contributes to other natural hazards that can lead to injury and death. The highest death rate from severe weather in the region has been from extreme heat and lighting strikes. Fourteen people in the area have reportedly been injured from both winter storms and lighting. Disruptive severe weather events have increased right along with the regions population growth, and with the exception of some outliers weather disturbances are expected to continue to follow population trends.

MITIGATION

Bryce Canyon City Severe Weather Mitigation Strategy #1	
Objective:	Protect life and property from severe weather events (E.g. Severe winter storms and severe heat), and provide back up electricity in the event of a long-term power outage.
Action:	Encourage all businesses and critical facilities to have enough back up generators to efficiently provide for life sustaining essentials until the power is restored. E.g. Power for an oxygen concentrator for those in need. Encourage businesses and tourism departments to provide emergency preparedness material to visitors.
Timeline:	1 Year/Ongoing
Estimated Cost:	$500-$10,000

Possible Funding:	Operating budgets of Businesses and Bryce Canyon City
Responsible Agencies:	Bryce canyon City and Local Businesses
Plan Goals Addressed:	Prevention, Life Protection, Property Protection, Education/ Outreach, Partnership Coordination
Priority:	Medium

Cannonville Severe Weather Mitigation Strategy #1	
Objective:	Protect vulnerable populations from the impacts of severe winter storms.
Action:	Identify specific at-risk populations that may be exceptionally vulnerable in the event of long-term power outages. Organize outreach to vulnerable populations, including establishing and promoting accessible heating centers in the community.
Timeline:	1 Year
Estimated Cost:	Unknown
Possible Funding:	Town Operating Budget
Responsible Agencies:	Cannonville
Plan Goals Addressed:	Partnership/Coordination, Education/Outreach, Life Protection
Priority:	High

Henrieville Severe Weather Mitigation Strategy #1	
Objective:	Protect buildings and infrastructure from the impacts of winter storms.
Action:	Ensure the development and enforcement of building codes for roof snow loads.
Timeline:	1 Year/Ongoing
Estimated Cost:	Unknown
Possible Funding:	Town Operating Budget
Responsible Agencies:	Henrieville
Plan Goals Addressed:	Property Protection
Priority:	High

Severe Weather Mitigation Strategy #1 (All Jurisdictions)	
Objective:	To reduce severe weather risk as it relates to the built environment.
Action:	Continued dedication/vigilance in enforcing the standards established in the International Building Code (IBC) as it relates to wind-loading, electrical grounding, snow-loading, and other weather-related hazards.
Timeline:	Ongoing

Estimated Cost:	Minimal
Possible Funding:	County or City government operating budget (where applicable).
Responsible Agencies:	County or City government (where applicable).
Plan Goals Addressed:	Prevention, Property Protection
Priority:	

Severe Weather Mitigation Strategy #2 (All Jurisdictions)	
Objective:	Ensure that the general public is warned of severe weather occurrences via broadcast media.
Action:	**Action 1**-Enhance the Emergency Alert System (television and radio). **Action 2**-Enhance NOAA Weather Radio All Hazard coverage.
Timeline:	Ongoing
Estimated Cost:	Unknown
Possible Funding:	Federal and State government operating budget.
Responsible Agencies:	Federal and State government.
Plan Goals Addressed:	**Action 1**-Education/Outreach, Emergency Services, Partnership/ Coordination **Action 2**-Education/Outreach, Emergency Services, Partnership/ Coordination
Priority:	

Severe Weather Mitigation Strategy #3 (All Jurisdictions)	
Objective:	Guard against the negative effects of severe weather by becoming a StormReady community.
Action:	At the county Local Emergency Planning Committee (LEPC) level, meet the program guidelines then apply to the National Weather Service StormReady program.
Timeline:	3 to 5 years
Estimated Cost:	Minimal
Possible Funding:	County and City operating budget.
Responsible Agencies:	County and City government.
Plan Goals Addressed:	Emergency Services, Partnership/Coordination, Prevention, Property Protection
Priority:	

Beaver County



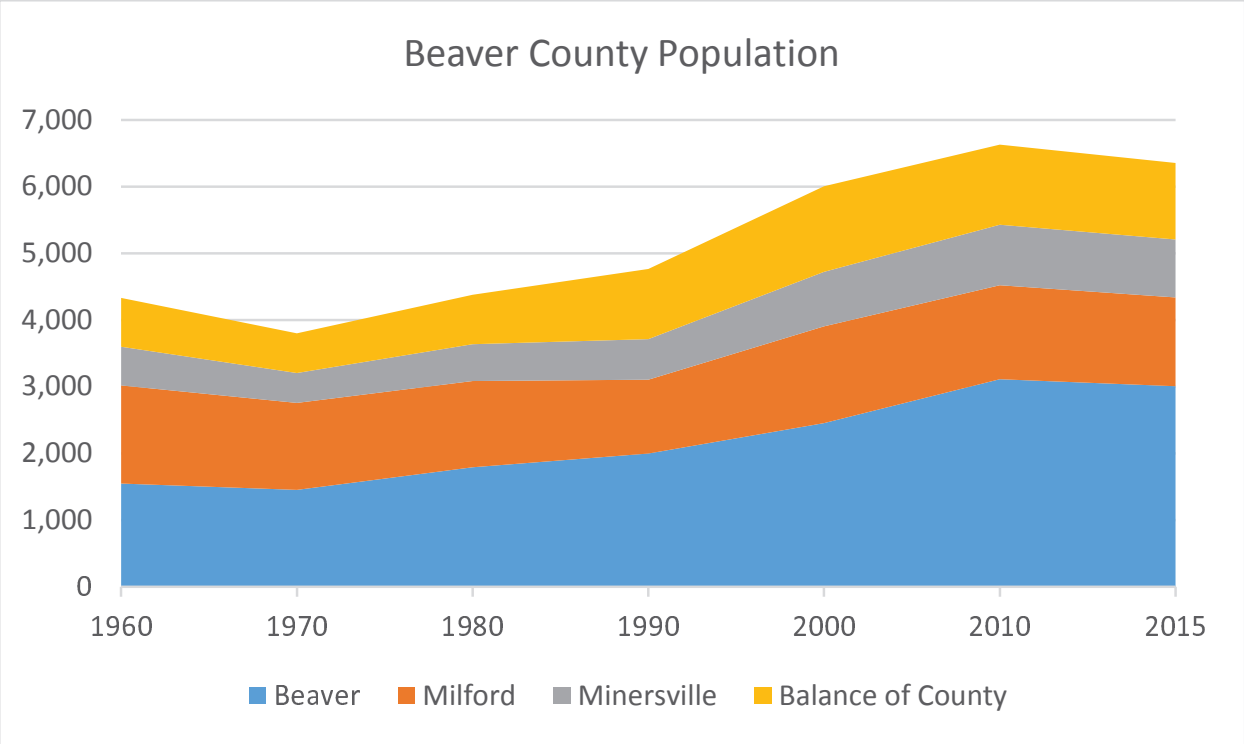
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Demographics

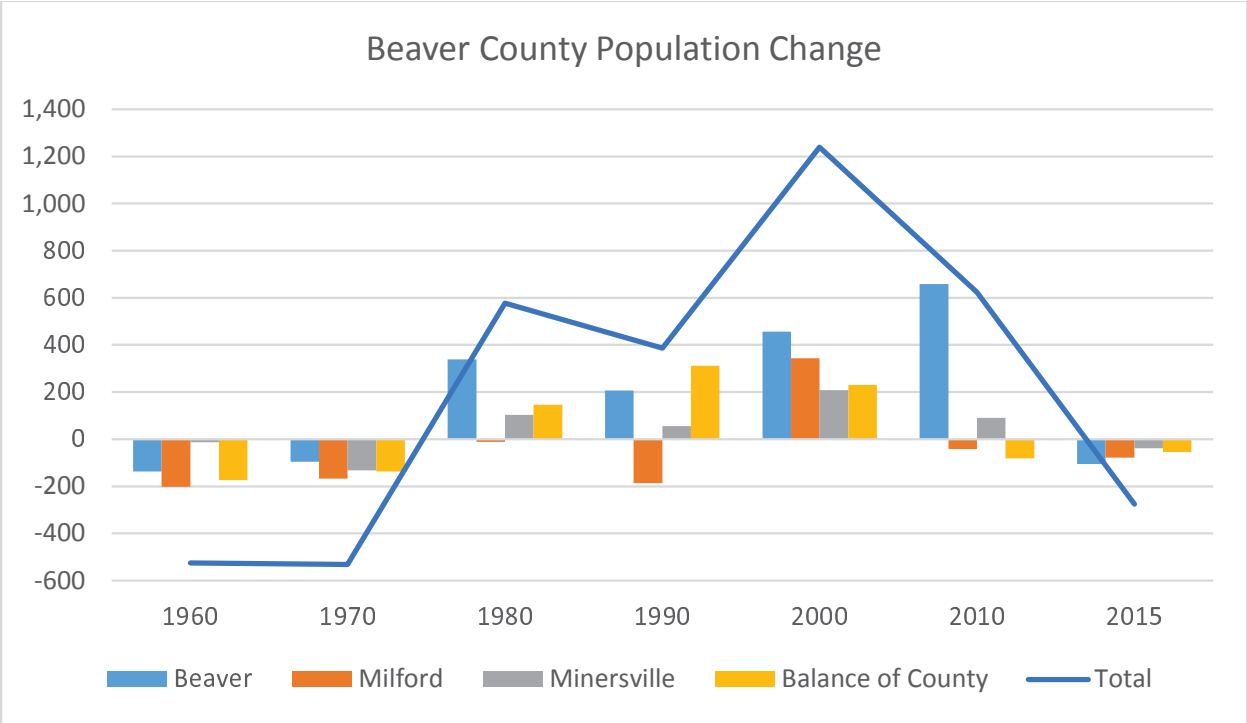
Beaver County is approximately halfway between Salt Lake City and Las Vegas. Interstate 15 passes through the eastern portion of the county as well as Beaver City, the county seat. I-15 intersects I-70 near the north east border of the county. Another important form of transportation in the county is The Union Pacific Railroad, which runs north-south through the center of the county as well as the city of Milford.

The reasons behind the regions growth are important, but the purpose for analyzing population in this document is to better inform decision makers about how many people could potentially be affected by a natural hazard.



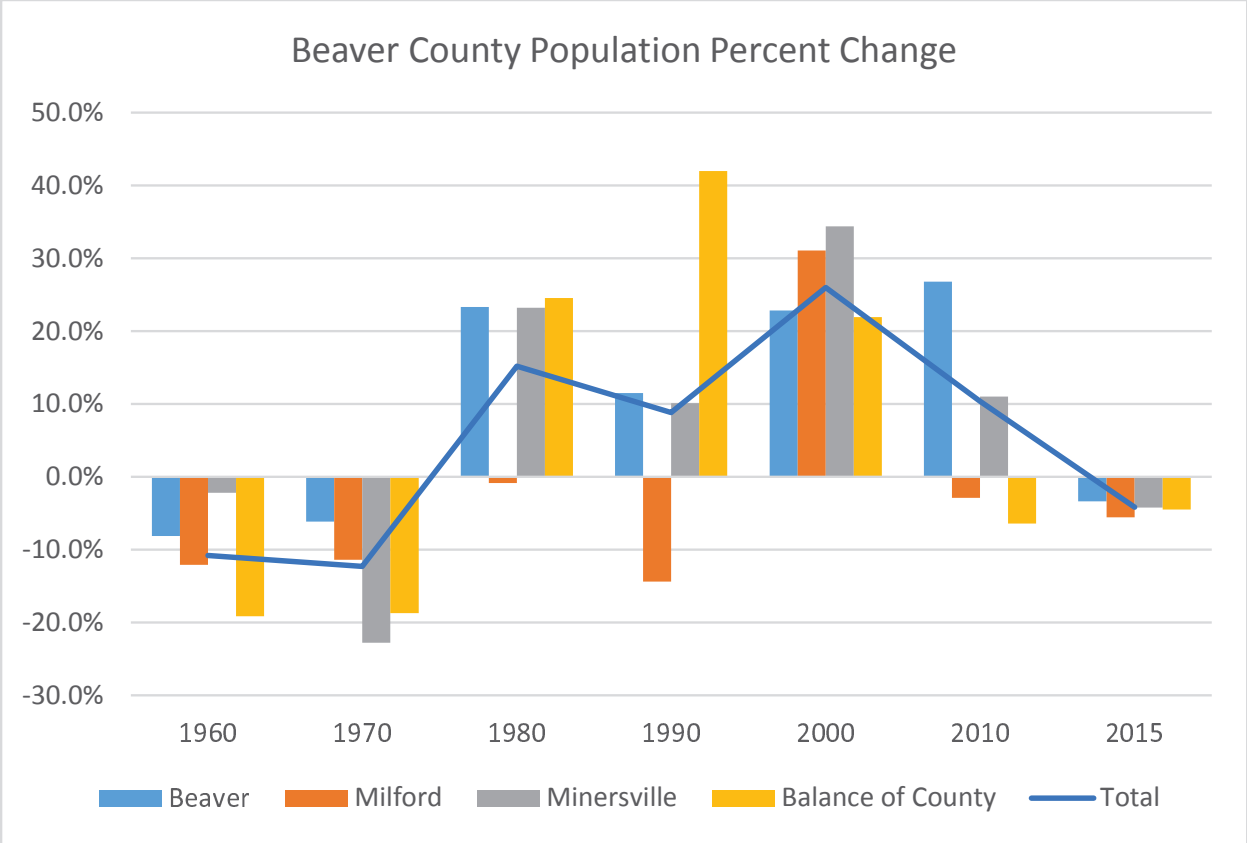
Beaver County Population by Incorporated Place							
City/Town	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2015**
Beaver	1,548	1,453	1,792	1,998	2,454	3,112	3,007
Milford	1,471	1,304	1,293	1,107	1,451	1,409	1,331
Minersville	580	448	552	608	817	907	869
Balance of County	732	595	741	1,052	1,283	1,201	1,147
Total	**4,331**	**3,800**	**4,378**	**4,765**	**6,005**	**6,629**	**6,354**
Source: U.S. Census Bureau; Utah History Encyclopedia, Governor's Office of Management & Budget							

Beaver County has increased its population by more than 2,000 people over the last fifty years. The most significant growth was between 1970 and 2010, while the county experienced population declines between 1960 and 1970, and between 2010 and 2015.



Beaver County Population Change							
City/Town	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2015**
Beaver	-137	-95	339	206	456	658	-105
Milford	-202	-167	-11	-186	344	-42	-78
Minersville	-13	-132	104	56	209	90	-38
Balance of County	-173	-137	146	311	231	-82	-54
Total	**-525**	**-531**	**578**	**387**	**1,240**	**624**	**-275**
Source: U.S. Census Bureau; Utah History Encyclopedia, Governor's Office of Management & Budget							

Population change refers to the net increase or decrease of a population for a geographical area. Since the 1960's Beaver County has had three major population decreases, between 50's and 60's, 60's and 70's, and the 2015 estimates show a population decrease as well. The municipality with the most notable decrease is Milford as the only growth during this period occurred between 1990 and 2000.



Beaver County Population Percent Change							
City/Town	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2015**
Beaver	-8.1%	-6.1%	23.3%	11.5%	22.8%	26.8%	-3.4%
Milford	-12.1%	-11.4%	-0.8%	-14.4%	31.1%	-2.9%	-5.5%
Minersville	-2.2%	-22.8%	23.2%	10.1%	34.4%	11.0%	-4.2%
Balance of County	-19.1%	-18.7%	24.5%	42.0%	22.0%	-6.4%	-4.5%
Total	**-10.8%**	**-12.3%**	**15.2%**	**8.8%**	**26.0%**	**10.4%**	**-4.1%**
Source: U.S. Census Bureau; Utah History Encyclopedia, Governor's Office of Management & Budget							

The percent of change is important to look at because it indicates what percent of the total population is increasing or decreasing. 2000 was a standout years because the population increased by 26 percent from the previous decade.

According to the Governor's Office of Planning and Budget, Beaver County can expect significant increases in population over the next 20 years. The projected population increase from 2010 to 2020 is 40.2% and 44.8% from 2020 to 2030. Overall this translates to 103% growth projected for those twenty years.

The projected increase in population is not expected to change the rural nature of the County. If the present population pattern continues, most of the population increase is expected to occur in established developed areas of the County. It is also anticipated that the established trend for

population growth in the unincorporated part of the County will continue. Much of this growth in the unincorporated area is expected to occur near Beaver City in the proximity of Beaver Canyon and Elk Meadows. However, the 2015 population estimates show that Beaver County and all three jurisdictions are declining in population.

The Beaver County General Plan stipulates, "As a basis for all land use decisions affecting land within the County's jurisdictions, it is recommended that new development, including residential subdivisions, commercial and industrial activities, etc. be permitted to occur only within the boundaries of incorporated communities or, immediately adjacent to such communities." Growth is further managed through implementation of growth boundaries which specifically state that County land which contains natural constraints, such as critical areas (environmentally-sensitive land) be preserved.

BEAVER COUNTY OVERVIEW

The County is 90 miles in length from east to west and 30 miles wide from north to south, with an area of 2,568 square miles. It is crossed by a number of short mountain ranges oriented generally on a north-south axis, the highest being the Tushar range in the eastern portion with peaks over 12,000 feet high. The Beaver River originates in the Tushar range and flows in a westerly and north-westerly direction. The entire eastern portion of the County lies within the Beaver River drainage areas. The remainder of the County is drained by intermittent streams.

The elevation of Beaver Valley in the eastern section is 5,970 feet, while the elevation of Milford Valley in the western portion is 4,962 feet. There are four well-defined seasons. Precipitation averages 11.65 inches annually in Beaver Valley and 8.5 inches in the Milford area.



A variety of land uses are represented in Beaver County. The major land uses in Beaver County are indicative of the ownership by federal and state governments. The Bureau of Land Management (BLM) areas are used primarily for grazing, mining, recreation, and open space. Most of the forested areas in the county are contained in National Forest boundaries. The National Forest lands have multiple uses which include recreation, timber cultivation and harvest, grazing, wildlife habitat, and watersheds. Privately owned lands, which account for the smallest percentage of the total land are in Beaver County, are given to the most diverse uses.

The majority of urban land uses, including residential, commercial, industrial and public uses are located in or near the three incorporated municipalities in Beaver County: Beaver City, Milford City and the town of Minersville. Beaver City and Milford City are the County's primary centers for commerce and social activity. Beaver City is the County seat and derives a considerable portion of its income from the tourism market. Milford is a railroad and agricultural center. Minersville and the unincorporated communities in Beaver County are primarily agricultural in character.

Recreation importance of the region is increasing, with growing numbers of tourists attracted to the National Parks and Recreation Areas. Beaver County hosts many travelers for short periods as they pass through to the major attractions of the region. The county itself is also a destination for thousands of hunters, fishermen, hikers, bikers, ATVs, and campers looking for a high country outdoor experience.

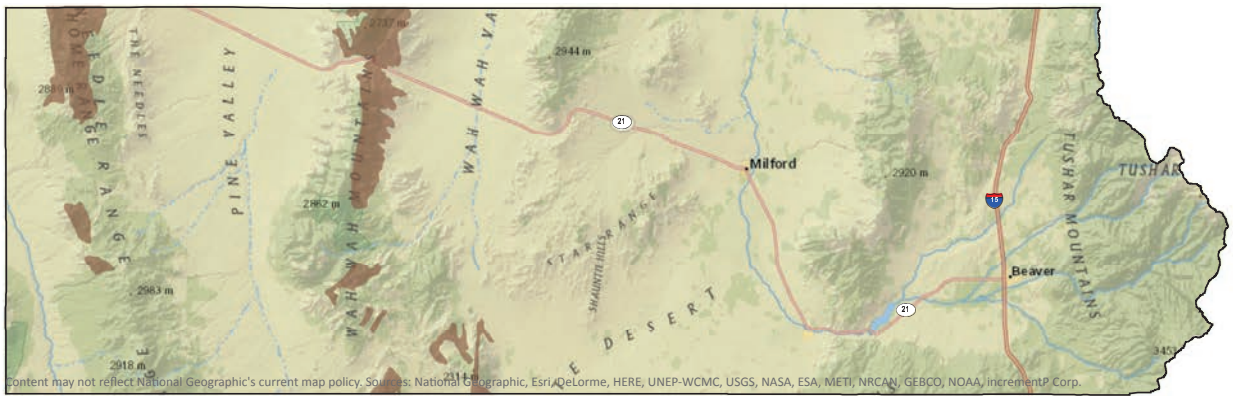
Problem Soils

HAZARD RISK ASSESSMENT

After reaching out to local governments, and several engineering and construction firms that deal directly with problem soils it is evident that very little data concerning structural damage due to problem soils is tracked, recorded and/or reported in the region.

Some mapping of problems soils have been done which helps to indicate where problem soils may lie. There is a chance that problem soils extend beyond the current engineering problem soils layer provided by the Utah Automated Geographic Reference Center (AGRC). As for the data available, below are the values of structures that lie within the problem soils areas for Beaver County.

Beaver County Problem Soils



Five County Association of Goverments and Southern Utah University June 2016
FCAOG and SUU GIS use information and data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended.
Map data was used from UTAH AGRC (Automated Geographic Refrence Center)
For specific data source information, please contact FCAOG.

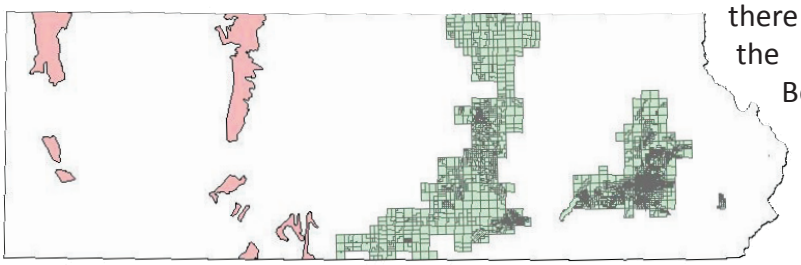
N

Hazard
Limestone (Karst)

Value of Structures at Risk - Problem Soils - Beaver County		
Structure Type	Market Value	Number of Structures
Residential	$0	0
Commercial	$0	0

Agriculture	$0	0
Total	$0	0
Source: Problem Soils-AGRC, Tax Data-Beaver County Tax Assessor, Analysis-SUU GIS Lab		

GIS analysis of Beaver County parcel tax data and the AGRC's problem soils layer reveals that there are no taxable structures within the mapped problem soils areas. Because detailed soil studies have not been conducted throughout the entire county, one should not assume that problem soils do not exist in areas containing such soils.



Key

Problem Soils

Parcel with taxed structures.

SUMMARY

Due to a lack of record keeping there is an undetermined number of structures that have been negatively affected by problem soils within Beaver County. Further, detailed mapping of hazardous soils have not been produced within the county, and current maps indicating where soils are display little risk to the counties structures.

Based on this analysis, decision makers should not assume that structures are not at risk from hazardous soils. Further geologic study needs to be conducted in order to understand any underlying threat.

MITIGATION STRATEGY

Beaver County Problem Soils Mitigation Strategy #1	
Objective:	Lessen the risk to buildings from problem soils.
Action:	**Action 1-**Address problem soils at the building/construction level by requiring all subdivision proposals to have a geotechnical report. **Action 2-**If jurisdiction does not have trained staff to review the geotechnical report, the jurisdiction can, upon request, have Utah Geological Survey (UGS) perform a review of the report.
Timeline:	Ongoing
Estimated Cost:	$1,000 to $10,000
Possible Funding:	Private funds/ developer; Local government operating budget; Utah Geologic Survey operating budget.
Responsible Agencies:	Local, jurisdictional level; Utah Geological Survey

Plan Goals Addressed:	**Action 1**-Prevention, Property Protection **Action 2**-Partnership/Coordination, Prevention, Property Protection
Priority:	Low

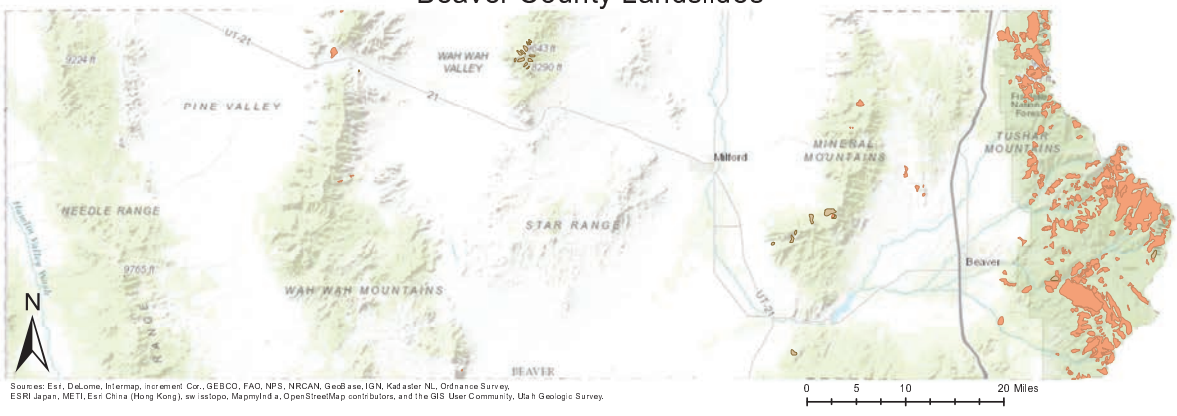
Beaver County Problem Soils Mitigation Strategy #2	
Objective:	Lessen the risk to buildings from collapsible and expansive soils.
Action:	Through mapping, identify areas which contain collapsible and expansive soils. Require soils testing at the building/construction level and ensure that engineer's recommendations are followed.
Timeline:	Ongoing
Estimated Cost:	$1,000 to $5,000
Possible Funding:	Private funds/ developer; Local government operating budget.
Responsible Agencies:	Local, jurisdictional level.
Plan Goals Addressed:	Prevention, Property Protection
Priority:	Low

Landslide

HAZARD RISK ASSESSMENT

Landslides are prevalent anywhere there are steep and over steepened slopes, and Beaver County is no exception. The Utah geologic Survey has mapped more than 200 historic and prehistoric landslides in the area mostly in and around the Tushar and Mineral Mountains.

Beaver County Landslides



Sources: Esri, DeLorme, Intermap, increment Cor., GEBCO, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, ESRI Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, OpenStreetMap contributors, and the GIS User Community, Utah Geologic Survey.

deep or unclassified landslide

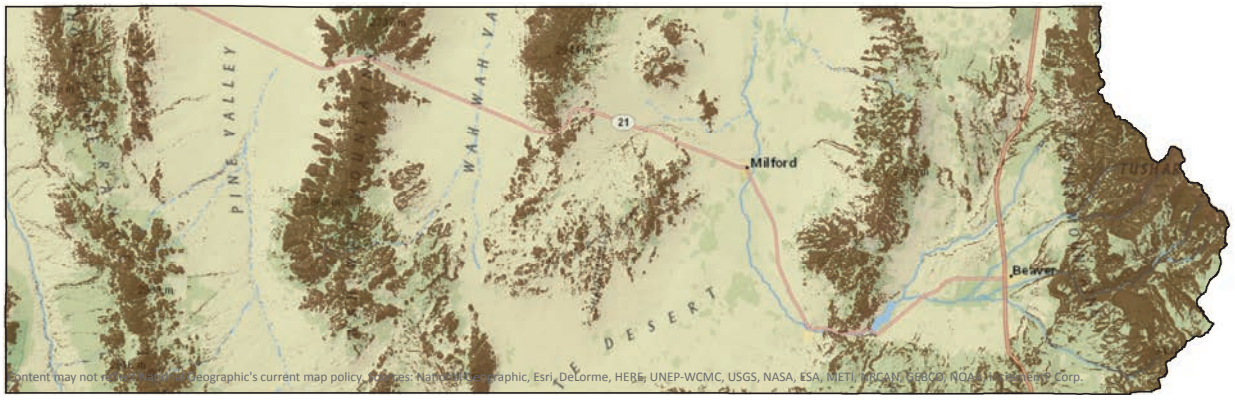
landslide and/or landslide undifferentiated from talus, colluvial, rock-fall, glacial, and soil creep deposits

Recording and archiving historic landslides in Utah is a feat that has not been thoroughly compiled into one place. Through the United States Geological Survey (USGS) and other state Surveys a landslide inventory pilot project was put together for several states including Utah for a period of time. Unfortunately, the data was only gathered for landslides between 1850-1975 (See Table below). SHELDUS, USGS's Landslide Hazard Program, and NOAA's Storm Events Database are all places that have gathered data regarding recent landslides. Additional links are http://hvri.geog.sc.edu/SHELDUS/ and http://geology.utah.gov/

Beaver County Landslides 1850-1978				
Event Year	**Location**	**Landslide Type**	**Cause**	**Source number**
1967	Milford	Debris flow	Natural	1
1936	Dry Gulch near Adamsville	Debris flow	Natural	9
1923	RR south of Milford	Landslide	Natural	6
2011	Beaver County	NCDC_Landslide	Not specified	SHELDUS
1984	Beaver County	Landslides	Not specified	SHELDUS
1983	Beaver County	Landslides	Not specified	SHELDUS
1984	Beaver County	Heavy Snow and Mudslide	Not specified	SHELDUS
Source: 1, 6, 9 UGS newspaper reference, see references & works cited page. & SHELDUS				

Highway widening and over steepening of slopes in 1962 are cited for the increase in frequency of land sliding along State Route 153 and the reactivation of some older slope failures. Although major landslide movements in the area have decreased in recent years, rock falls and shallow slope failures continue to make an impact.

Beaver County Landslide Susceptibility



Five County Association of Goverments and Southern Utah University June 2016
FCAOG and SUU GIS use information and data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. Map data was used from UTAH AGRC (Automated Geographic Refrence Center) Utah DNR Landslide layers.For specific data source information, please contact FCAOG.

0 5 10 20 30 Miles

Landslide Susceptibility
Moderate-High

N

The Landslide Susceptibility map was creating using landslide susceptibility data from the Utah

Geological Survey (UGS) and overlaying it with landslide data from the UGS. Areas that landslides exist are often some of the most vulnerable areas to future landslides. The Value of Structures at Risk data was created by overlaying county tax assessors data with Moderate to High susceptibility data.

Value of Structures at Risk - Landslide - Beaver County		
Type of Structure	**Market Value**	**Number of Structures**
Residential	$18,066,873	171
Commercial	$0	0
Agriculture	$420,707	24
Total	**$18,487,580**	**195**
Source: Landslide Potential-Utah Geological Survey, Values-Beaver Co. Tax Assessor, Analysis-SUU GIS Lab, Parcels-AGRC		

Factors included in assessing landslide risk include built property distribution in the hazard area, the frequency of landslide or debris flow occurrences, slope steepness, and soil characteristics. The Landslide Susceptibility map was created using landslide susceptibility data from the Utah Geological Survey (UGS) and overlaying it with landslide data from the UGS. Areas where landslides exist are often some of the most vulnerable areas for future landslides. The Value of Structures at Risk data was created by overlaying county tax assessor data with moderate to high susceptibility data.

With over $18 million of structures at risk of land sliding, it is more important than ever that future development does not encroach further into the areas that are at risk of sliding, which will put more citizens in harm's way.

Between 2010 and 2015 every town in Beaver County had an estimate of decreased population. If development in the county has stopped due to lack of growth there should be very little new development invading lands susceptible to land sliding. Even Though there is no current growth, decision makers should be aware of landslide risks to prevent future development in these areas.

SUMMARY

Hundreds of landslides have been mapped in Beaver County, but very few historic landslides have been recorded. Despite the minimal amount of landslides that have occurred and/or have been recorded in the last 150 years, Beaver County is home to vast amounts of land that is susceptible to the hazard.

Beaver County experienced very little population growth over the last fifty years and has lost population in the last five years. Despite little to no growth it is important that people are aware of the county's landslide risk, as it is pertinent to their safety.

MITIGATION STRATEGY

The mitigation strategies listed below identify cost effective measures that will yield measurable benefits toward reducing the risk of landslide hazards.

Beaver County Landslide Mitigation Strategy #1	
Objective:	Increase the level of knowledge related to landslides.
Action:	Increase public education related to landslide hazards by distributing Utah Geological Survey (UGS) landslide informational brochures to local municipality level emergency management, engineering and planning departments.
Timeline:	Ongoing
Estimated Cost:	Very Minimal: request UGS to deliver brochures; and/or download brochures directly from: http://geology.utah.gov
Possible Funding:	Local, jurisdictional level.
Responsible Agencies:	Local, jurisdictional level.
Plan Goals Addressed:	Education/Outreach, Emergency Services, Partnership/ Coordination, Prevention
Priority:	Medium

Beaver County Landslide Mitigation Strategy #2	
Objective:	To reduce landslide risk as it relates to the built environment.
Action:	**Action 1**-Address landslide risk at the building/construction level by requiring all subdivision proposals to have a geotechnical report. **Action 2**-If jurisdiction does not have trained staff to review the geotechnical report, the jurisdiction can, upon request, have Utah Geological Survey (UGS) perform a review of the report. **Action 3**-Drafting/updating zoning and/or landslide ordinances to prevent development of structures near debris flows, landslides, and rock fall areas.
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	Private funds/ developer; Local government operating budget; Utah Geologic Survey operating budget.
Responsible Agencies:	Local, jurisdictional level; Utah Geological Survey
Plan Goals Addressed:	**Action 1**-Prevention, Property Protection **Action 2**-Partnership/Coordination, Prevention, Property Protection
Priority:	High

HAZARD RISK ASSESSMENT

Hundreds of fires have occurred in Beaver County over the last 39 years, most of which are just a fraction of an acre. However, there have been several significant fires that have burned several hundred thousand acres of wildland.

Beaver County BLM Fires 1976-2015



There are many other agencies involved with wildfire that should not be disregarded because they have not been reported in this section. The tables and maps are designed to inform people that fires are a real threat and this map and table should and not be used as a complete history of wildfires in the area.

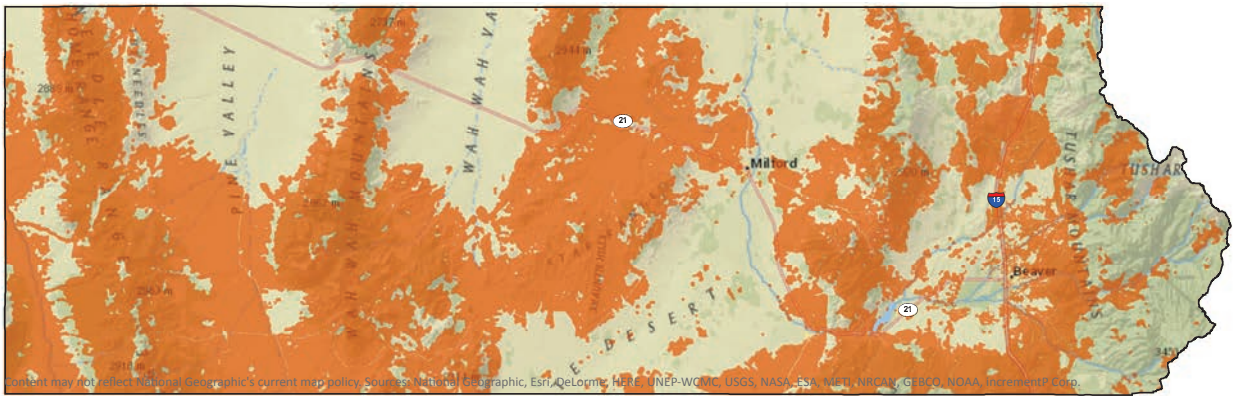
Significant BLM Wildland Fires 1976-2015 - Beaver County			
Fire Name	**Year**	**Acres**	**Other Counties Effected**
Milford Flat	2007	337,675	Millard
Twin	1996	41,827	Millard
Baboon	2012	19,778	Iron
Cunningham	1996	14,718	none
Honeyboy	1996	10,477	none
Milfordbench	1994	9,906	none
Milfordpass	1995	9,092	Millard
Wrangler	2011	8,455	Iron
Badger	2006	7,953	Iron
Minersville	1998	4,061	none
Source: Bureau of Land Management			

One of Utah's larges wildfires, The Milford Flat Fire of 2007 spanned large tracts of land in both Beaver and Millard Counties, burning a total of 337,675 acres. The fire was caused by lightning, but high winds and heat drove the flames quickly through extremely dry cheat grass and other

fuels. The fire closed portions of I-15 and I-70, during the confusion two motorcyclists were struck and killed by a motorist. Costs escalated to $17 million in efforts to try to mitigate for future fires and eliminate fuels like cheat grass from coming back.

The following provides a summarization of Fire threat in Beaver County. Fire threat is the likely hood of an acre burning.

Beaver County Fire Threat



Five County Association of Goverments and Southern Utah University June 2016
FCAOG and SUU GIS use information and data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. Map data was used from UTAH AGRC (Automated Geographic Refrence Center) Utah DNR and Oregon DPF fire threat rasters. For specific data source information, please contact FCAOG.

0 5 10 20 30 Miles

Fire Threat
Moderate-Extreme

N

Value of Structures at Risk - Wildfire - Beaver County		
Type of Structure	**Market Value**	**Number of Structures**
Residential	$83,432,402	1,224
Commercial	$38,318,920	110
Agriculture	$23,912,590	192
Total	$145,663,912	1,526
Source: Utah Department of Natural Resources, Beaver County Tax Assessor, SUU GIS Lab		

The analysis of structures at risk is defined by how many structures are within the medium to extreme fire threat boundary.

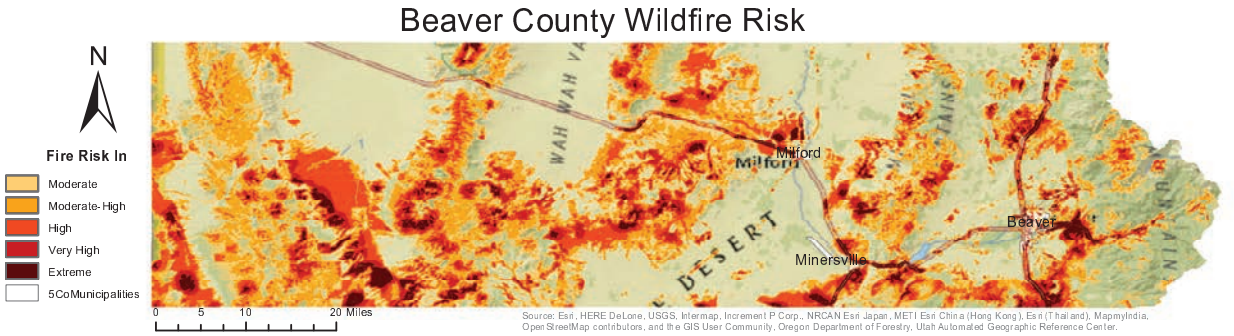
In addition to structures located within a defined hazard area, there is also an overwhelming amount (in terms of quantity and value) of infrastructure that is not captured by this analysis. This is in large part due to the fact that compilation of this data would be exhaustive; nevertheless, the following provides a summarization of additional infrastructure at risk from wildfire.

Infrastructure at Risk - Beaver County	
Infrastructure	**Miles**
Major Roads	244.9
Rail	47.5
Transmission Lines	196.9
Source: Utah AGRC	

Miles of major roads were calculated using road centerline data. The types of roads used for the Major roads include; Interstates, US Highway, Separated; US Highway, Unseparated; Major State Highway, Separated; Major State Highway,

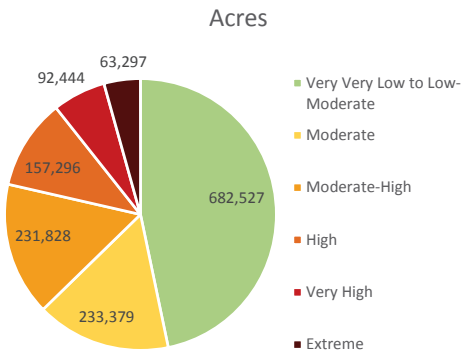
Unseparated; Other State Highway, (Institutional); Ramps, Collectors; Major Local Roads, Paved.

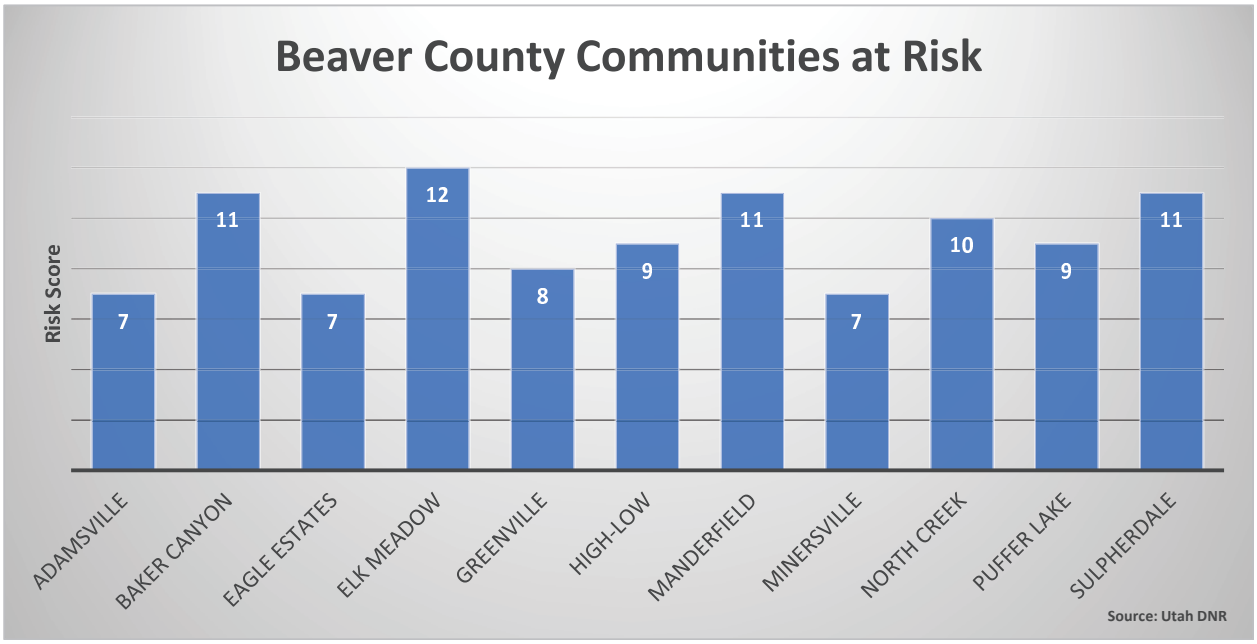
The following provides a summarization of Fire Risk in Beaver County. Fire Risk "represents the possibility of loss or harm occurring from a wildfire." (Oregon Department of Forestry) The county risk assessment values are based on Suppression Difficulty, Wildland Development Areas, Forest Assets, Riparian Assets, Drinking Water Importance Areas (watersheds), and Infrastructure Assets.



All three of Beaver County's municipalities and the majority of highways fall completely within high to extreme risk areas. This means that the majority of Beaver Counties population can potentially be affected by a wildfire.

The Following is a summary of Beaver County communities at risk.





Each community's risk in the county was determined using four categories, each category received a score between one and three, one being the lowest risk and three being the highest. When the scores are added together the minimum a community can receive is a three while the maximum score is twelve. The categories are Fire Occurrence, Fuel Hazards, Values Protected, and Fire Protection Capability.

All the communities that are at risk in Beaver County received relatively high scores, with three communities scoring greater than ten.

SUMMARY

Hundreds of wildfires have occurred in Beaver County including a portion of Utah's largest fire, the Milford Flat Fire. Wildfire threat is ubiquitous in Beaver County putting more than 1,500 structures, and hundreds of miles of roads, rail, and transmission lines at risk. Other assets at risk include wildland development areas, forest assets, riparian assets, and drinking water importance areas. There are currently eleven communities at risk from wild fire, four of which are at extreme risk.

MITIGATION STRATEGY

Beaver County Wildfire Mitigation Strategy #1	
Objective:	Promote public awareness campaign for property owners living in Wildland-Urban Interface areas and to encourage local governments to require property owners and developers to utilize defensible space tactics.
Action:	**Action 1**-Provide printed Information, Public Service Announcements; Encourage new homes and communities in the Wildland-Urban Interface to follow the WUI code and be Firewise compliant. Complete WUI assessment. **Action 2**-Voluntary site visits (to CARs) by fire crews to consult with landowners about specific ways to reduce risk to their property. **Action 3**-Develop local code enhancements that require utilization of defensible space tactics.
Timeline:	Every 2-3 years/ongoing
Estimated Cost:	Unknown
Possible Funding:	State and Federal wildfire grant programs, Local government operating budget; Special Service District operating budget
Responsible Agencies:	State and Federal government, Community & local government entities

Plan Goals Addressed:	**Action 1**-Education/Outreach, Partnership/Coordination, Prevention, Property Protection **Action 2**-Education/Outreach, Emergency Services, Partnership/ Coordination, Prevention, Property Protection **Action 3**-Prevention, Property Protection
Priority:	High

Beaver County Wildfire Mitigation Strategy #2	
Objective:	Provide training, equipment, and resources for fire departments to fight wildfires.
Action:	Enhance existing wildfire training programs, equipment procurement, and firefighting resources for wildfire suppression.
Timeline:	Ongoing
Estimated Cost:	Unknown
Possible Funding:	State CIB funding; Federal wildfire grant programs
Responsible Agencies:	Federal Government
Plan Goals Addressed:	Emergency Services, Partnership/Coordination, Prevention, Property Protection
Priority:	High



Flood

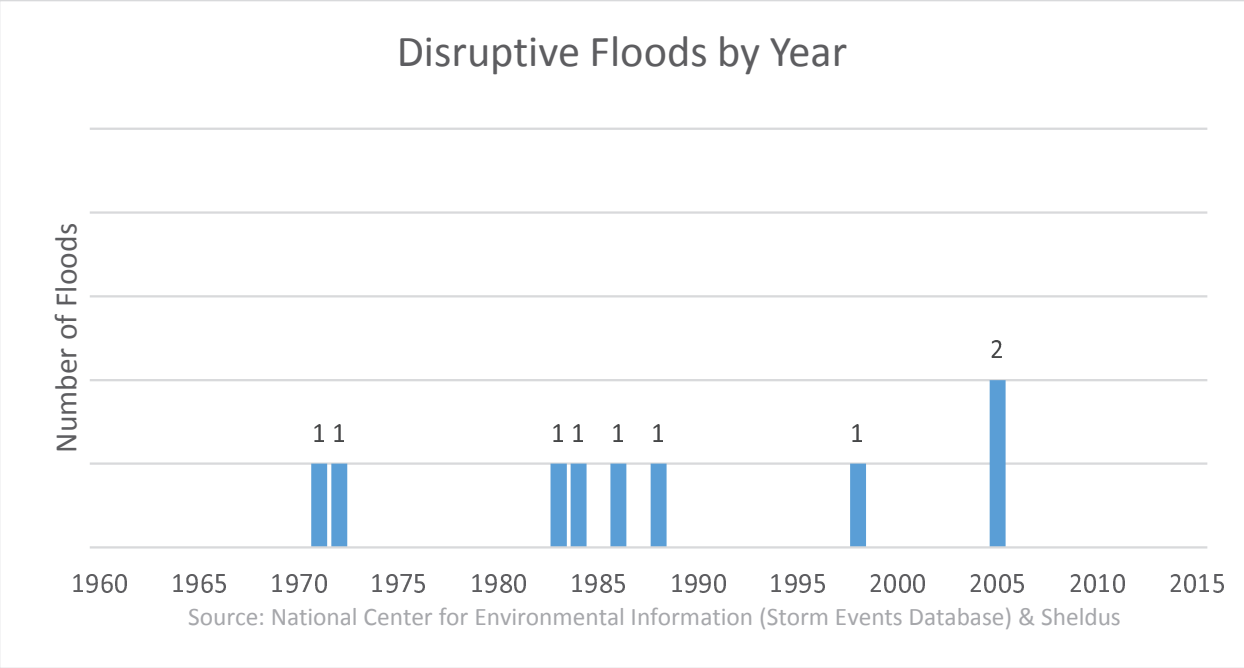
HAZARD RISK ASSESSMENT

There is very little data indicating that a large number floods have occurred in Beaver County. This does not mean that flooding has not and does not transpire. As for recorded data, The National Centers for Environmental Information and the Spatial Hazard Events and Losses Database for the United States (SHELDUS) has recorded a few floods that caused disturbance in the Beaver County.

Significant Floods - 1960-2015 - Beaver County						
LOCATION	**BEGIN DATE**	**EVENT TYPE**	**DEATHS**	**INJURIES**	**PROPERTY DAMAGE**	**CROP DAMAGE**
Beaver County	5/21/2005	Flood	0	0	$2,500	$0
Beaver County	1/10/2005	Flood	0	0	$0	$0
Beaver County	9/5/1998	Flood	0	0	$5,384	$884
Beaver Canyon	8/26/1988	Flash Flood	0	0	$500	$0
Beaver County	2/19/1986	Flooding	0	0	$29,411	$0

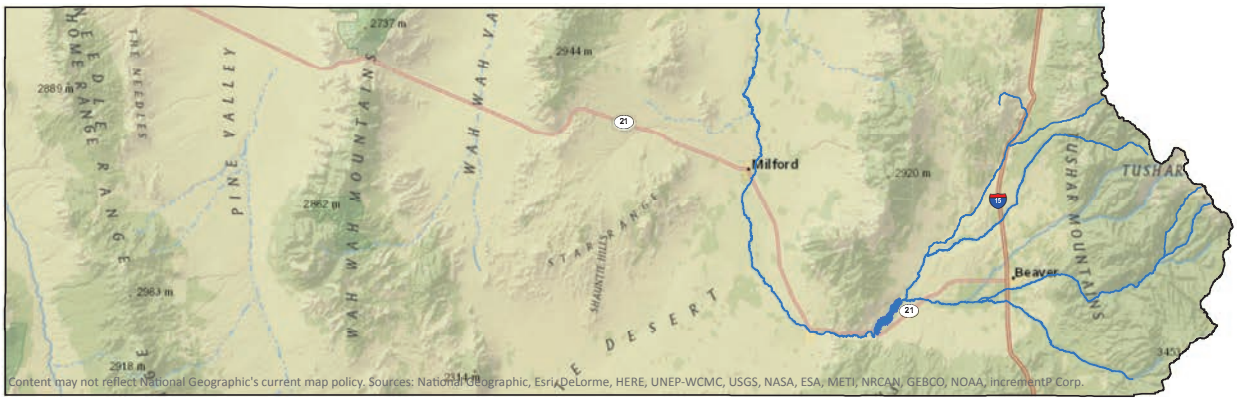


Beaver County	8/15/1984	Flash Flood	0	0	$5,000	$0
Beaver County	5/1/1983	Flood	0	0	$2,380,952	$2,380,952
Beaver County	9/18/1972	Flooding	0	0	$384	$0
Minersville	8/20/1971	Flash Flood	0	0	$5,000	$500
Source: NOAA-National Centers for Environmental Information (Storm Events Database), SHELDUS						



The Federal Emergency Management Agency (FEMA) has done very little in the way of flood mapping , and there has been very few historical floods in the area, but there are bodies of water that should be of concern.

Beaver County Major Water Bodies



Five County Association of Goverments and Southern Utah University June 2016
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Map data was used from UTAH AGRC (Automated Geographic Refrence Center) Lakes and Streams layers.
For specific data source information, please contact FCAOG.

N
Streams
Minersvilleres

Potential flood sources in Beaver County include reservoirs, lakes, streams, and dry washes. Vulnerability assessment as it relates to specific developed area in unincorporated county includes the following:

- Adamsville: Little threat as Indian creek runs quite east of the community.
- Greenville: Some risk due to Dry Creek running through town.
- Manderfield: A large channel just east of the main street appears to pose a moderate flood threat.

Vulnerability assessment as it relates to specific developed areas in incorporated Beaver County includes the following:

- Beaver: The town is susceptible to flooding primarily on the very south end of town from Beaver Creek and on the very north end of town from North Creek.
- Milford: An existing, large Corps of Engineers project, Big Wash Diversion Dam and Channel, provide adequate flood protection resulting in this community's non-special flood hazard area (NSFHA) designation.
- Minersville: Relatively protected due to the Minersville Dam being just a few miles upstream (to the east) and due to the long and relatively large interceptor levee that extends for close to 2 miles along the foothills southeast of town. With that being said Minersville is in the dam break inundation area which could cause flooding in town if the dam were to break.

The following provides an analysis of structures at risk based on the FEMA 100 year floodplain.

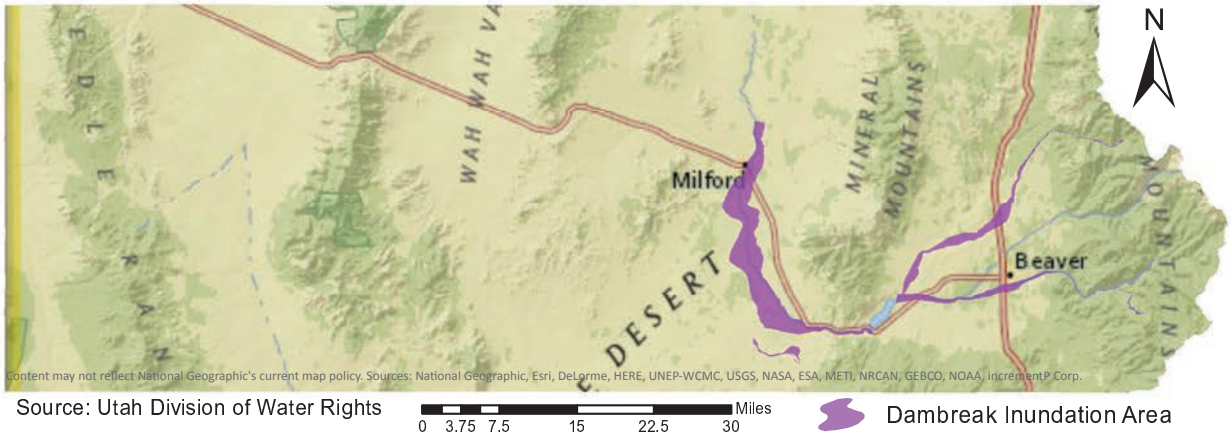
Value of Structures at Risk - Flood - Beaver County		
Structure Type	**Market Value**	**Number of Structures**
Residential	$0	0
Commercial	$0	0
Agriculture	$0	0
Total	$0	0
Source:		

Quantitative flood measures as they relate to structural damage cannot be determined due to the lack of mapped flood zones in the County. The only current flood mapping in Beaver is a minuscule area along Main Street and a dam break inundation map.

Dam failure has the potential to cause significant flooding and damage to communities downstream. The Utah Division of Water Rights and the state engineer list the dam hazard ranking to help communities understand the risk of dam failure inundation. The Hazard classification of dam risk is determined by the threat to human life and property damage in the event that a dam fails. The hazard ratings of inspected dams are listed on the following table. (Excluded are low risk dams)

Beaver County Dam Hazard Classification			
Dam Name	**Hazard**	**Dam Name**	**Hazard**
KENT`S LAKE NO 1 (UPPER)	HIGH	LABARON	MOD
KENT`S LAKE NO 2 (MIDDLE)	HIGH	LITTLE RESERVOIR	MOD
MANDERFIELD (A.K.A. BEAVER)	HIGH	MINERSVILLE-BIG WASH DEBRIS	MOD
ROCKY FORD (BEAVER)	HIGH	MINERSVILLE-RED HILLS DEBRIS	MOD
THREE CREEKS (BEAVER)	HIGH	PUFFER LAKE	MOD
ANDERSON MEADOW	MOD	SOUTH CREEK (BEAVER)	MOD
BLUE LAKE	MOD		
Source: Utah Division of Water Rights-Dam Safety Database Information Viewer			

Beaver County Dam Break Inundation Areas



Beaver, Minersville and Milford are all in dam break inundation areas. Minersville and Milford are especially at risk because they have large portions of incorporated town in these areas. Beaver potentially is at the least risk because the inundation areas cut through small portions of town to the south and east.

The following list the communities participating in the National Flood Insurance Program, FEMA's repetitive flood claims, and other FEMA claims.

Communities Participating in the National Flood Insurance Program (FEMA)				
Community	**Initial FHBM Identified**	**Initial FIRM Identified**	**Current Effective Map Date**	**Reg-Emerg Date**
Beaver County	No Data	9/18/1987	All Zone D	9/18/1987
Milford	8/9/1974	No Data	(NSFHA)	2/2/1984
FIRM - Flood Insurance Rate Map FHBM - Flood Hazard Boundary Map		(M) - No Elevation Determined Zones A,C,X NSFHA - No Special Flood Hazard Area, Zone C		
Source: FEMA National Flood Insurance Program Community Status Book Feb/2016				

Beaver City is not participating in the National Flood Insurance Plan, and Minersville is not listed in either category.

There are NO FEMA REPETITIVE FLOOD CLAIMS in Beaver County.

The following table is a list of historical claims through FEMA's National Flood Insurance Program.

(Claims) FEMA Loss Statistics from Jan 1/1978 through Nov/30/2015 - Beaver County					
Community Name	**Total Losses**	**Closed Losses**	**Open Losses**	**CWOP Losses**	**Total Payments**
Beaver County	1	1	0	0	$3,671.94
Milford, City of	1	1	0	0	$3,446.94
Total	**2**	**2**	**0**	**0**	**$7,118.88**
Total Losses - All losses submitted regardless of the status. Closed Losses - Losses that have been paid. Open Losses - Losses that have not been paid. CWOP Losses - Losses that have been closed without Payment. Total Payments - Total amount paid on losses.					
Source: FEMA Policy and Claim Statistics for Flood Insurance					

SUMMARY

Few floods have occurred and/or have been recorded in Beaver County over the last half century. Beaver County has many rivers, washes and reservoirs, some of which are in the incorporated areas. Despite these bodies of water, the county has little to no flood plain mapping. Some of the best flood mapping in the county is currently the flood inundation maps which cover segments of all three incorporated municipalities. Major contributors to the inundation areas are five high hazard dams and eight medium hazard dams.

Beaver County and the town of Milford are the only communities participating in the National Flood Insurance Program. Since 1978 there have been only two claims, none of which are repetitive.

MITIGATION STRATEGY

Beaver County FEMA 100 year flood plain mapping is generally non-existent; with the exception of one small flood plain mapped on the south end of Main Street in Beaver City. Based upon this fact, the #1 Priority flood mitigation strategy is to provide much needed mapping in flood prone areas of the County. Additionally, local zoning regulations need to be drafted/implemented (where applicable) to ensure that development is adequately setback from areas which pose risk due to flooding.

Beaver City Flood Mitigation Strategy #1	
Objective:	Prevent damage to private and public property, continue to generate power, and continue to provide secondary water to citizens.
Action:	Replace the Pressurized Irrigation and Hydro Power Plant Diversion.
Timeline:	Bonding: Sept. & Oct. 2016. Construction: Oct. 2016 Project Finished Nov. 2016
Estimated Cost:	$442,000-$520,000
Possible Funding:	Utah Division of Water Resources, Water Fund for City Portion.
Responsible Agencies:	Beaver City
Plan Goals Addressed:	Property Protection, Environmental Protection, Secondary Water Availability, Hydro Electric Generation
Priority:	High

Milford Flood Mitigation Strategy #1	
Objective:	Allow the water to move freely and eliminate water from backing up into private properties.
Action:	Install a culvert with a box in our main drainage ditch (300S 100 E) The culvert will be extended 15' past the 100 East. This will allow the water to move more efficiently and freely. The culvert will end in the main drainage canal, which is located on Railroad Property, east of 100 East. The City crew will be cleaning out the drainage ditch, which is on the Railroad Property to ensure the water moves freely out of city limits.
Timeline:	1 year
Estimated Cost:	$10,500
Possible Funding:	Milford operating budget.
Responsible Agencies:	Milford
Plan Goals Addressed:	Property Protection, Prevention
Priority:	High

Minersville Flood Mitigation Strategy #1	
Objective:	Prevent high intensity rains from flooding property in Minersville
Action:	"Construct proper drainage as addressed in a storm water and drainage master plan to prevent flood damage to property. Will be putting in sidewalk curb and gutter where necessary. "
Timeline:	Phased out over approximately 10 years
Estimated Cost:	"$800.000 - $1 million Minersville Town budgeted 35,000 in2016"
Possible Funding:	Minersville Town operating budget, CIB, CDBG, FEMA, UDOT
Responsible Agencies:	Minersville Town

Plan Goals Addressed:	Property Protection and Environmental protection, Prevention
Priority:	High

Minersville Flood Mitigation Strategy #2	
Objective:	Officially recognize Minersville as a NSFHA.
Action:	Draft and adopt a NSFHA ordinance
Timeline:	1-5 years
Estimated Cost:	Minimal
Possible Funding:	Local Government operating budget; State and Federal flood grant programs
Responsible Agencies:	Local government, State Floodplain Coordinator, FEMA
Plan Goals Addressed:	Education/Outreach, Partnership/Coordination, Prevention, Property Protection
Priority:	High

Beaver County Flood Mitigation Strategy #1	
Objective:	Identify flood prone areas in the County.
Action:	Work with State Floodplain Coordinator & FEMA. Attain FEMA flood Maps for the County
Timeline:	2-5 years
Estimated Cost:	Unknown
Possible Funding:	Federal flood programs
Responsible Agencies:	Federal (FEMA)
Plan Goals Addressed:	Emergency Services, Environmental Protection, Partnership/ Coordination, Prevention, Property Protection
	High

Beaver County Flood Mitigation Strategy #2	
Objective:	Minimize future flood damage in the County.
Action:	Nonstructural measures appear to be the most prudent option for the county to implement. Zoning to prevent development of structures near all rivers, creeks, and lakes (100’ min. setback).
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	Local government operating budget; State and Federal flood and planning grant programs
Responsible Agencies:	Local government.
Plan Goals Addressed:	Emergency Services, Partnership/Coordination, Property Protection
Priority:	High

Beaver County Flood Mitigation Strategy #3	
Objective:	To reduce flooding risk as it relates to the built environment.
Action:	Address flood control at the building/construction level by requiring all subdivision proposals to have a storm water drainage system.
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	Private funds/ developer.
Responsible Agencies:	Local (Beaver County, Beaver City, Milford City, Minersville town). jurisdictional level.
Plan Goals Addressed:	Environmental Protection, Prevention, Property Protection
Priority:	High

Beaver County Flood Mitigation Strategy #4	
Objective:	To reduce flooding risk at the community level.
Action:	Clear debris and other material from all waterways.
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	Related public/private property owners.
Responsible Agencies:	Private property owners, irrigation companies, local jurisdictions.
Plan Goals Addressed:	Environmental Protection, Prevention, Property Protection
Priority:	High

The Indian Peaks Band of Paiute Indians has indicated that there are several areas of the “water tank” roadway that experience drainage problems as a result of rain and/or snow melt.

Flood Mitigation Strategy #5	
Objective:	Indian Peaks Band of Paiute Indians- Prevent future roadway erosion of the road which leads to the water tank.
Action:	Add culverts to keep water off of the road.
Timeline:	1-5 years
Estimated Cost:	Unknown/annually
Possible Funding:	Federal flood grant programs
Responsible Agencies:	Indian Peaks Band of Paiute Indians
Plan Goals Addressed:	Prevention, Property Protection
Priority:	High

Beaver County Flood Mitigation Strategy #6	
Objective:	Obtain FEMA flood mapping throughout the county

Action:	Follow the proper steps to obtain flood mapping for the county
Timeline:	Unknown
Estimated Cost:	Unknown
Possible Funding:	Local, State, and Federal funding as available
Responsible Agencies:	Local, State, and Federal governments
Plan Goals Addressed:	Environmental Protection, Prevention, Property Protection/ Partnership/Coordination
Plan Goals not Addressed:	Education/Outreach, Emergency Services

Beaver County Flood Mitigation Strategy #7	
Objective:	Install flash flood warning signs along roadways in areas that are prone to flash floods.
Action:	Obtain and install flash flood warning signs in the appropriate areas.
Timeline:	Within the next five years.
Estimated Cost:	Unknown
Possible Funding:	Local governments, State and Federal funding as available
Responsible Agencies:	Local governments
Plan Goals Addressed:	Education/Outreach, Prevention, Property Protection
Priority:	Medium

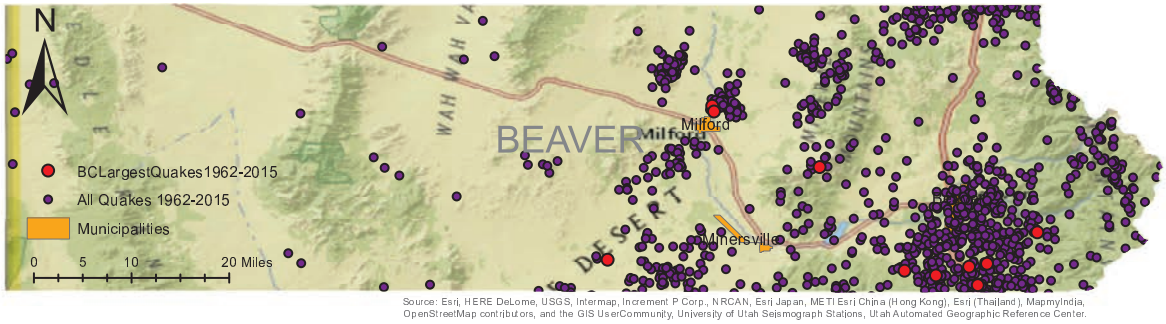
Beaver County Flood Mitigation Strategy #8	
Objective:	Improve flood plain management activities by exceeding the minimum Nation Flood Insurance Program standards. Decrease flood insurance Rates.
Action:	Each community will voluntarily participate in the FEMA Community Rating system which will help to keep communities more safe, reduce flood insurance rates, and improve flood plain management activities.
Timeline:	Ongoing
Estimated Cost:	Variable
Possible Funding:	Local, State, and Federal Funding Sources
Responsible Agencies:	Local Government
Plan Goals Addressed:	Environmental Protection, Partnership/Coordination, Prevention, Property Protection
Priority:	Medium

Earthquake

HAZARD IDENTIFICATION

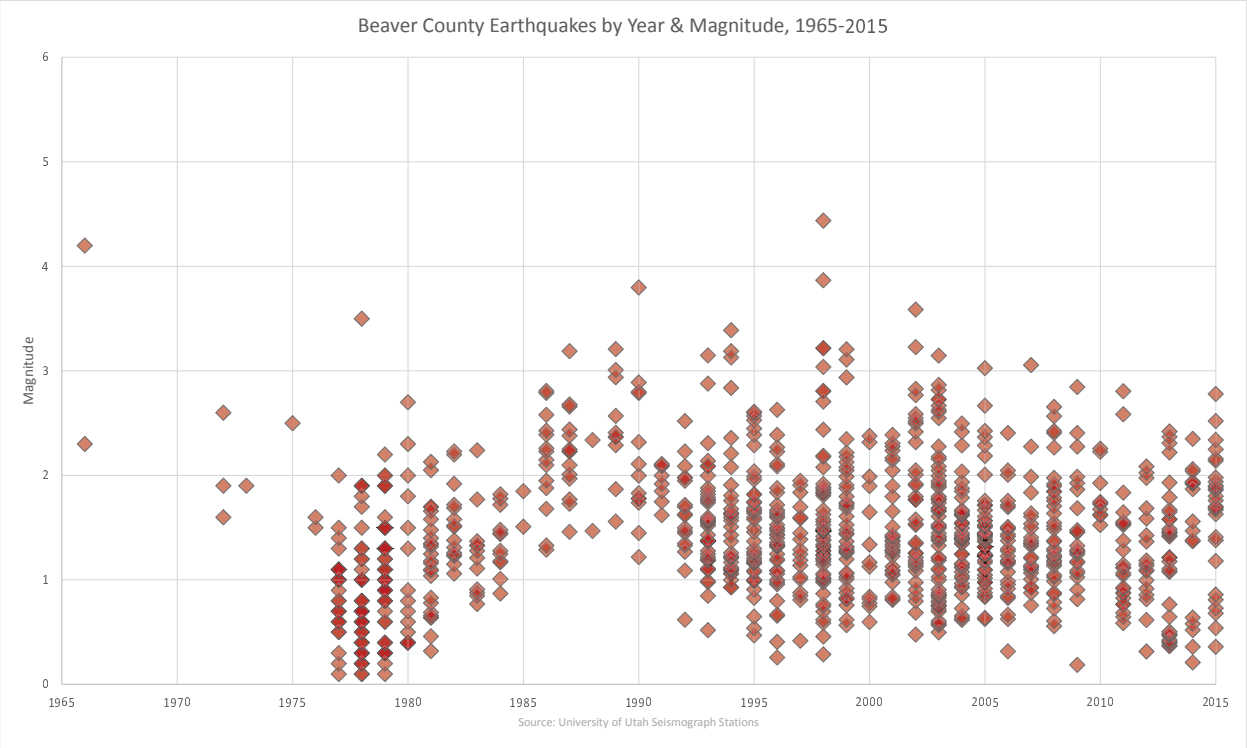
An Earthquake releases built up energy when blocks of earth slip past each other. Earthquakes are a frequent occurrence in Beaver County but are rarely large enough to be felt. Between 1962-2015 more than 1,000 earthquakes have transpired in the County. While several of those have been large enough to cause disturbance, none of the cataloged earthquakes have caused severe damage. Despite the lack of significant events in recent years there is still potential for a disastrous quake.

Beaver County Earthquakes 1962-2015



Greatest Earthquakes 1962-2015 - Beaver County		
Date	**Magnitude**	**Location**
1/2/1998	4.44	6 mi. East of Beaver
10/21/1966	4.2	9.7 mi. East-Southeast of Minersville
4/10/1998	3.87	0.6 mi. North of Milford
5/6/1990	3.8	4.1 mi. South-Southeast of Beaver
1/20/2002	3.59	3.4 mi. South-Southwest of Beaver
2/24/1978	3.5	8.8 mi. Southeast of Milford
11/17/1994	3.39	4.5 mi. Southwest of Beaver
1/17/1964	3.3	2.9 mi. South of Beaver
8/12/2002	3.23	5.3 mi. South of Beaver
4/9/1998	3.22	1 mi. North of Milford
Source: Utah Seismograph Stations/University of Utah, Earthquakes measured using Local Magnitude (ML)		

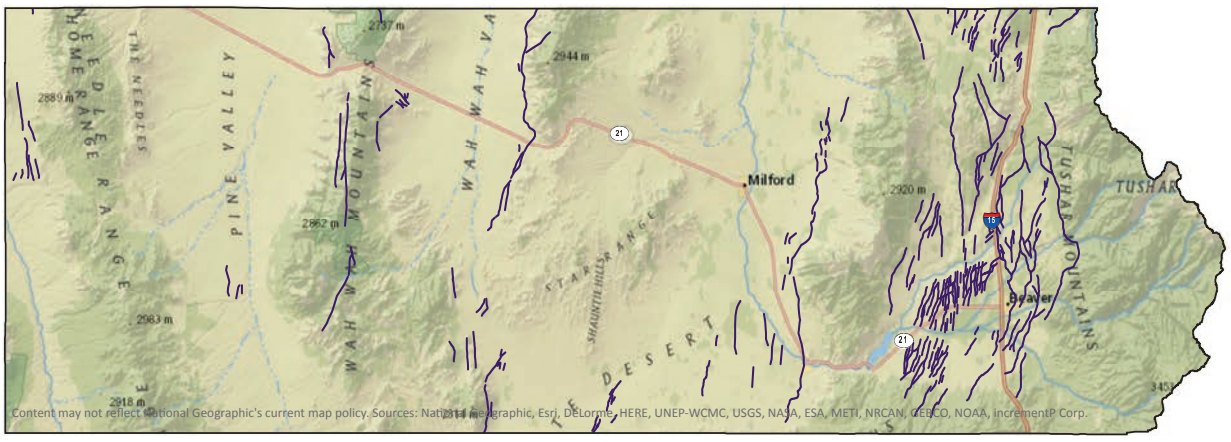
The majority of earthquakes in Beaver County occur right around a series of faults near Beaver City. The majority of these quakes are quite small, averaging between a magnitude one and two. There have been a few earthquakes since 1965 that are large enough to be felt but little information has been reported on these quakes. The graphic below displays the earthquakes by year and magnitude.



*The increasing number of earthquakes by year is likely contributed to more seismograph stations and equipment advances.

Earthquakes are not a predictable hazard. However, Geologic study of the recent geologic past can help reveal what can be expected for the future. The Charts provided depicting recent historical quakes are not intended to indicate the cycle of regional earthquakes and what to expect, but rather, to display that earthquakes are and will continue to be real threat.

Beaver County Quaternary Faults



Five County Association of Goverments and Southern Utah University June 2016
FCAOG and SUU GIS use information and data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended.
Map data was used from UTAH AGRC (Automated Geographic Refrence Center) Quaternary Faults layer
For specific data source information, please contact FCAOG.

0 5 10 20 30 Miles

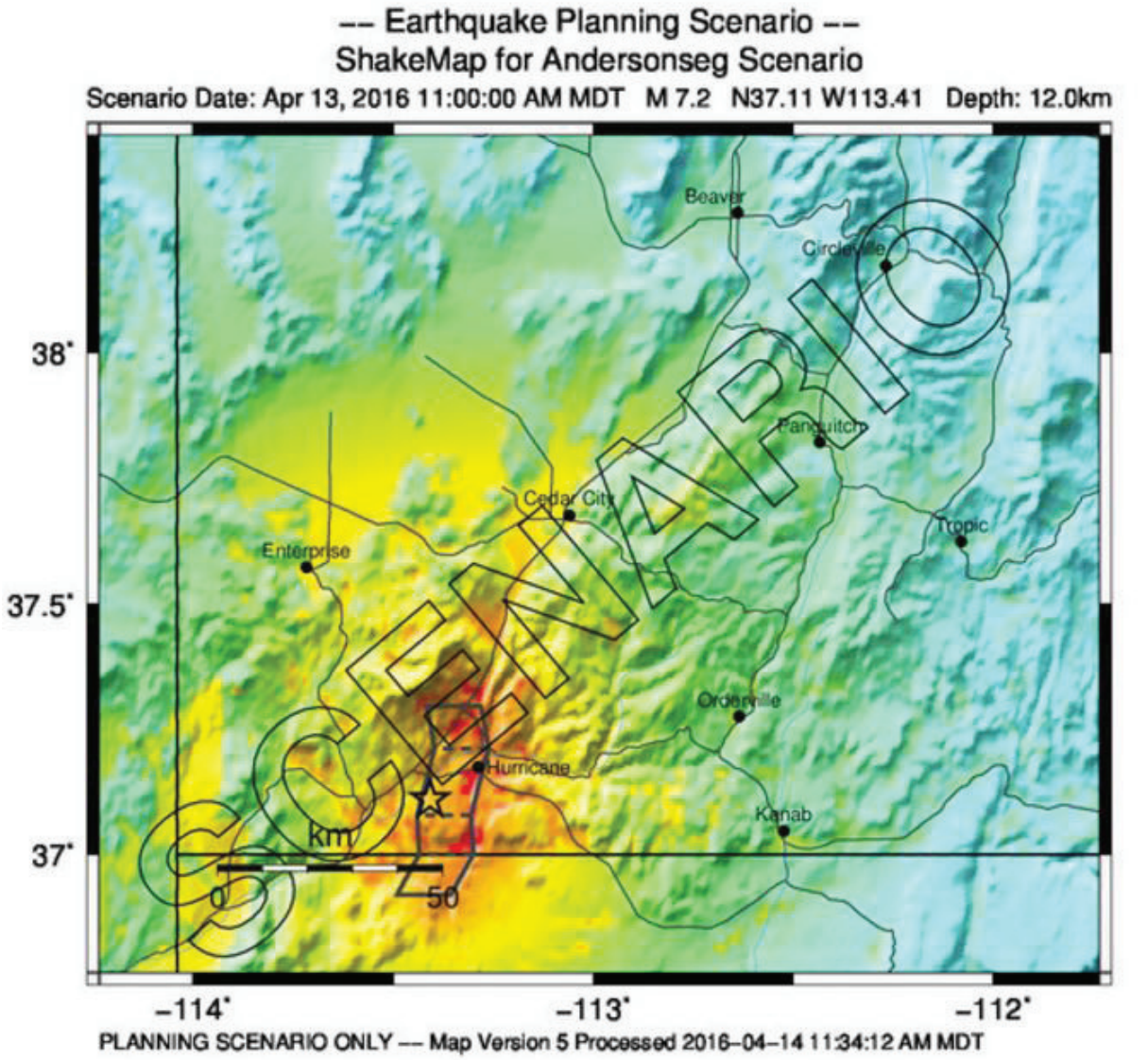
Quaternary Faults

N

The Previous mitigation plan included an analysis for all structures within 1,000 feet of a fault. The problem with this type of analysis that it only accounts for structures within this boundary. ShakeMap scenarios account for ground movement providing a more realistic scenario and analysis of structural damage.

Due to time and resource constraints only one shake map was produced. Because of these limitations the scenario with the fault segment able to produce the largest earthquake near the largest population was selected. In this scenario it is the Anderson Segment of the Hurricane Fault. Hopefully future mitigation plans will include ShakeMap scenarios for each county in the region.

In this scenario Beaver County will receive weak, light, and moderately perceived ground shaking with the possibility of very light damage.



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	*<0.1*	*0.5*	*2.4*	*6.7*	*13*	24	44	83	>156
PEAK VEL.(cm/s)	<0.07	0.4	1.9	5.8	*11*	*22*	*43*	*83*	*>160*
INSTRUMENTAL INTENSITY	I	II–III	IV	V	VI	VII	VIII	IX	X+

Scale based upon Wald, et al.; 1999

SUMMARY

Beaver County is a geologically active county with over 1,000 earthquakes occurring since 1962. Only a handful of the quakes have been large enough to be felt. The majority of the earthquakes occur along faults in and around Beaver City. There is currently no ShakeMap analysis for a worst case scenario in Beaver County, but with the current scenario there is a possibility of very light damage.

MITIGATION STRATEGY

Earthquake mitigation strategies include general mitigation actions that agencies are capable of implementing during the next five years, given their existing resources and authorities. In addition to the earthquake mitigation strategies provided herewith, this Natural Hazard Mitigation Plan endorses any seismic mitigation proffered by the Utah Seismic Safety Commission. In particular, numerous and varied earthquake mitigation strategies are provided in *A Strategic Plan for Earthquake Safety in Utah (January, 1995)* completed by the Utah Seismic Safety Commission. It is highly recommended that jurisdictions whom desire to provide more specific earthquake mitigation strategies consult the aforementioned plan, which can be accessed at: http://ussc.utah.gov/.

Beaver County Earthquake Mitigation Strategy #1	
Objective:	Promote building safety through non-structural improvements.
Action:	Increase public education related to earthquake hazards by distributing Utah Seismic Safety Commission informational brochures to County and City emergency management agencies.
Timeline:	Ongoing
Estimated Cost:	Very Minimal: request Utah Seismic Safety Commission to deliver brochures; and/or download brochures directly from: http://ussc.utah.gov/
Possible Funding:	County and City operating budget; Utah Seismic Safety Commission operating budget.
Responsible Agencies:	Local, jurisdictional level.
Plan Goals Addressed:	Education/Outreach, Partnership/Coordination
Priority:	Medium

Beaver County Earthquake Mitigation Strategy #2	
Objective:	To reduce earthquake risk as it relates to the built environment.
Action:	Continued dedication/vigilance in enforcing the seismic standards established in the International Building Code (IBC).
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	County or City government operating budget (where applicable).
Responsible Agencies:	County or City government (where applicable).
Plan Goals Addressed:	Prevention, Property Protection
Priority:	High

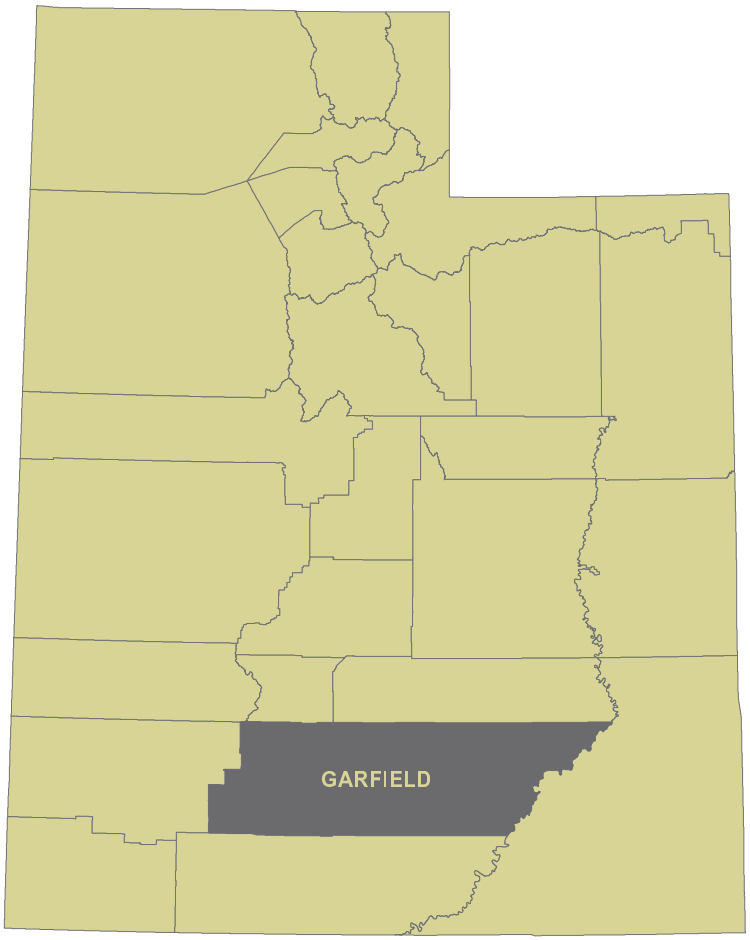
Beaver County Earthquake Mitigation Strategy #3

Objective:	To reduce earthquake losses by mapping and identifying earthquake hazard areas.
Action:	**Action 1**-Utilize the Earthquake Risk Map provided in this plan as a tool to assess earthquake risks as it relates to any building/ subdivision proposals. If deemed necessary, jurisdiction should require the builder/developer to conduct a site-specific earthquake hazard identification/mapping study. **Action 2**-At the County level, contract with Utah Geological Survey (UGS) to formally study/map earthquake hazard areas.
Timeline:	**Action 1**-Ongoing **Action 2** 3 to 5 years
Estimated Cost:	**Action 1**-$1,000 to $5,000 **Action 2**-$7,109 to $14,218 per jurisdiction (1995 cost as reflected in *A Strategic Plan for Earthquake Safety in Utah* adjusted for inflation)
Possible Funding:	**Action 1**-Private funds/ developer. **Action 2**-Local government operating budget; Utah Geologic Survey operating budget.
Responsible Agencies:	Local, jurisdictional level; Private property owner; Utah Geological Survey
Plan Goals Addressed:	**Action 1**-Prevention, Property Protection **Action 2**-Partnership/Coordination, Prevention, Property Protection
Priority:	Low

Garfield County



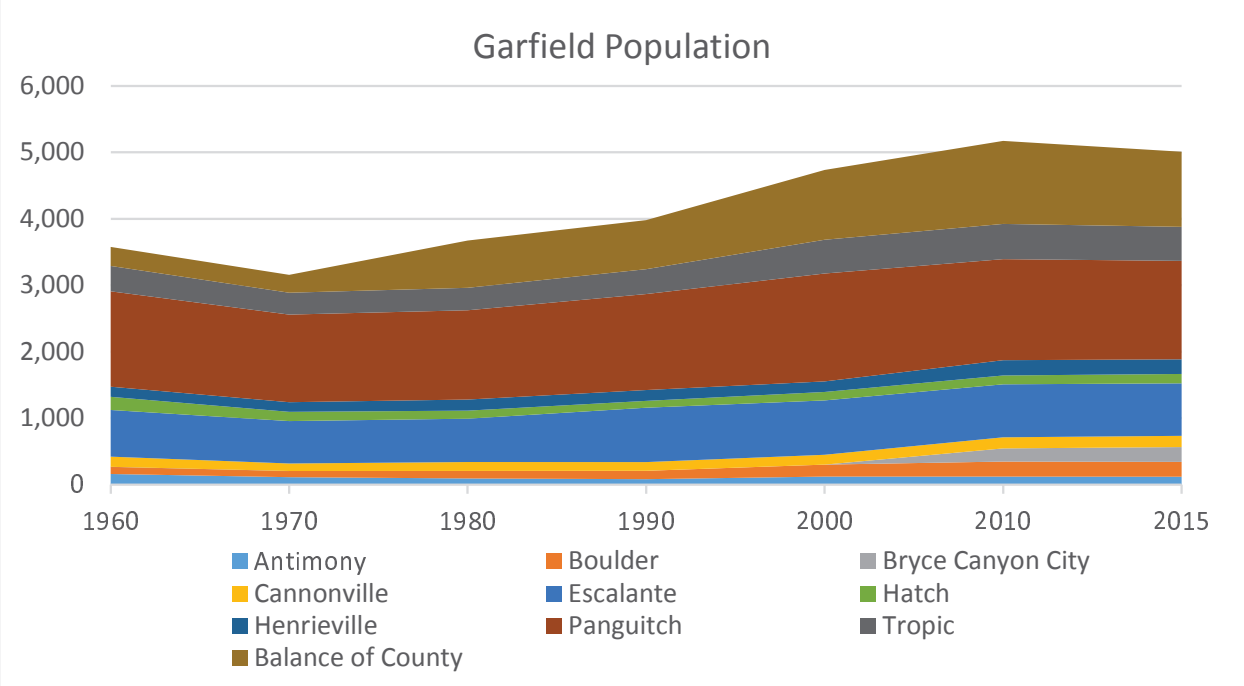
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Demographics

Garfield County is bordered on the west by Iron County, on the south by Kane County, on the north by Piute and Wayne counties, and the Colorado River defines the eastern border. Within Garfield County there are several state and federal highways, the most prominent being Federal Highway 89 and State Route SR-12. US-89 runs in north/south, and is located in the far western portion of the County. SR-12 begins at US-89 midway between Hatch and Panguitch, and runs east/southeast where it connects with SR-24 in Wayne County.

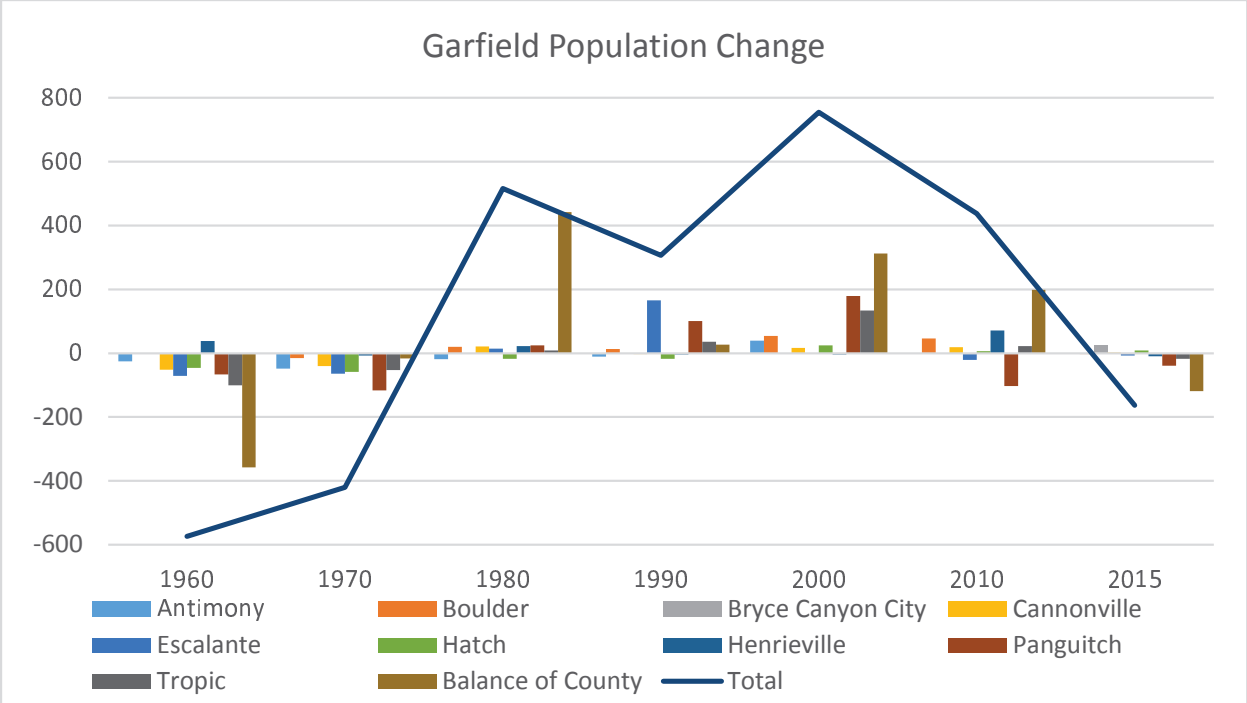
The reasons behind the regions growth are important, but the purpose for analyzing population in this document is to better inform decision makers about how many people could potentially be affected by a natural hazard.



Garfield Population by Incorporated Place							
City/Town	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2015**
Antimony	161	113	94	83	122	122	120
Boulder	108	93	113	126	180	226	223
Bryce Canyon City	na	na	na	na	na	198	223
Cannonville	153	113	134	131	148	167	169
Escalante	702	638	652	818	818	797	790
Hatch	198	139	121	103	127	133	141
Henrieville	152	145	167	163	159	230	220

Panguitch	1,435	1,318	1,343	1,444	1,623	1,520	1,481
Tropic	382	329	338	374	508	530	512
Balance of County	286	269	711	738	1,050	1,249	1,130
Total	**3,577**	**3,157**	**3,673**	**3,980**	**4,735**	**5,172**	**5,009**
na: City/Town not yet Incorporated							
Source: U.S. Census Bureau; Utah History Encyclopedia, Governor's Office of Management & Budget							

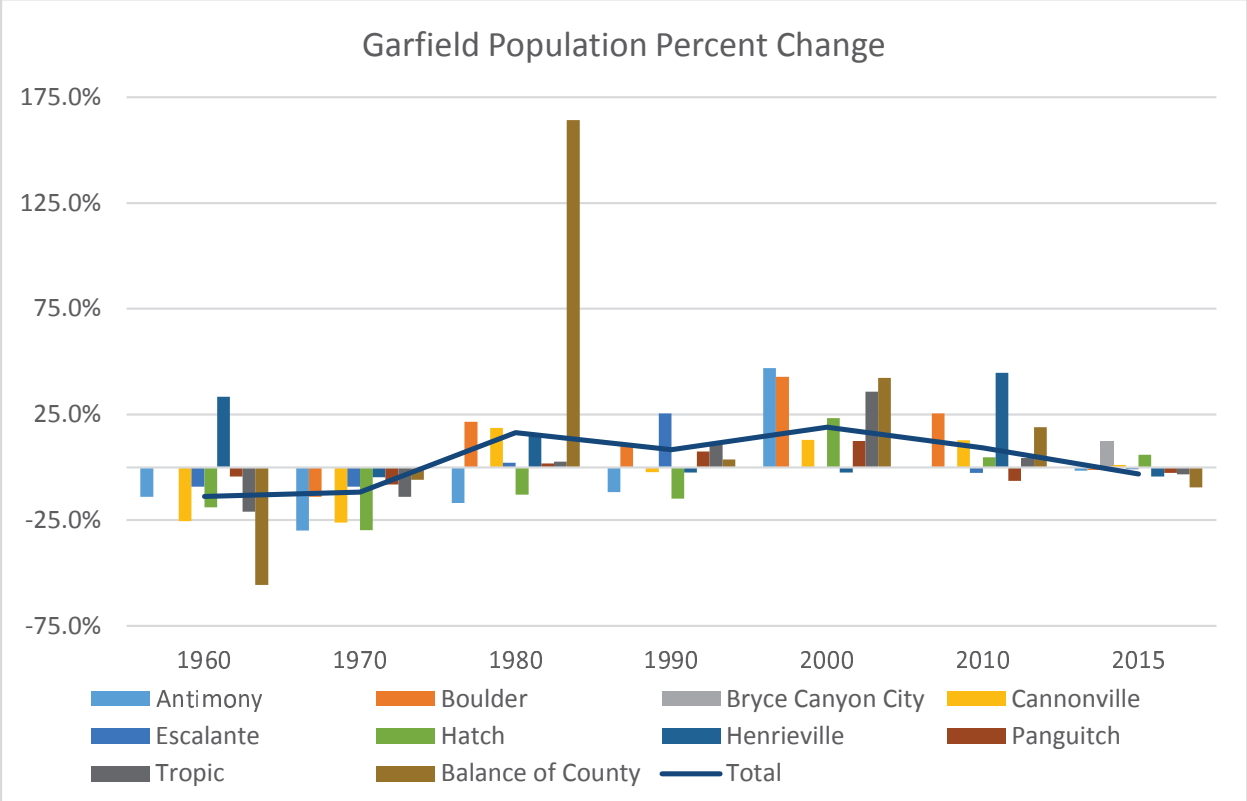
Panguitch and Escalante are the two largest municipalities in Garfield County, and another large portion of the county live outside of incorporated areas. Growth of Garfield County municipalities has fluctuated over the years, but the overall trend shows that the county has grown by 1,432 people since 1960.



Garfield Population Change							
City/Town	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2015**
Antimony	-26	-48	-19	-11	39	0	-2
Boulder	na	-15	20	13	54	46	-3
Bryce Canyon City	na	na	na	na	na	na	25
Cannonville	-52	-40	21	-3	17	19	2
Escalante	-71	-64	14	166	0	-21	-7
Hatch	-46	-59	-18	-18	24	6	8
Henrieville	38	-7	22	-4	-4	71	-10
Panguitch	-66	-117	25	101	179	-103	-39

Tropic	-101	-53	9	36	134	22	-18
Balance of County	-358	-17	442	27	312	199	-119
Total	-574	-420	516	307	755	437	-163
na: Not available							
Source: U.S. Census Bureau; Utah History Encyclopedia, Governor's Office of Management & Budget							

The majority of Garfield County lost population during the decades between 1950 and 1970 but saw significant growth between the decades of 1970 and 2010. 2015 population estimates show that the county is declining in population since 2010.



Garfield Population Percent Change							
City/Town	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2015**
Antimony	-13.9%	-29.8%	-16.8%	-11.7%	47.0%	0.0%	-1.6%
Boulder	na	-13.9%	21.5%	11.5%	42.9%	25.6%	-1.3%
Bryce Canyon City	na	na	na	na	na	na	12.6%
Cannonville	-25.4%	-26.1%	18.6%	-2.2%	13.0%	12.8%	1.2%
Escalante	-9.2%	-9.1%	2.2%	25.5%	0.0%	-2.6%	-0.9%
Hatch	-18.9%	-29.8%	-12.9%	-14.9%	23.3%	4.7%	6.0%
Henrieville	33.3%	-4.6%	15.2%	-2.4%	-2.5%	44.7%	-4.3%
Panguitch	-4.4%	-8.2%	1.9%	7.5%	12.4%	-6.3%	-2.6%

Tropic	-20.9%	-13.9%	2.7%	10.7%	35.8%	4.3%	-3.4%
Balance of County	-55.6%	-5.9%	164.3%	3.8%	42.3%	19.0%	-9.5%
Total	-13.8%	-11.7%	16.3%	8.4%	19.0%	9.2%	-3.2%
na: Not available							
Source: U.S. Census Bureau; Utah History Encyclopedia, Governor's Office of Management & Budget							

The percent of change is important to look at because it indicates what percent of the total population is increasing or decreasing. Between 2010 and 2015 Garfield County has decreased in population by 3.2%, this is a total of 163 people. The majority of this population was from the balance of county which accounted for 119 of the 163 people.

With approximately 1.5 million visitors per year, the daily number of tourists visiting Garfield County during the peak of tourist season is roughly the same as the county's full time population. That being said there are thousands more people at risk than this assessment addresses. In the event that a natural disaster is to affect access to Bryce Canyon or other attractions, there is a high potential for long term financial hardships. This would occur because many residents and communities in the county rely heavily upon the tourist industry.

The Garfield County General Plan stipulates, “The health, general welfare, and safety of County residents and visitors is one of the primary purposes for local land use plans. Because of this basis, the location and extent of potentially hazardous natural conditions will be identified and disclosed to present and future residents and visitors.” Growth as it relates to natural hazard conflicts is further managed through implementation of policy statements which discourage development within areas prone to natural hazards

GARFIELD COUNTY OVERVIEW

High wooded plateaus, fertile river valleys, rugged mountains, steep canyons, deserts, and red sandstone rock formations contribute to the varied landscape of Garfield County. A portion of the boundary that separates the Colorado Plateau and the Great Basin runs through the County. This geographic boundary enters the area at the Utah-Arizona border, south of Hurricane, and follows a north-easterly course to the Beaver-Millard County line. The northeast trending Hurricane Fault which passes through the area is the approximate break between the two provinces. Eastward from this boundary are found the high plateaus of Utah, which make up a portion of the Colorado Plateau. Westward lies the basin and range of western Utah. A portion of the Great Basin is characterized by elaborately faulted and folded strata, arranged as north to south trending ridges, generally less than 9,000 feet in elevation, separated by broad, semiarid valleys.

Elevations in Garfield County range from less than 5,000 feet to over 10,000 feet. This wide range of elevation influences the county’s climate. Annual precipitation shows a direct relationship to change in elevation, and ranges from less than 10” per year in the lower elevation to more than 20” a year in the higher elevations. Summers are characterized by hot, dry weather with average maximum temperatures of 100 degrees at lower elevations to temperatures in the 80’s at elevations above 6,000 feet. Winters are relatively severe due to the high mountain valleys.

The most striking characteristic of land ownership in Garfield County is the large percentage of government owned land. Only 4% of the land found within the County is privately owned. Parts of three national parks, a national recreation area, and national forest are found in the County. The largest category of land ownership is the national resource lands managed by the Bureau of Land Management.

The predominant use of private land in Garfield County is agriculture. Pasture and rangeland comprise the greatest portions of private agricultural land while irrigated croplands consist the smallest. Land which is considered urban or “built-up” (cities, towns, industrial sites, cemeteries, airports, golf courses, institutional and public administrative facilities, and roads) makes up one of the smallest portion of the County land area.

Problem Soils

HAZARD RISK ASSESSMENT

After reaching out to local governments, and several engineering and construction firms that deal directly with problem soils it is evident that very little data concerning structural damage due to problem soils is tracked recorded and/or reported.

Some mapping of problems soils have been done which helps to indicate where some problem soils lie. There is a chance that problem soils extend beyond the current engineering problem soils layer provided by the Utah Automated Geographic Reference Center. As for the data available, the table below lists the values of structures that lie within the problem soils areas for Garfield County.

Garfield County Problem Soils



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FCAOG and SUU GIS use information and data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended.
Map data was used from UTAH AGRC (Automated Geographic Refrence Center)
For specific data source information, please contact FCAOG.

Value of Structures at Risk - Problem Soils - Garfield County		
Structure Type	Market Value	Number of Structures
Residential	$29,195,700	285
Commercial	$6,035,685	27
Agriculture	$599,891	54
Total	$35,831,276	366
Source: Problem Soils-AGRC, Tax Data-Garfield County Tax Assessor, Analysis-SUU GIS Lab		

There is over $35 million of structures within the available hazardous soils map layer. This map is considered out dated, but it is currently the only hazardous soils map available for Garfield County. Because detailed soil studies have not been conducted throughout the entire county, one should not assume that problem soils do not exist beyond the extent of this maps soils layer.

SUMMARY

Due to a lack of record keeping there is an undetermined number of structures that have been negatively affected by problem soils within Garfield County. Detailed mapping of hazardous soils have not been produced within the county, and current analysis indicates 366 structures at risk of problem soils, valued at more than $35 million.

MITIGATION STRATEGY

Problem soils can pose a significant risk to the current/future built environment. Many of these risks can be dramatically reduced through proper assessment of the hazard and adherence to applicable mitigation measures. The mitigation strategies listed below identify cost effective measures that will yield measurable benefits toward reducing the risk of problem soils as they relate to the built environment. Further, these mitigation strategies include general actions that agencies are capable of implementing during the next five years, given their existing resources and authorities.

Garfield County Problem Soils Mitigation Strategy #1	
Objective:	Lessen the risk to buildings from problem soils.
Action:	**Action 1**-Address problem soils at the building/construction level by requiring all subdivision proposals to have a geotechnical report. **Action 2**-If jurisdiction does not have trained staff to review the geotechnical report, the jurisdiction can, upon request, have Utah Geological Survey (UGS) perform a review of the report.
Timeline:	Ongoing
Estimated Cost:	Variable
Possible Funding:	Private funds/ developer; Local government operating budget; Utah Geologic Survey operating budget.

Responsible Agencies:	Local, jurisdictional level; Utah Geological Survey
Plan Goals Addressed:	**Action 1**-Prevention, Property Protection **Action 2**-Partnership/Coordination, Prevention, Property Protection
Priority:	Low

Garfield County Problem Soils Mitigation Strategy #2	
Objective:	Lessen the risk to buildings from collapsible and expansive soils.
Action:	Through mapping, identify areas which contain collapsible and expansive soils. Require soils testing at the building/construction level and ensure that engineer's recommendations are followed.
Timeline:	Ongoing
Estimated Cost:	$1,000 to $8,000
Possible Funding:	Private funds/ developer; Local government operating budget.
Responsible Agencies:	Local, jurisdictional level.
Plan Goals Addressed:	Prevention, Property Protection
Priority:	Low

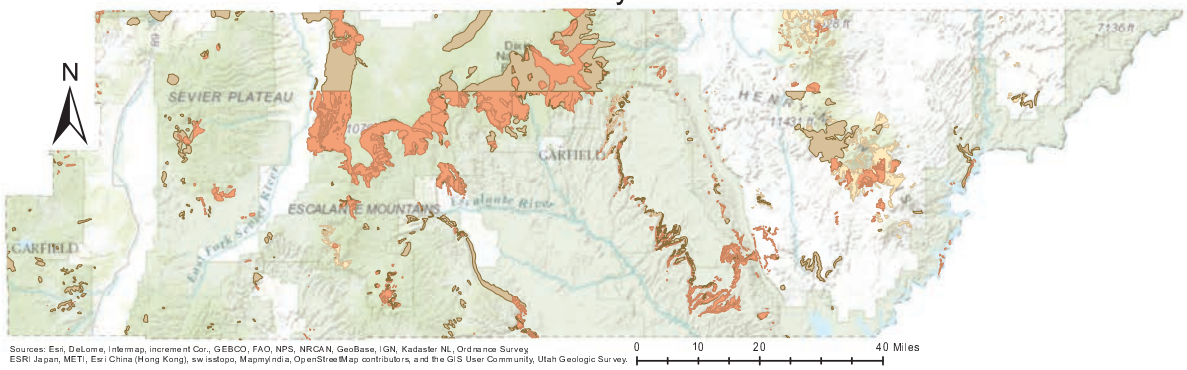
Landslide

HAZARD RISK ASSESSMENT

Landslides are prevalent anywhere there are steep and over steepened slopes, and Garfield County is no exception. Factors included in assessing the counties landslide risk include built property distribution in the hazard area, the frequency of landslide or debris flow occurrences, slope steepness, and soil characteristics. This type of analysis generates estimates of the damages to the county due to a landslide or debris flow event on the current built environment.

The Utah geologic Survey has mapped more than 1,800 historic and prehistoric landslides in the area, they are prominent in and around the Escalante, Boulder, and Henry Mountains, and Circle Cliffs.

Garfield County Landslides



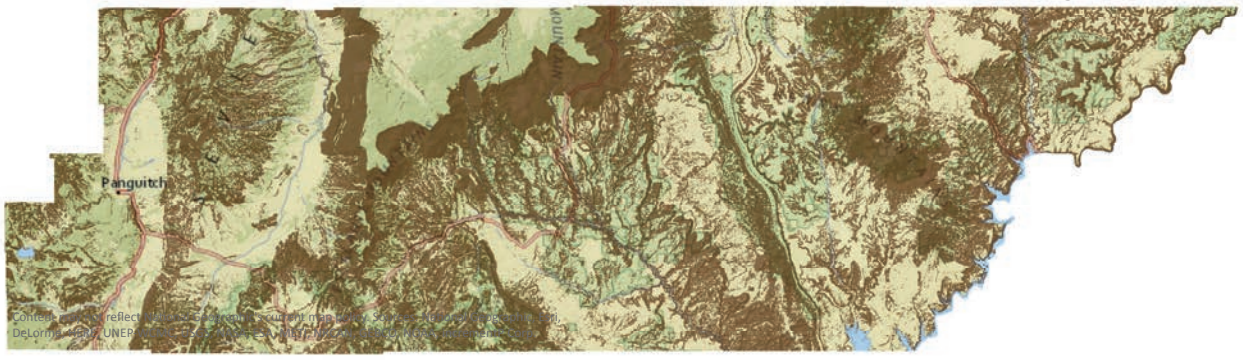
deep or unclassified landslide
landslide and/or landslide undifferentiated from talus, colluvial, rock-fall, glacial, and soil creep deposits
landslide undifferentiated from talus and/or colluvial deposits not classified
shallow landslide

Recording and archiving historic landslides in Utah is a feat that has not been thoroughly compiled into one place. Through the United States Geological Survey (USGS) and other state surveys, a landslide inventory pilot project was put together for several states including Utah for a period of time. Unfortunately the data was only gathered for landslides between 1850-1975 (See Table below). SHELDUS, USGS's Landslide Hazard Program, and NOAA's Storm Events Database are all places that have gathered data regarding recent landslides. Additional links are http://hvri.geog.sc.edu/SHELDUS/ and http://geology.utah.gov/

Garfield County Landslides 1850-1978				
Event Year	**Location**	**Landslide Type**	**Cause**	**Source number**
1940	Panguitch and Circleville	Debris flow	Natural	1
1943	Garfield or Kane	Rock slide	Natural	4
1983	Garfield County	Landslides	Not specified	SHELDUS
1984	Garfield County	Landslides	Not specified	SHELDUS
2011	Garfield County	NCDC_Landslides	Not specified	SHELDUS
Source: 1, 4 UGS newspaper reference number, see references & works cited page. & SHELDUS				

While there has likely been more landslide occurrences in Garfield County over the last 150 years than what is listed in the table above, many unseen and small landslides, or landslides far from communities go unreported. Knowing were landslides happen can help to keep people safe, but more importantly knowing the areas most susceptible to land sliding can keep people out of harm's way. Below is a map of landslide susceptibility in Garfield County.

Garfield County Landslide Susceptibility



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Factors included in assessing landslide risk include built property distribution in the hazard area, the frequency of landslide or debris flow occurrences, slope steepness, and soil characteristics. The Landslide Susceptibility map was created using landslide susceptibility data from the Utah Geological Survey (UGS) and overlaying it with landslide data from the UGS. Areas where landslides exist are often some of the most vulnerable areas for future landslides. The Value of Structures at Risk data was created by overlaying county tax assessor data with moderate to high susceptibility data.

Value of Structures at Risk - Landslide - Garfield County		
Type of Structure	**Market Value**	**Number of Structures**
Residential	$26,237,726	207
Commercial	$1,091,367	10
Agriculture	$1,134,480	53
Total	**$28,463,573**	**270**
Source: Landslide Potential-Utah Geological Survey, Values-Beaver Co. Tax Assessor, Analysis-SUU GIS Lab, Parcels-AGRC		

The current data shows 270 structures valued over $28 million within the medium to high landslide susceptibility areas. Due to the extent and age of this data geological studies should be conducted at the parcel level to determine risk for future development.

SUMMARY

Well over 1,000 landslides have been mapped in Garfield County, but very few historic landslides have been recorded. Despite the minimal amount of landslides that have occurred and/or have been recorded in the last 150 years, Garfield County is home to vast amounts of land that is susceptible to the hazard.

Over the last fifty years Garfield County has increased its population by less than 1,500 people, and in the last five years its population has decreased; despite little to no growth it is important that people are aware of the county's landslide risk, as it is pertinent to their safety.

MITIGATION STRATEGY

The mitigation strategies listed below identify cost effective measures that will yield measurable benefits toward reducing the risk of landslide hazards.

Boulder Landslide Mitigation Strategy #1	
Objective:	Prevent damage to property and environment from landslides through zoning and development standards.

Action:	Adopt a zoning ordinance that prohibits development sloped exceeding 30% average grade or on sensitive lands. Including the prevention of excavating or grading in areas of sensitive lands, hillside, and Mesa Tops Overlay District prior to final approval by the proper officer or body. Information will be required for development in areas of slope exceeding 15% average grade.
Timeline:	1 Year/Ongoing
Estimated Cost:	Unknown
Possible Funding:	Town Operating Budget
Responsible Agencies:	Boulder
Plan Goals Addressed:	Prevention, Property Protection, Environmental Protection
Priority:	High

Garfield County Landslide Mitigation Strategy #1	
Objective:	Increase the level of knowledge related to landslides.
Action:	Increase public education related to landslide hazards by distributing Utah Geological Survey (UGS) landslide informational brochures to local municipality level emergency management, engineering and planning departments.
Timeline:	Ongoing
Estimated Cost:	Very Minimal: request UGS to deliver brochures; and/or download brochures directly from: http://geology.utah.gov
Possible Funding:	Local, jurisdictional level.
Responsible Agencies:	Local, jurisdictional level.
Plan Goals Addressed:	Education/Outreach, Emergency Services, Partnership/ Coordination, Prevention
Priority:	Medium

Garfield County Landslide Mitigation Strategy #2	
Objective:	Minimize future landslide damage in the unincorporated County.
Action:	Drafting/updating zoning and/or landslide ordinances to prevent development of structures near debris flows, landslides, and rock fall areas.
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	Local government operating budget; State and Federal planning grant programs.
Responsible Agencies:	Local government
Plan Goals Addressed:	Prevention, Property Protection
Priority:	Medium

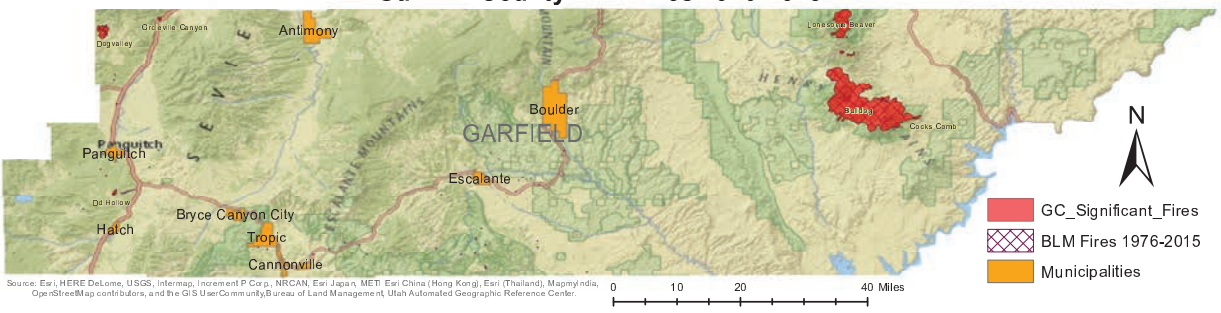
Garfield County Landslide Mitigation Strategy #3	
Objective:	To reduce landslide risk as it relates to the built environment.
Action:	**Action 1**-Address landslide risk at the building/construction level by requiring all subdivision proposals to have a geotechnical report. **Action 2**-If jurisdiction does not have trained staff to review the geotechnical report, the jurisdiction can, upon request, have Utah Geological Survey (UGS) perform a review of the report.
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	Private funds/ developer; Local government operating budget; Utah Geologic Survey operating budget.
Responsible Agencies:	Local, jurisdictional level; Utah Geological Survey
Plan Goals Addressed:	**Action 1**-Prevention, Property Protection **Action 2**-Education/Outreach, Emergency Services, Environmental Protection, Partnership/Coordination
Priority:	High

Wildfire

HAZARD RISK ASSESSMENT

Garfield County has had hundreds of wildfires over the last 39 years, ranging in size from a fraction of an acre to over 40,000 acres. The majority or the fires burned only a few acres or less, but these fires have the potential to be a threat to the county's population.

Garfield County BLM Fires 1976-2015



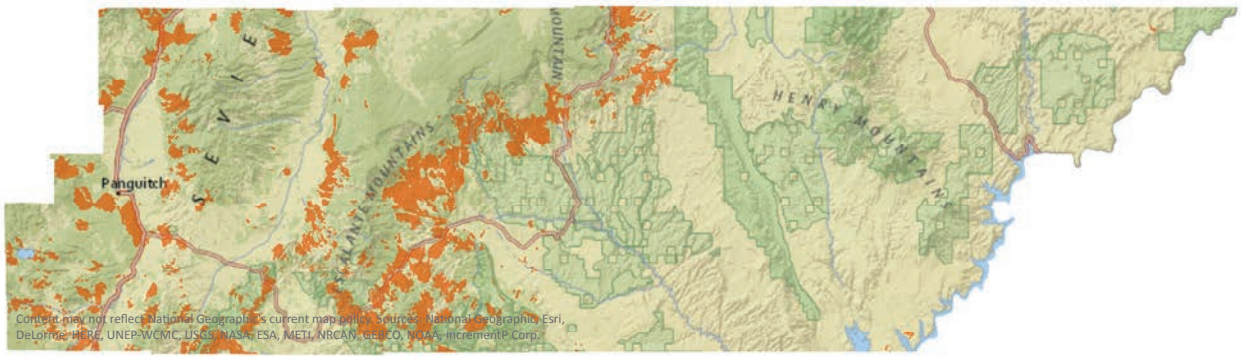
There are many other agencies involved with wildfire that should not be disregarded because they have not been reported in this section. The tables and maps are designed to inform people that fires are a real threat and this map and table should and not be used as a complete history of wildfires in the area.

Significant BLM Wildland Fires 1976-2015 - Garfield County			
Fire Name	**Year**	**Acres**	**Other Counties Effected**
Bulldog	2003	31,726	none
Lonesome Beaver	2003	4,171	none
Dogvalley	1999	1,204	none
Cocks Comb	2006	160	none
Dd Hollow	1996	131	none
Circleville Canyon	2012	93	none
Source: Bureau of Land Management			

One of the larger fires in the county burned 31,729 acres just 17 miles north of Ticaboo. The Deseret News reported that two old uninhabited mining cabins burned down, and several structures were at risk.

The following provides a summarization of Fire threat in Garfield County. Fire threat is the likely hood of an acre burning.

Garfield County Fire Threat



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0 5 10 20 30 Miles

Fire Threat
Moderate-High

N

Value of Structures at Risk - Wildfire - Garfield County		
Type of Structure	**Market Value**	**Number of Structures**
Residential	$74,196,098	608
Commercial	$7,710,030	30
Agriculture	$864,104	51
Total	$82,770,232	689
Source: Utah Department of Natural Resources, Garfield County Tax Assessor, SUU GIS Lab		

The analysis of structures at risk is defined by how many structures are within the medium to extreme fire threat boundary.

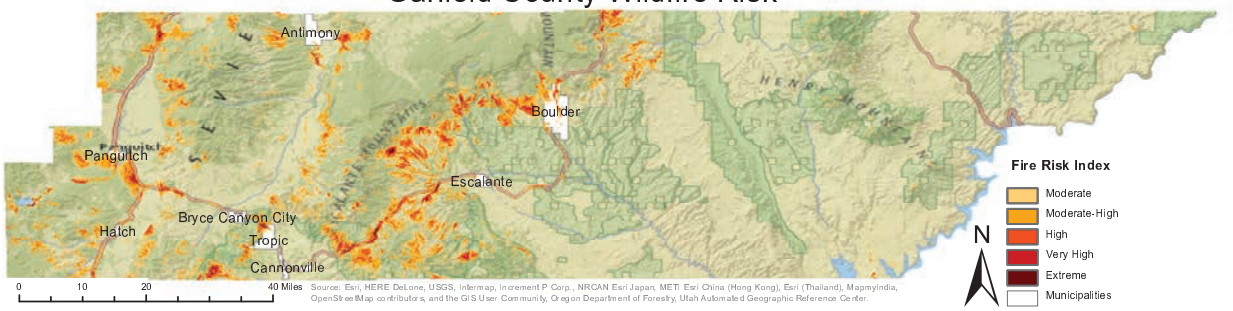
In addition to structures located within a defined hazard area, there is also an overwhelming amount (in terms of quantity and value) of infrastructure that is not captured by this analysis. This is in large part due to the fact that compilation of this data would be exhaustive; nevertheless, the following provides a brief summarization of additional infrastructure at risk from wildfire.

Infrastructure at Risk - Garfield County	
Infrastructure	**Miles**
Major Roads	371
Rail	0
Transmission Lines	279.4
Source: Utah AGRC	

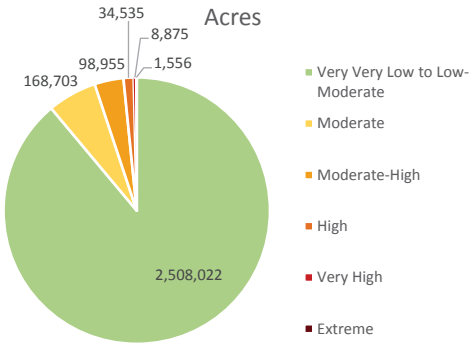
Miles of major roads were calculated using road centerline data. The road data used for the Major roads analysis include: Interstates; US Highway, Separated; US Highway, Unseparated; Major State; Highway, Separated; Major State Highway, Unseparated; Other State Highway, (Institutional); Ramps, Collectors; and Major Local Roads, Paved

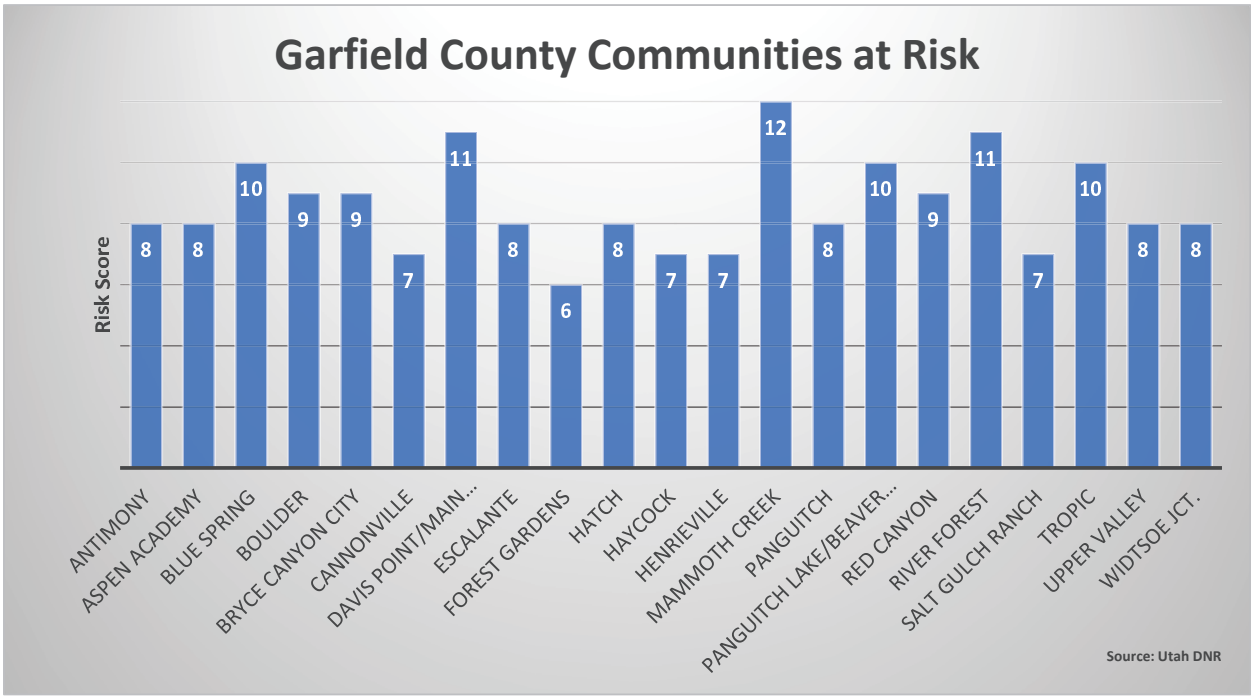
The following provides a summarization of fire risk in Beaver County. Fire risk "represents the possibility of loss or harm occurring from a wildfire." (Oregon Department of Forestry) The county risk assessment values are based on suppression difficulty, wildland development areas, forest assets, riparian assets, drinking water importance areas (watersheds), and infrastructure assets.

Garfield County Wildfire Risk



Because Panguitch houses a large percent of the county's population and a large portion of infrastructure it is natural that risk is high in this area. However, the Escalante Mountains also contain many acres of medium to extreme risk areas because they contribute to the Drinking Water Importance Areas and have nearly 200,000 acres of fire sensitive Forest Assets.





Each community's risk in the county was determined using four categories, each category received a score between one and three, one being the lowest risk and three being the highest. When the scores are added together the minimum a community can receive is a three while the maximum score is twelve. The categories are Fire Occurrence, Fuel Hazards, Values Protected, and Fire Protection Capability.

SUMMARY

Hundreds of wildfires have occurred in Garfield County since 1976, including some fires burning thousands of acres. Wildfire is a pervasive threat to the majority of the communities is Garfield County, putting nearly 700 structures and hundreds of miles of roadways and transmission lines at risk. Other assets at risk include wildland development areas, forest assets, riparian assets, and drinking water importance areas. There are currently 21 communities at risk from wild fire, some of which are at extreme risk.

MITIGATION STRATEGY

Bryce Canyon City Wildfire Mitigation Strategy #1	
Objective:	The potential spread of wildfire in to Bryce Canyon City.
Action:	Mechanical thinning and cleanup of fuels on wildland interface areas along boundaries of City
Timeline:	Ongoing mitigation each year
Estimated Cost:	$1 – $1.5 million
Possible Funding:	United States Forest Service

Responsible Agencies:	Bryce Canyon City / Bryce Canyon City Fire Department
Plan Goals Addressed:	Property Protection, Prevention, Resident's and guest's protection
Priority:	High

Boulder Wildfire Mitigation Strategy #1	
Objective:	Educate property owners and citizens about actions that they can take to reduce risk to property, and the risks of wildfire.
Action:	Organize the local Fire Academy to inform residents of wildfire danger, and educate citizens about fire mitigation systems, defensible spaces, etc. Hand out fire safety materials. The town will also keep hydrants clear of weeks and debris.
Timeline:	Ongoing/Annual
Estimated Cost:	Unknown
Possible Funding:	Town Operating Budget
Responsible Agencies:	Boulder
Plan Goals Addressed:	Education/Outreach, Partnership/Coordination, Property Protection
Priority:	High

Garfield County Wildfire Mitigation Strategy #1	
Objective:	Promote public awareness campaign for property owners living in Wildland-Urban Interface areas.
Action:	Mailings; Printed Information; Public Service Announcements;
Timeline:	Ongoing
Estimated Cost:	Unknown
Possible Funding:	State and Federal wildfire grant programs, Special Service Districts, Home Owners Associations
Responsible Agencies:	State and Federal government
Plan Goals Addressed:	Education/Outreach, Partnership/Coordination, Prevention, Property Protection
Priority:	High

Garfield County Wildfire Mitigation Strategy #2	
Objective:	Fuels reduction and defensible space tactics.

Action:	**Action 1**-Continue to place strategic fuel breaks throughout the focus area. **Action 2**-Encourage landowner mitigation and defensible space work. **Action 3**-Compliment fuels reduction work being done by the Park Service and Forest Service onto private lands. **Action 4**-Prevent fires on private lands which may spread onto federal lands.
Timeline:	Ongoing
Estimated Cost:	Unknown
Possible Funding:	State and federal loans and grants as available
Responsible Agencies:	Community & local government entities (Bryce Canyon City); private property owner
Plan Goals Addressed:	**Action 1**-Emergency Services, Environmental Protection, Prevention, Property Protection, **Action 2**-Education/Outreach, Emergency Services, Partnership/Coordination, Prevention, Property Protection **Action 3**-Emergency Services, Partnership/Coordination, Prevention, Property Protection **Action 4**-Emergency Services, Partnership/Coordination, Prevention, Property Protection
Priority:	High

Garfield County Wildfire Mitigation Strategy #3	
Objective:	Wildfire prevention through proper training and equipment so fire departments can respond and put out small fires before they become catastrophic.
Action:	Enhance existing wildfire training programs, equipment procurement, and firefighting resources for wildfire suppression.
Timeline:	Ongoing
Estimated Cost:	Unknown
Possible Funding:	State CIB funding; Federal wildfire grant programs, local governments.
Responsible Agencies:	Federal Government
Plan Goals Addressed:	Emergency Services, Partnership/Coordination, Prevention, Property Protection
Priority:	High

Garfield County Wildfire Mitigation Strategy #4	
Objective:	Minimize fire in the Wildland-Urban Interface.

Action:	**Action 1**-Optimize the Wildland-Urban Interface Program **Action 2**-Forest Health through Harvesting timber **Action 3**-BLM & Pinion/Juniper Conditioning
Timeline:	Unknown
Estimated Cost:	Unknown
Possible Funding:	Federal and State funds as available
Responsible Agencies:	Federal and State Governments
Plan Goals Addressed:	**Action 1,2, & 3**-Environmental Protection, Prevention, Property Protection, Education Outreach, Partnership/Coordination
Priority:	High



Flood

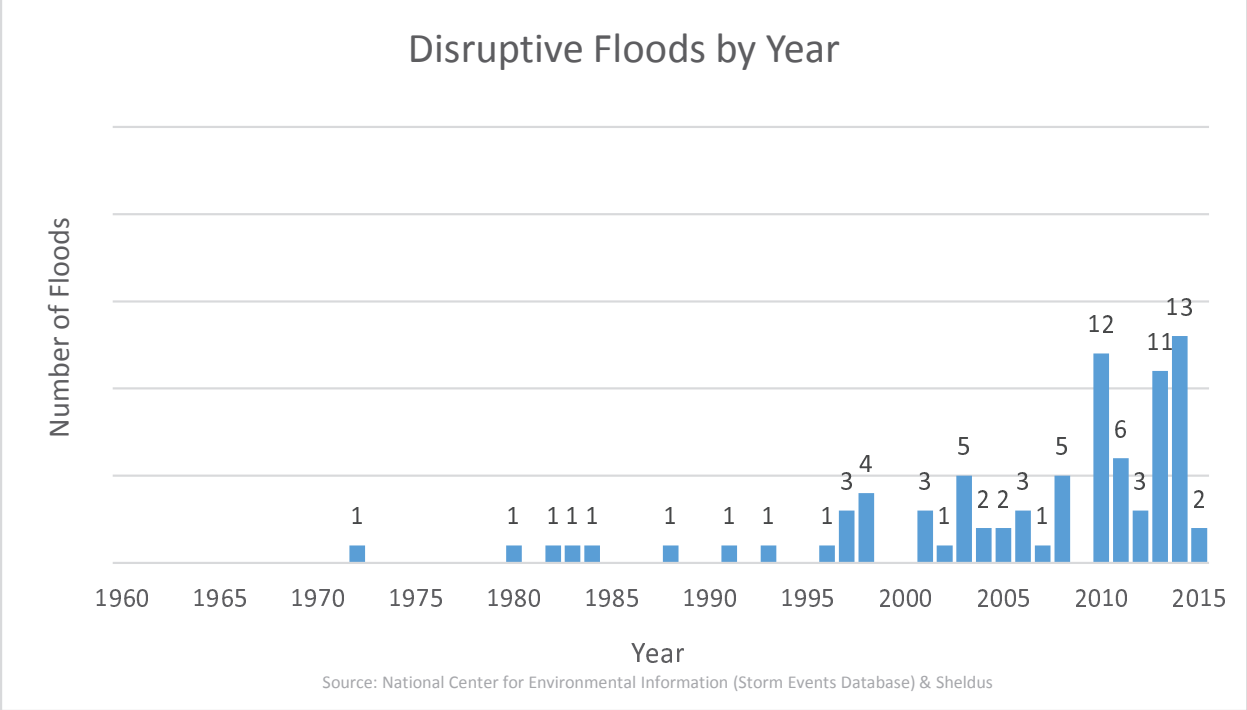
HAZARD RISK ASSESSMENT

Since 1960 there have been nearly 100 flooding events in Garfield County recorded by the National Centers for Environmental Information's Storm Events Database and the Spatial Hazard Events and Losses Database for the United States (SHELDUS). This only accounts for a portion of flooding throughout the county as floods go unreported every year. The following table lists some of the most significant floods with quantitative values associated with the event. The list is in a numerical descending order with deaths and injuries listed as the most significant followed by property damage and crop damage.

Significant Floods - 1960-2015 - Garfield County						
LOCATION	**BEGIN DATE**	**EVENT TYPE**	**DEATHS**	**INJURIES**	**ESTIMATED PROPERTY DAMAGE**	**ESTIMATED CROP DAMAGE**
Glen Canyon	9/10/2008	Flash Flood	2	2	$0	$0
Kodachrome Basin State Park	9/27/2014	Flash Flood	0	2	$50,000	$0
Tropic	8/23/2003	Flash Flood	0	0	$600,000	$50,000
Bryce Canyon Area/ Widtsoe/Grandstaircase /Hole-In-The-Rock/etc.	9/10/2013	Flood	0	0	$300,000	$0



Escalante River	8/26/1996	Flash Flood	0	0	$100,000	$0
Tropic/Paria River	7/20/2010	Flash Flood	0	0	$50,000	$0
Hatch	6/17/2011	Flood	0	0	$50,000	$0
Henrieville/Paria River	9/15/1997	Flash Flood	0	0	$30,000	$0
Orton/Panguitch	9/2/2013	Flash Flood	0	0	$30,000	$0
Bullfrog/GlenCanyon/SR 95 Marker 31	9/14/2013	Flash Flood	0	0	$30,000	$0
SR 12/between Henrieville & Escalante	8/24/1998	Flash Flood	0	0	$20,000	$3,000
Source: NOAA-National Centers for Environmental Information (Storm Events Database)						



The number of disruptive floods have increased significantly after the early 90's. The data provided does not indicate why this is occurring. To prevent speculation a study should be conducted to understand why the number of recorded disruptive flooding events are escalating.

The following map depicts FEMA's 100 year flood plain in Garfield County.

Garfield County Floodzones



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Map data was used from UTAH AGRC (Automated Geographic Refrence Center) Quaternary Faults layer
For specific data source information, please contact FCAOG.

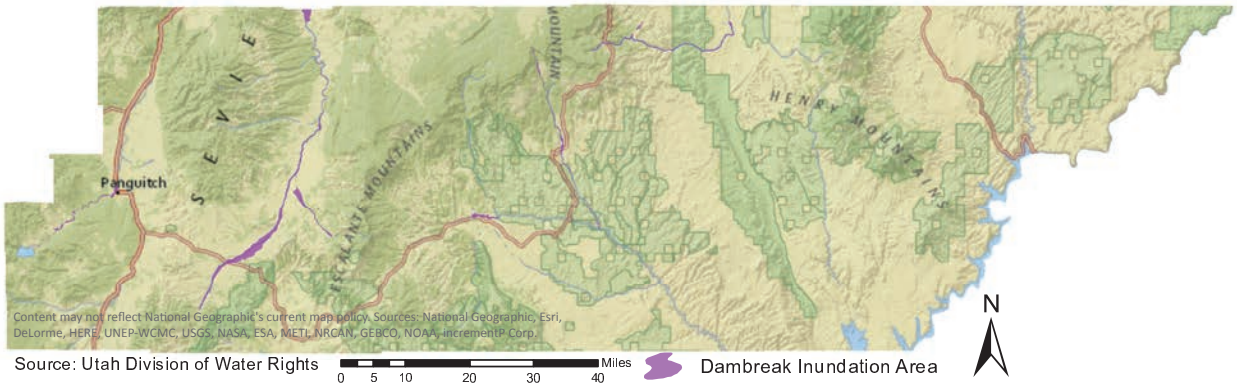
The following provides an analysis of structures at risk based on the FEMA 100 year floodplain.

Value of Structures at Risk - Flood - Garfield County		
Structure Type	**Market Value**	**Number of Structures**
Residential	$37,465,708	405
Commercial	$8,468,743	35
Agriculture	$1,061,253	116
Total	$46,995,704	556
Source:		

Dam failure has the potential to cause significant flooding and damage to communities downstream. The Utah Division of Water Rights and the state engineer list the dam hazard ranking to help communities understand the risk of dam failure inundation. The Hazard classification of dam risk is determined by the threat to human life and property damage in the event that a dam fails. The hazard ratings of inspected dams are listed on the following table.

Garfield County Dam Hazard Classification			
Dam Name	**Hazard**	**Dam Name**	**Hazard**
OAK CREEK (A.K.A. UPPER BOWNS)	HIGH	NORTH CREEK	MOD
PANGUITCH LAKE	HIGH	PACER LAKE	MOD
TROPIC	HIGH	PINE LAKE	MOD
BOWNS (LOWER)	MOD	SPECTACLE LAKE	MOD
JACOBS VALLEY	MOD		
Source: Utah Division of Water Rights-Dam Safety Database Information Viewer			

Garfield County Dam Break Inundation Areas



The mapped dam break inundation areas occur through much of unincorporated county and cut through portions of Panguitch, Antimony, Escalante, and Boulder.

There are NO FEMA REPETITIVE FLOOD CLAIMS in Garfield County.

Communities Participating in the National Flood Insurance Program (FEMA)				
Community	**Initial FHBM Identified**	**Initial FIRM Identified**	**Current Effective Map Date**	**Reg-Emerg Date**
Escalante	8/9/1974	8/28/1979	8/28/1979(M)	8/28/1979
Garfield County	1/10/1978	8/5/1986	8/5/1986(M)	7/24/1979
Hatch	2/7/1975	7/24/1979	7/24/1979(M)	12/4/1979
Henrieville	2/7/1975	9/25/1979	9/28/1979(M)	9/25/1979
Panguitch	6/28/1974	8/28/1979	8/28/1979(M)	8/28/1979
Tropic	2/7/1975	12/4/1979	7/24/1979(M)	12/4/1979
FIRM - Flood Insurance Rate Map FHBM - Flood Hazard Boundary Map		(M) - No Elevation Determined Zones A,C,X NSFHA - No Special Flood Hazard Area, Zone C		
Source: FEMA National Flood Insurance Program Community Status Book Feb/2016				

Antimony is not participating in the National Flood Insurance Program, and Boulder, Bryce Canyon City, and Cannonville are not listed in either category.

The following is a list of historical claims through FEMA's National Flood Insurance Program.

(Claims) FEMA Loss Statistics from Jan 1/1978 through Nov/30/2015 - Garfield County					
Community Name	**Total Losses**	**Closed Losses**	**Open Losses**	**CWOP Losses**	**Total Payments**
Garfield County	1	1	0	0	$3,626.63
Total	**1**	**1**	**0**	**0**	**$3,626.63**

Total Losses - All losses submitted regardless of the status. Closed Losses - Losees that have been paid. Open Losses - Losses that have not been paid. CWOP Losses - Losses that have been closed without payment. Total Payments - Total amount paid on losses.
Source: FEMA Policy and Claim Statistics for Flood Insurance

SUMMARY

Over eighty floods have been recorded in Garfield County with many more going unrecorded. The recorded data indicates that at least 2 people have died, 4 people were injured, and hundreds of thousands of dollars in property damage.

FEMA 100 year flood areas are mapped along waterways in and near most of the towns and cities in Garfield County. Other flood ways include dam inundation zones which run through Panguitch, Escalante, Antimony, Boulder, and elsewhere in unincorporated county. There is currently over $46 million of structures in the 100 year floodplains.

There are no FEMA repetitive flood claims in the county and the communities participating in the National Flood Insurance Program are Escalante, Garfield County, Hatch, Henrieville, Panguitch, and Tropic. Since 1978 there has been one FEMA flood claim valued at $3,626.

MITIGATION STRATEGY

Antimony Flood Mitigation Strategy #1	
Objective:	Prevent snow melt and high intensity precipitation events from flooding property, and roads, and to protect nearby water lines.
Action:	Routinely clearing debris and sediment build-up from washes and creeks
Timeline:	Annual
Estimated Cost:	Unknown
Possible Funding:	Town Operating Budget
Responsible Agencies:	Antimony
Plan Goals Addressed:	Prevention, Property Protection, Environmental Protection
Priority:	High

Escalante Flood Mitigation Strategy #1	
Objective:	Prevent high intensity precipitation events from flooding property in town.
Action:	Construct proper drainage as addressed in the Storm Water Master plan to prevent flood damage to property.
Timeline:	Phased out over 10 years.
Estimated Cost:	$800,000-$1 million

Possible Funding:	Local Government Operating budget, CIB, CDBG, FEMA
Responsible Agencies:	Escalante
Plan Goals Addressed:	Property Protection, Environmental Protection, Prevention
Priority:	High

Hatch Flood Mitigation Strategy #1	
Objective:	Prevent snow melt and high intensity precipitation events from flooding property, and roads.
Action:	Perform regular drainage system maintenance, such as sediment and debris clearance from culverts.
Timeline:	Annual
Estimated Cost:	Unknown
Possible Funding:	Town Operating Budget
Responsible Agencies:	Hatch
Plan Goals Addressed:	Prevention, Property Protection, Environmental Protection
Priority:	High

Hatch Flood Mitigation Strategy #1	
Objective:	Prevent flooding and property damage to homes and businesses in Hatch during high precipitation events.
Action:	Construct flood control measures that are addressed in the town drainage study. Specifically curb and gutter to prevent flooding during high precipitation events.
Timeline:	5 Years
Estimated Cost:	$408,000
Possible Funding:	Hatch, FEMA, CIB, CDBG
Responsible Agencies:	Hatch
Plan Goals Addressed:	Prevention, Property Protection, Environmental Protection
Priority:	High

Panguitch Wildfire Mitigation Strategy #1	
Objective:	Reduce flood damage to homes and property at the community level.
Action:	Reduce flood risk by clearing debris and other material form all waterways
Timeline:	Annually
Estimated Cost:	Minimal
Possible Funding:	Municipality operating budget
Responsible Agencies:	Panguitch City



Plan Goals Addressed:	Property Protection, Prevention
Priority:	High

Tropic Flood Mitigation Strategy #1	
Objective:	Prevent flooding problems throughout Tropic during high intensity storms.
Action:	Construct proper drainage as addressed in the Storm Water Master plan to prevent flood damage to property.
Timeline:	Phased out as funding becomes available
Estimated Cost:	$335,307
Possible Funding:	DWQ, RDA, CIB, CDBG, HMGP
Responsible Agencies:	Town of Tropic
Plan Goals Addressed:	Property Protection, Environmental Protection, Prevention
Priority:	High

Garfield County Flood Mitigation Strategy #1	
Objective:	Minimize future flood damage in the county.
Action:	Nonstructural measures appear to be the most prudent option for the county to implement. Zoning to prevent development of structures near all rivers, creeks, and lakes (100' min. setback).
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	Local government operating budget; State and Federal flood and planning grant programs
Responsible Agencies:	Local government
Plan Goals Addressed:	Emergency Services, Partnership/Coordination, Property Protection
Priority:	High

Garfield County Flood Mitigation Strategy #2	
Objective:	To reduce flooding risk as it relates to the built environment.
Action:	Address flood control by requiring subdivision proposals to have a storm water drainage system on case by case basis.
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	Private funds/ developer.
Responsible Agencies:	Local (Garfield County, Antimony Town, Boulder Town, Town of Cannonville, Escalante City, Town of Hatch, Town of Henrieville, Panguitch City, Town of Tropic), jurisdictional level.
Plan Goals Addressed:	Environmental Protection, Prevention, Property Protection

Priority:	High

Garfield County Flood Mitigation Strategy #3	
Objective:	To reduce flooding risk at the community level.
Action:	Clear debris and other material from all waterways.
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	Related public/private property owners.
Responsible Agencies:	Private property owners, irrigation companies, local jurisdictions.
Plan Goals Addressed:	Environmental Protection, Prevention, Property Protection
Priority:	High

Garfield County Flood Mitigation Strategy #4	
Objective:	Flood mitigation along the Paria River between Bryce Canyon and the Garfield/Kane County border.
Action:	Construct flood mitigation improvements to prevent disruptive flooding.
Timeline:	Unknown
Estimated Cost:	Unknown
Possible Funding:	Local, State, and Federal funds as available.
Responsible Agencies:	Local, State, and Federal Governments.
Plan Goals Addressed:	Environmental Protection, Prevention, Property Protection, Partnership/Coordination
Priority:	High

Garfield County Flood Mitigation Strategy #5	
Objective:	Improve flood plain management activities by exceeding the minimum Nation Flood Insurance Program standards. Decrease flood insurance Rates.
Action:	Voluntarily participate in the FEMA Community Rating system which will help to keep communities more safe, reduce flood insurance rates, and improve flood plain management activities.
Timeline:	Ongoing
Estimated Cost:	Variable
Possible Funding:	Local, State, and Federal Funding Sources
Responsible Agencies:	Local Government
Plan Goals Addressed:	Environmental Protection, Partnership/Coordination, Prevention, Property Protection
Priority:	High

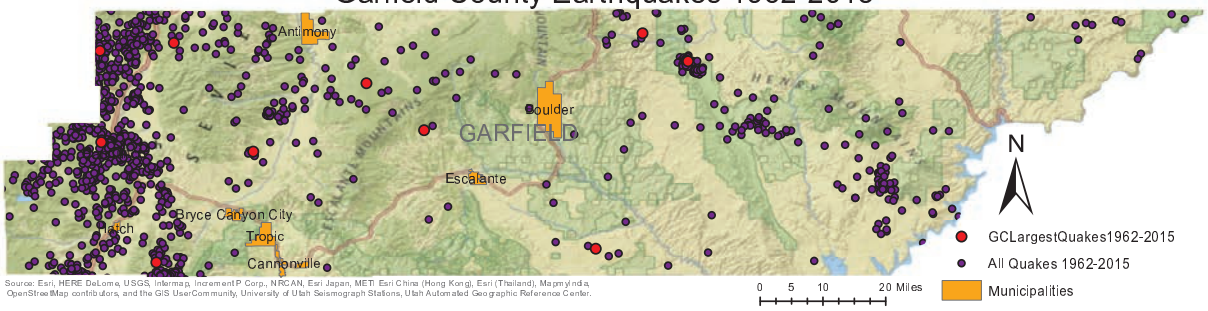


Earthquake

HAZARD RISK ASSESSMENT

An Earthquake releases built up energy when blocks of earth slip past each other. Earthquakes are a frequent occurrence in Garfield County but are rarely large enough to be felt. Between 1962-2015 more than 1,000 earthquakes have transpired in the County. While several of those have been large enough to cause some disturbance, none of the cataloged earthquakes had reports of severe damage. Despite the lack of significant events in recent years there is still potential for a disastrous quake.

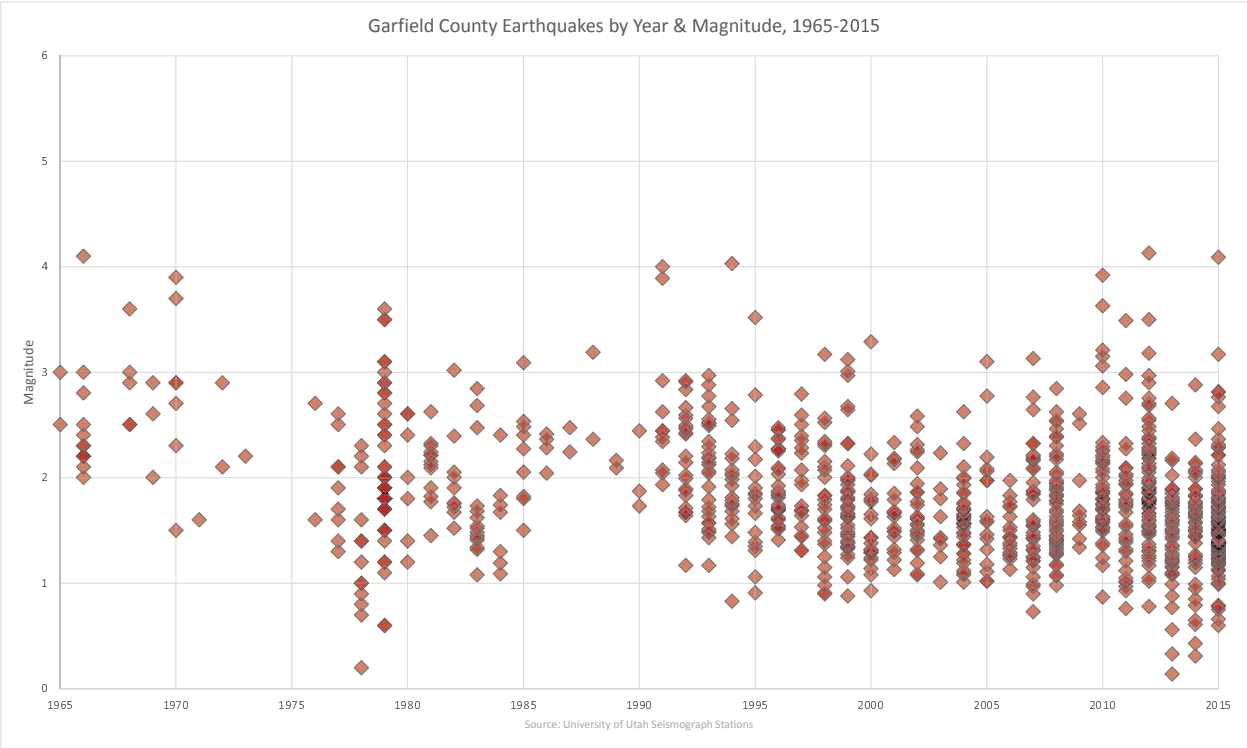
Garfield County Earthquakes 1962-2015



Greatest Earthquakes 1962-2015 - Garfield County		
Date	**Magnitude**	**Location**
9/30/1963	4.3	14 mi. Northeast of Boulder
4/12/2012	4.13	9 mi. North of Bryce Canyon City
5/20/1966	4.1	8.6 mi. Southeast of Antimony
7/4/2015	4.09	1.5 mi. Northwest of Panguitch
9/6/1994	4.03	16.3 mi. West of Antimony
1/26/1991	4	17.2 mi. Southeast of Escalante
4/14/2010	3.92	16.7 mi. East-Northeast of Boulder
5/23/1970	3.9	15.1 mi. North-Northwest of Panguitch
12/21/1991	3.89	6.8 mi. Southeast of Hatch
4/18/1970	3.7	8.9 mi. Northwest of Escalante

Source: Utah Seismograph Stations/University of Utah, Earthquakes measured using Local Magnitude (ML)

The majority of earthquakes in Garfield County occur right around and to the north of Panguitch. The majority of these quakes are quite small with a median magnitude of 1.7. There have been about twenty five earthquakes large enough to be felt, and with the exception of a disruption at a children's bike parade, very little information has been reported on these quakes.



*The increasing number of earthquakes by year is likely contributed to more seismograph stations and equipment advances.

Earthquakes are not a predictable hazard. However, Geologic study of the recent geologic past can help reveal what can be expected for the future. The Charts provided depicting recent historical quakes are not intended to indicate the cycle of regional earthquakes and what to expect, but rather, to display that earthquakes are and will continue to be real threat.

Garfield County Quaternary Faults



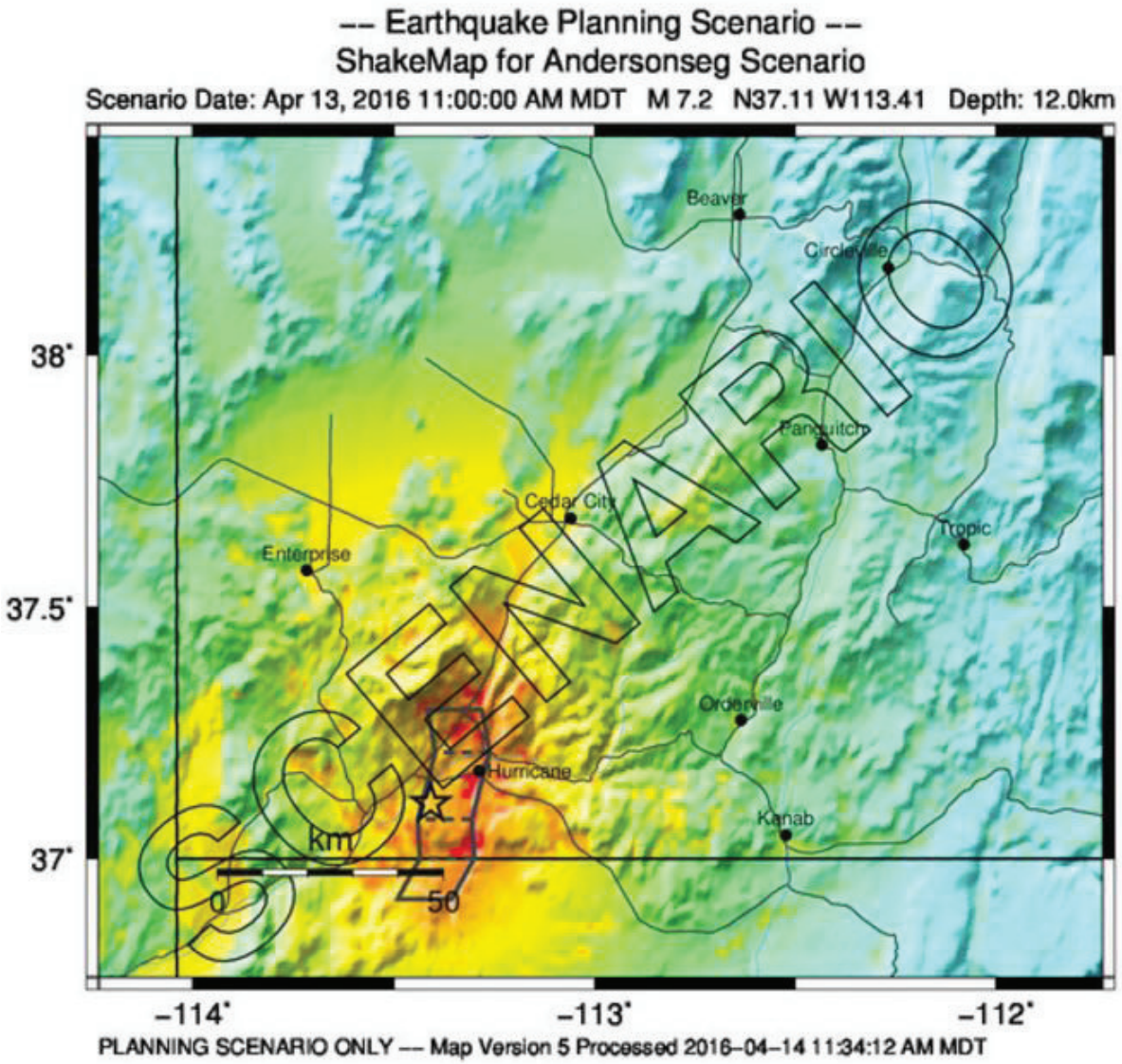
Five County Association of Goverments June 2016 Southern Utah University
FCAOG and SUU GIS use information and data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended.
Map data was used from UTAH AGRC (Automated Geographic Refrence Center) Quaternary Faults layer
For specific data source information, please contact FCAOG.

0 5 10 20 30 Miles

QuaternaryFaults

The previous mitigation plan included an analysis for all structures within 1,000 feet of a fault. The problem with this type of analysis that it only accounts for structures within this boundary. ShakeMap scenarios account for ground movement providing a more realistic scenario and analysis of structural damage.

Due to time and resource constraints only one shake map was produced. Because of these limitations the scenario with the fault segment able to produce the largest earthquake near the largest population was selected. In this scenario it is the Anderson Segment of the Hurricane Fault. It is the intent that future mitigations plans will include a ShakeMap scenario specific to Garfield County. In the scenario light shaking will be felt as far north as Circleville and the possibility moderate shaking in Panguitch.



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	*<0.1*	*0.5*	*2.4*	*6.7*	*13*	24	44	83	>156
PEAK VEL.(cm/s)	<0.07	0.4	1.9	5.8	*11*	*22*	*43*	*83*	*>160*
INSTRUMENTAL INTENSITY	I	II–III	IV	V	VI	VII	VIII	IX	X+

Scale based upon Wald, et al.; 1999

SUMMARY

Garfield County is a geologically active county with over 1,000 earthquakes occurring since 1962. Only about twenty five of the quakes have been large enough to be felt. The majority of the earthquake are clustered around Panguitch and as far north as Circleville. There is currently no ShakeMap for Garfield County, but the current scenario shows a possibility of very light potential damage as far north as Panguitch.

MITIGATION STRATEGY

Earthquake mitigation strategies include general mitigation actions that agencies are capable of implementing during the next five years, given their existing resources and authorities. In addition to the earthquake mitigation strategies provided herewith, this Natural Hazard Mitigation Plan endorses any seismic mitigation proffered by the Utah Seismic Safety Commission. In particular, numerous and varied earthquake mitigation strategies are provided in *A Strategic Plan for Earthquake Safety in Utah (January, 1995)* completed by the Utah Seismic Safety Commission. It is highly recommended that jurisdictions whom desire to provide more specific earthquake mitigation strategies consult the aforementioned plan, which can be accessed at: http://ussc.utah.gov/.

Garfield County Earthquake Mitigation Strategy #1	
Objective:	To reduce earthquake risk as it relates to the built environment.
Action:	Continued dedication/vigilance in enforcing the seismic standards established in the International Building Code (IBC).
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	County or City government operating budget (where applicable).
Responsible Agencies:	County or City government (where applicable).
Plan Goals Addressed:	Prevention, Property Protection
Priority:	High

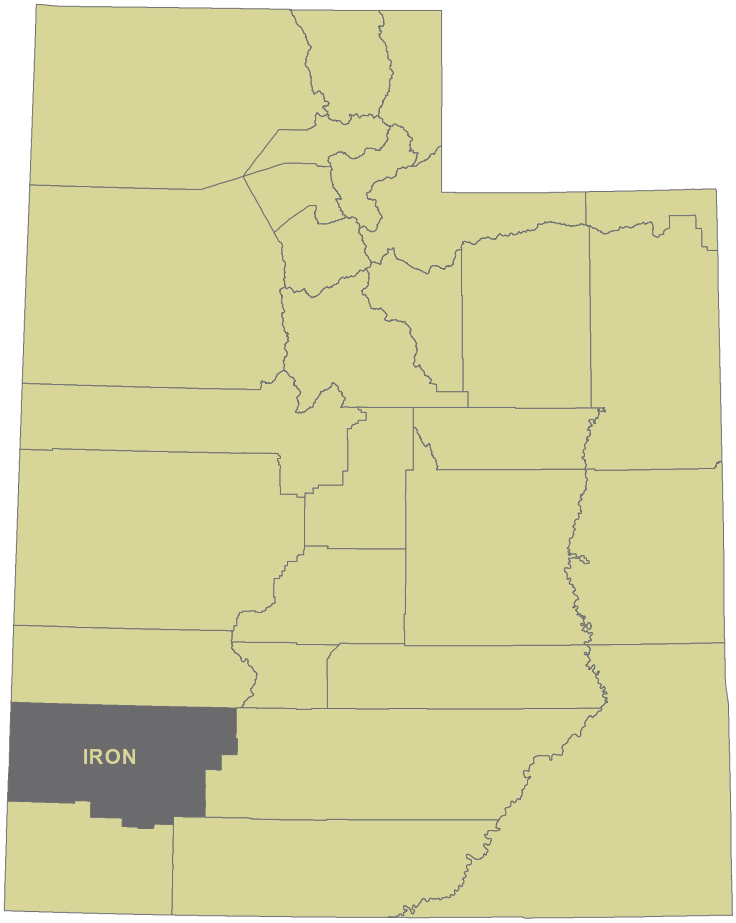
Garfield County Earthquake Mitigation Strategy #2	
Objective:	To reduce earthquake losses by mapping and identifying earthquake hazard areas.
Action:	**Action 1**-Utilize the Earthquake Risk Map provided in this plan as a tool to assess earthquake risks as it relates to any building/ subdivision proposals. If deemed necessary, jurisdiction should require the builder/developer to conduct a site-specific earthquake hazard identification/mapping study. **Action 2**-At the County level, contract with Utah Geological Survey (UGS) to formally study/map earthquake hazard areas.
Timeline:	**Action 1**-Ongoing **Action 2**-3 to 5 years
Estimated Cost:	**Action 1**-$1,000 to $8,000 **Action 2**- $11,200 to $22,400
Possible Funding:	**Action 1**-Private funds/ developer. **Action 2**-Local government operating budget; Utah Geologic Survey operating budget.

Responsible Agencies:	Local, jurisdictional level; Private property owner; Utah Geological Survey
Plan Goals Addressed:	**Action 1**-Prevention, Property Protection, Partnership/Coordination **Action 2**-Education/Outreach, Emergency Services, Environmental Protection, Partnership/Coordination
Priority:	Medium

Iron County



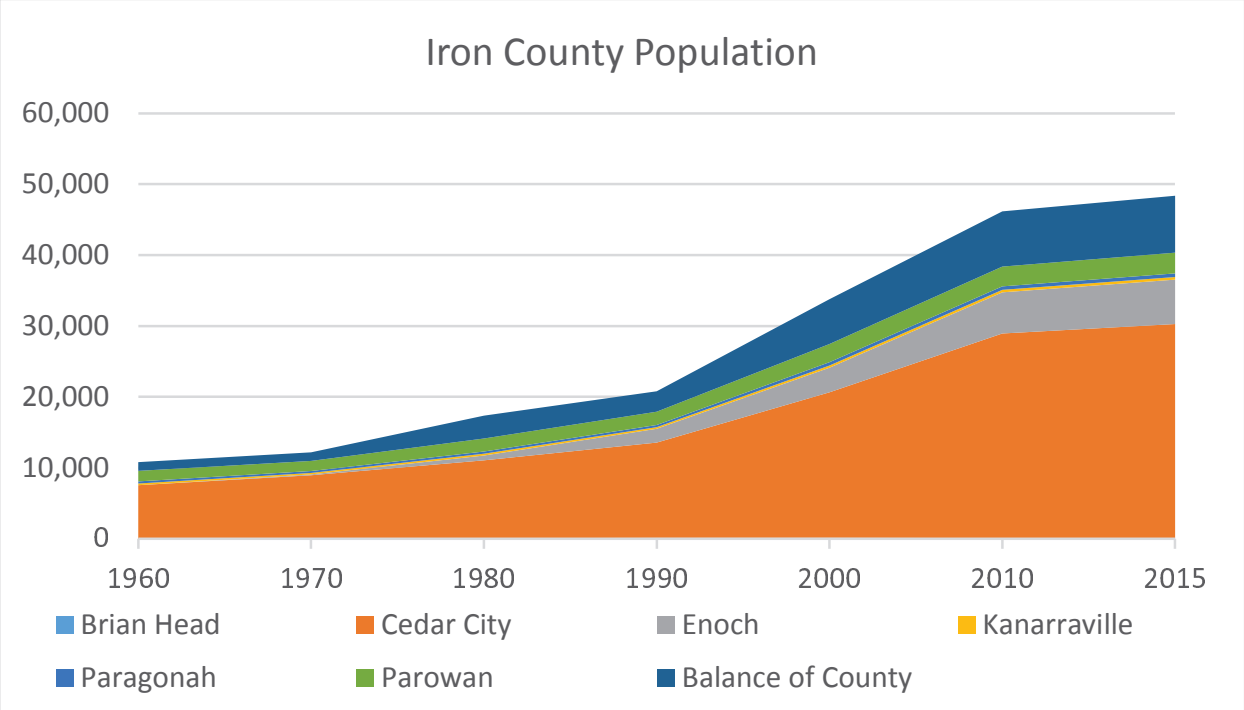
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Demographics

Iron County is located in the southwestern quarter of Utah bounded by Nevada on the west, Beaver County on the north, Washington County on the south, and Garfield County on the east. Interstate 15 bisects the eastern part of the county in a north-south direction. State highways 56 from the west, SR-14 and SR-20 from the east, and SR-130 from the north provide excellent access into the surrounding areas. Iron County is strategically located to service visitors that come to visit southern Utah and to service visitors passing through.

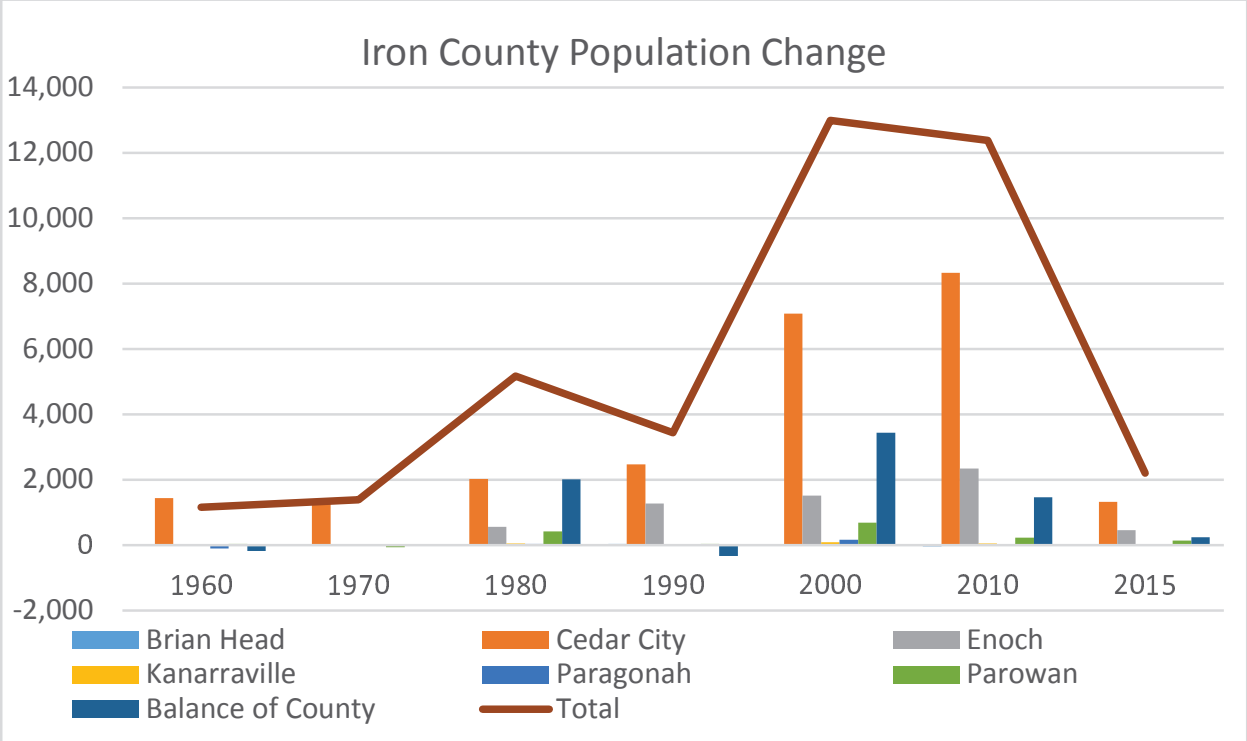
The reasons behind the regions growth are important, but the purpose for analyzing population in this document is to better inform decision makers about how many people could potentially be affected by a natural hazard.



Iron County Population by Incorporated Place							
City/Town	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2015**
Brian Head	na	na	77	109	118	83	87
Cedar City	7,543	8,946	10,972	13,443	20,527	28,857	30,184
Enoch	na	120	678	1,947	3,467	5,803	6,265
Kanarraville	236	204	255	228	311	355	369
Paragonah	300	275	310	307	470	488	509
Parowan	1,486	1,423	1,836	1,873	2,565	2,790	2,926

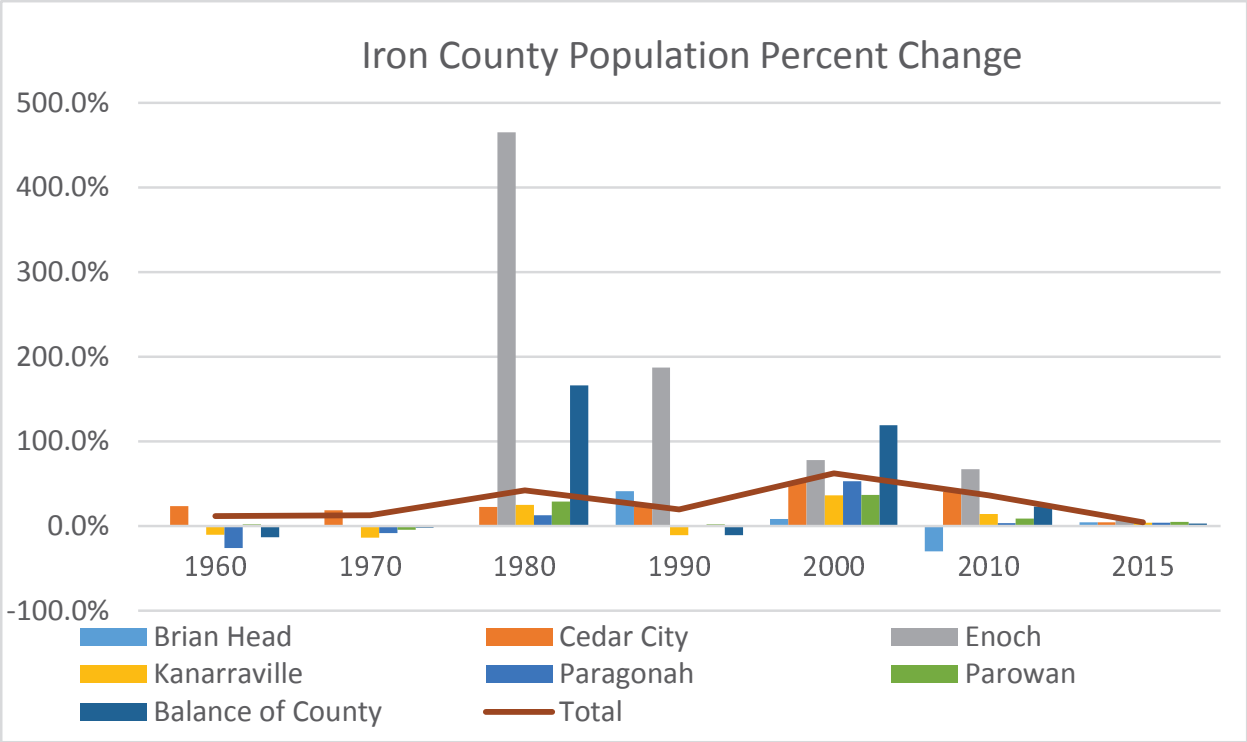
Balance of County	1,230	1,209	3,221	2,882	6,321	7,787	8,028
Total	**10,795**	**12,177**	**17,349**	**20,789**	**33,779**	**46,163**	**48,368**
na: City/Town not yet incorporated							
Source: U.S. Census Bureau; Utah History Encyclopedia, Governor's Office of Management & Budget							

Iron County's population has increased by 37,573 people since 1960, averaging 27.3% growth per decade since that time. Some of the towns in Iron County have seen population decreases during this study period, but the county as a whole has increase during each decade.



Iron County Population Change							
City/Town	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2015**
Brian Head	na	na	na	32	9	-35	4
Cedar City	1,437	1,403	2,026	2,471	7,084	8,330	1,327
Enoch	na	na	558	1,269	1,520	2,336	462
Kanarraville	-27	-32	51	-27	83	44	14
Paragonah	-104	-25	35	-3	163	18	21
Parowan	31	-63	413	37	692	225	136
Balance of County	-184	-21	2,012	-339	3,439	1,466	241
Total	**1,153**	**1,382**	**5,172**	**3,440**	**12,990**	**12,384**	**2,205**
na: Not available							
Source: U.S. Census Bureau; Utah History Encyclopedia, Governor's Office of Management & Budget							

Population change refers to the net increase or decrease of a population for a geographical area. The large downward trend in 2015 demonstrates that the county is still growing, just not as fast as it has in the past.



Iron County Population Percent Change							
City/Town	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2015**
Brian Head	na	na	na	41.6%	8.3%	-29.7%	4.8%
Cedar City	23.5%	18.6%	22.6%	22.5%	52.7%	40.6%	4.6%
Enoch	na	na	465.0%	187.2%	78.1%	67.4%	8.0%
Kanarraville	-10.3%	-13.6%	25.0%	-10.6%	36.4%	14.1%	3.9%
Paragonah	-25.7%	-8.3%	12.7%	-1.0%	53.1%	3.8%	4.3%
Parowan	2.1%	-4.2%	29.0%	2.0%	36.9%	8.8%	4.9%
Balance of County	-13.0%	-1.7%	166.4%	-10.5%	119.3%	23.2%	3.1%
Total	**12.0%**	**12.8%**	**42.5%**	**19.8%**	**62.5%**	**36.7%**	**4.8%**
na: Not available							
Source: U.S. Census Bureau; Utah History Encyclopedia, Governor's Office of Management & Budget							

The percent of change is important to look at because it indicates what percent of the total population is increasing or decreasing. With the exception of Brian Head every town and city in Iron County had a positive percent change between 2000 and 2015. Several towns and the county balance had a negative percent change in 1960, 1970, and 1990, but the county as a whole maintained a positive percent.

Generally speaking, population growth in Iron County has mirrored state expansion rates. That trend ended in the 1990s when the population of Iron County exploded. During the1990's population grew by 63 percent. Growth in the County continued at a rate of 44% from 2000 to 2009. According to growth projections provided by the Governor's Office of Planning and Budget, Iron County can expect noteworthy increases in population over the next 20 years. The projected population increase from 2010 to 2020 is 35% and 28.3% from 2020 to 2030. Overall this translates to 73% growth projected over the next 20 years. This growth projection is much higher than the State of Utah growth projection of 49.9% over the same period.

Despite the dramatic growth projections, Iron County officials diligently worked on ensuring that land use will be balanced to meet growth projections. Such planning has enabled the creation/ implementation of growth boundary designations to allow for appropriate growth while directing that growth into areas where services are available. The growth boundaries will accommodate the anticipated 20 year population projected for the county in locations which maximize the value, and minimize the effects, of growth on the county's environment and quality of life. In an effort to ensure that growth is minimized and/or eliminated in environmentally sensitive areas, the Iron County General Plan establishes through policy, "The County shall also designate a tier for the preservation of rural/environmentally sensitive land outside of the Urban Growth Boundary." This policy has been implemented through adoption (September 2006), of the *Iron County Tier Growth Map*. In general, this map and implementing ordinance limit the amount of growth in rural/ environmentally sensitive areas which ultimately affords increased safety in relation to natural hazards and the built environment.

IRON COUNTY OVERVIEW

Iron County lies almost entirely within the Great Basin except for some acreage along the south central county line that drains into the Virgin River. Elevations range from the high point of 11,307 feet at Brian Head to the low point of 5,050 feet northeast of Lund on the county line. The elevations extremes provide for a variety of landscapes, vegetative types, recreational choices and year-round livestock grazing opportunities. Mountain streams flow from the mountain ranges out onto the valley bottoms where the waters drain in the valley alluvium through free flow or are spread over the land through irrigation.

Historically, Cedar City has been a popular transportation hub for access to some of the National Parks; namely, Zion National Park, Bryce Canyon National Park, and Cedar Breaks National Monument. The center block of the Dixie National Forest lies in eastern Iron County and is easily accessed through Cedar City and Parowan. Vast expanses of public lands managed by the Bureau of Land Management occupy the northern and western parts of the county.

Coal in the canyons east of Cedar City, and iron ore in the mountains to the west brought mining and smelting to Iron County in the 19th century. However, smelting efforts failed because of the lack of economical transportation to large markets. Despite this change, the county has transitioned well into other economic sectors and have become a very strong economic players in the region. Iron County is well known for its Utah Shakespearean Festival, the Utah Summer Games, and

Southern Utah University.

The county contains a variety of soil types and conditions. The soils in the county are primarily igneous and sedimentary rocks. Many of the soils on mountain and foothill slopes are shallow or moderately deep and are gravelly, cobble or stony. In the alluvium valleys, soils are very deep and tend to have finer textures. Some timber and woodland products are harvested. The high mountain forests and the pinyon-juniper forests of the lowlands also provide recreational and aesthetic values important to the diversity found in Iron County.



Public land ownership in Iron County accounts for approximately 71% of the total land area. The largest category of land ownership, totaling 51%, is the national resource lands managed by the Bureau of Land Management.

Agricultural land uses are a long standing tradition in Iron County. The agricultural nature of the area has been a large factor in supporting residents of the area. In addition, the open space and rural qualities of the county are attractions for people wishing to leave the congestion of more urbanized areas of the country. This being said, the agricultural make-up of the county is rapidly being replaced by urban expansion. Approximately 95% of the Iron County population is located in the eastern third of the county along I-15. For this reason, Iron County officials have endeavored to comprehensively plan growth which can be a protection from the deterioration of rural communities.

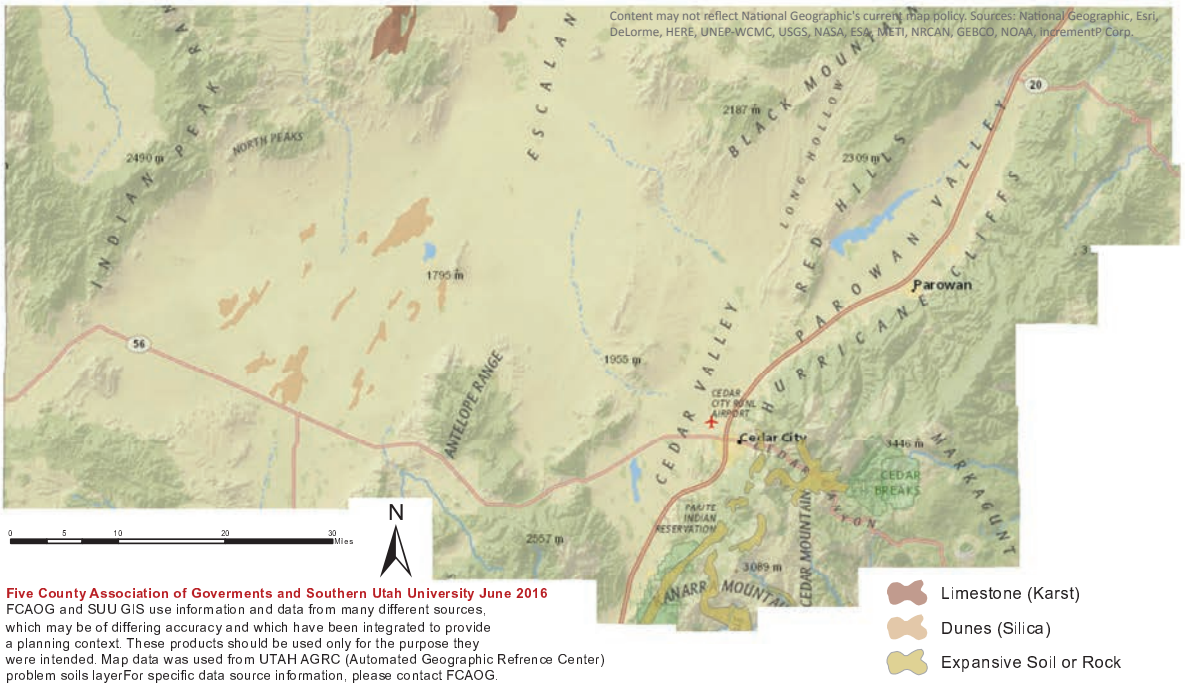
Problem Soils

HAZARD RISK ASSESSMENT

After reaching out to local governments, and several engineering and construction firms that deal directly with problem soils it is evident that very little data concerning structural damage due to problem soils is tracked recorded and/or reported.

Some mapping of problems soils have been done which helps to indicate where some problem soils lie. There is a chance that problem soils extend beyond the current engineering problem soils layer provided by the Utah Automated Geographic Reference Center. As for the data available, below are the values of structures that lie within the mapped problem soils areas and map of the problem soils areas for Iron County.

Iron County Problem Soils



Value of Structures at Risk - Problem Soils - Iron County		
Structure Type	**Market Value**	**Number of Structures**
Residential	$835,741,695	6,380
Commercial	$312,098,537	810
Agriculture	$7,345,251	141
Total	$1,155,185,483	7,331
Source: Problem Soils-AGRC, Tax Data-Iron County Tax Assessor, Analysis-SUU GIS Lab		

There is over $1 billion of structures within the available hazardous soils map layer. This map is considered out dated, but it is currently one of the best hazardous soil maps available for Iron County. Because detailed soil studies have not been conducted though out the entire county, one should not assume that problem soils do not exist beyond the extent of this maps soils layer.

SUMMARY

Due to the lack of record keeping there is an undetermined number of structures that have been negatively affected by problem soils within Iron County. Detailed mapping of hazardous soils have not been produced within the county, and current maps indicate 7,331 structures at risk of problem soils, valued at more than $1 billion.

MITIGATION STRATEGY

Problem soils pose a significant hazard to the current/future built environment. Many of these

problems can be dramatically reduced through proper assessment of the risk and adherence to applicable mitigation measures. The mitigation strategies listed below identify cost effective measures that will yield measurable benefits toward reducing the risk of problem soils as they relate to the built environment. Further, these mitigation strategies include general actions that agencies are capable of implementing during the next five years, given their existing resources and authorities.

Iron County Problem Soils Mitigation Strategy #1	
Objective:	Lessen the risk to buildings from problem soils.
Action:	**Action 1**-Address problem soils at the building/construction level by requiring all subdivision proposals to have a geotechnical report. **Action 2**-If jurisdiction does not have trained staff to review the geotechnical report, the jurisdiction can, upon request, have Utah Geological Survey (UGS) perform a review of the report.
Timeline:	Ongoing
Estimated Cost:	$1,000 to $5,000
Possible Funding:	Private funds/ developer; Local government operating budget; Utah Geologic Survey operating budget.
Responsible Agencies:	Local (especially Enoch City), jurisdictional level; Utah Geological Survey
Plan Goals Addresses:	**Action 1**-Prevention, Property Protection **Action 2**-Prevention, Property Protection, Partnership/Coordination
Priority:	Low

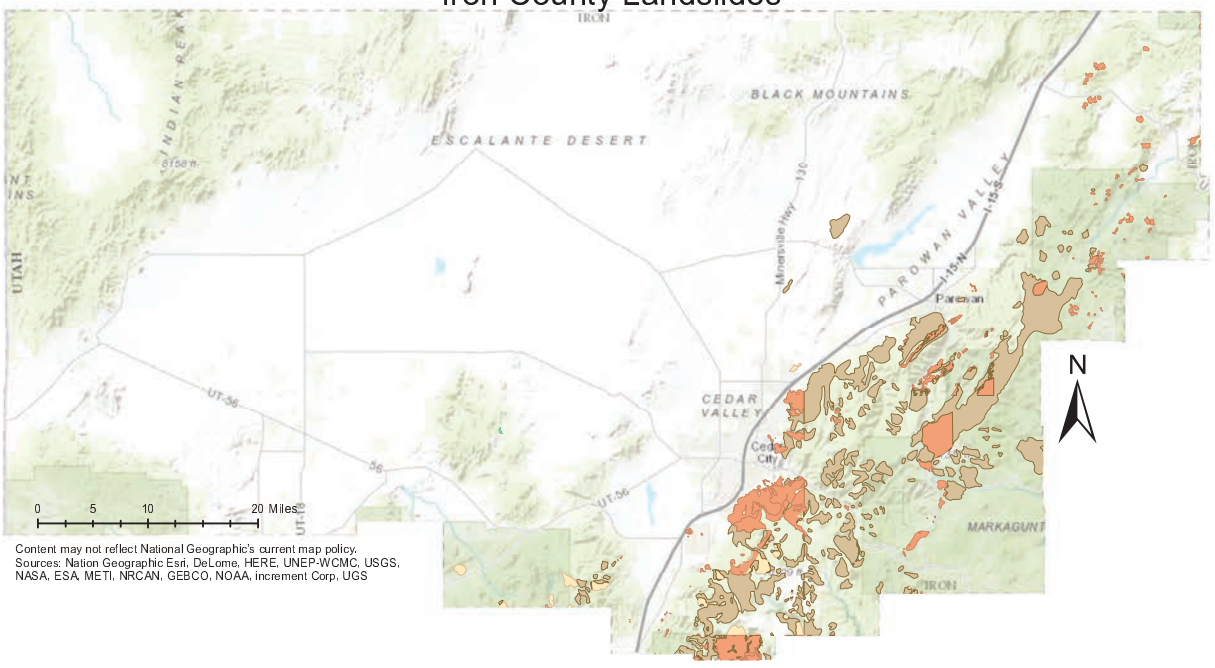
Iron County Problem Soils Mitigation Strategy #2	
Objective:	Lessen the risk to buildings from collapsible and expansive soils.
Action:	Through mapping, identify areas which contain collapsible and expansive soils. Require soils testing at the building/construction level and ensure that engineer's recommendations are followed.
Timeline:	Ongoing
Estimated Cost:	$1,000 to $5,000
Possible Funding:	Private funds/ developer; Local government operating budget.
Responsible Agencies:	Local, jurisdictional level.
Plan Goals Addresses:	Prevention, Property Protection
Priority:	Low

Landslide

HAZARD RISK ASSESSMENT

Landslides are prevalent anywhere there are steep and over steepened slopes, and Iron County is no exception. The Utah Geologic Survey has mapped more than 400 historic and prehistoric landslides in the area, they are most prominent in and around Kanarra Mountain, Cedar Mountain, Summit Mountain, and the Harmony Mountains.

Iron County Landslides



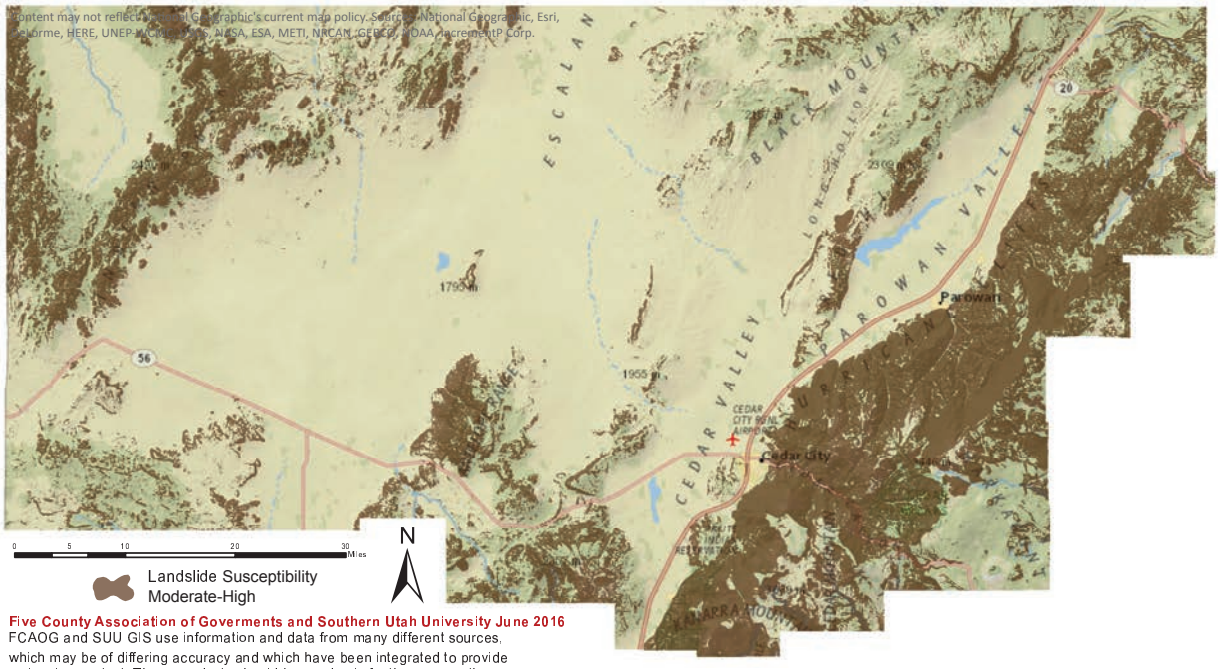
- deep or unclassified landslide
- landslide and/or landslide undifferentiated from talus, colluvial, rock-fall, glacial, and soil creep deposits
- landslide undifferentiated from talus and/or colluvial deposits not classified
- shallow landslide

Recording and archiving historic landslides in Utah is a feat that has not been thoroughly compiled into one place. Through the United States Geological Survey (USGS) and other state Surveys a landslide inventory pilot project was put together for several states including Utah for a period of time. Unfortunately the data was only gathered for landslides between 1850-1975 (See Table below). SHELDUS, USGS's Landslide Hazard Program, and NOAA's Storm Events Database are all places that have gathered data regarding recent landslides. Additional links are http://hvri.geog.sc.edu/SHELDUS/ and http://geology.utah.gov/

Iron County Landslides 1850-1978				
Event Year	**Location**	**Landslide Type**	**Cause**	**Source number**
1915	Coal Creek Canyon	Landslide	Natural	3
1930	Enoch	Debris Flow	Natural	9
1955	Kanarraville	Debris Flow	Natural	1
1961	Red Hill near Cedar City	Debris Flow	Natural	
1983	Iron County	Landslides	Not Specified	SHELDUS
1984	Iron County	Landslides	Not Specified	SHELDUS
1984	Iron County	Heavy Snow and Mudslide	Not Specified	SHELDUS
2011	SR-14 Iron County	NCDC Landslide	Not Specified	SHELDUS
Source: 1, 3, 9 UGS newspaper reference number, see references & works cited page. & SHELDUS				

While there has likely been more landslide occurrences in Iron county Over the last 150 years than what is listed in the table above, many unseen and small landslides, or landslides far from communities go unreported. Knowing were landslides happen can help to keep people safe but more importantly knowing the areas most susceptible to land sliding can keep people out of harm's way. Below is a brief overview of landslide susceptibility in Iron County.

Iron County Landslide Susceptibility



Factors included in assessing landslide risk include built property distribution in the hazard area, the frequency of landslide or debris flow occurrences, slope steepness, and soil characteristics.

The Landslide Susceptibility map was created using landslide susceptibility data from the Utah Geological Survey (UGS) and overlaying it with landslide data from the UGS. Areas where landslides exist are often some of the most vulnerable areas for future landslides. The Value of Structures at Risk data was created by overlaying county tax assessor data with moderate to high susceptibility data.

Value of Structures at Risk - Landslide - Iron County		
Type of Structure	**Market Value**	**Number of Structures**
Residential	$282,353,651	1,831
Commercial	$20,362,484	38
Agriculture	$9,307,035	37
Total	**$312,023,170**	**1,906**
Source: Landslide Potential-Utah Geological Survey, Values-Beaver Co. Tax Assessor, Analysis-SUU GIS Lab, Parcels-AGRC		

The current data shows 1,906 structures valued over $300 million within the medium to high landslide susceptibility areas. Due to the extent and age of this data geological studies should be conducted at the parcel level to determine risk for future development.

SUMMARY

Over 400 landslides have been mapped in Iron County, but very few historic landslides have been recorded. Despite the minimal amount of landslides that have occurred and/or have been recorded in the last 150 years, Iron County is home to vast amounts of land that is susceptible to the hazard.

Over the last fifty years Garfield County has increased its population by more than 37,000 people, and is projected to continue to grow at a similar rate. With this increase of population it is important that people are aware of the county's landslide risk, as it is pertinent to the safety of communities across the county.

MITIGATION STRATEGY

The mitigation strategies listed below identify cost effective measures that will yield measurable benefits toward reducing the risk of landslide hazards.

Iron County Landslide Mitigation Strategy #1	
Objective:	Increase the level of knowledge related to landslides.
Action:	Increase public education related to landslide hazards by distributing Utah Geological Survey (UGS) landslide informational brochures to the local municipality level emergency management, engineering and planning departments. Distribute educational materials to the public.
Timeline:	Ongoing

Estimated Cost:	Very Minimal: request UGS to deliver brochures; and/or download brochures directly from: http://geology.utah.gov
Possible Funding:	Local, jurisdictional level.
Responsible Agencies:	Local, jurisdictional level.
Plan Goals Addresses:	Education/Outreach, Emergency Services, Partnership/ Coordination, Prevention
Priority:	Medium

Iron County Landslide Mitigation Strategy #2	
Objective:	Minimize future landslide damage in the County.
Action:	Drafting/updating zoning and/or landslide ordinances to prevent development of structures near debris flows, landslides, and rock fall areas.
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	Local government operating budget; State and Federal planning grant programs.
Responsible Agencies:	Local government
Plan Goals Addresses:	Prevention, Property Protection
Priority:	High

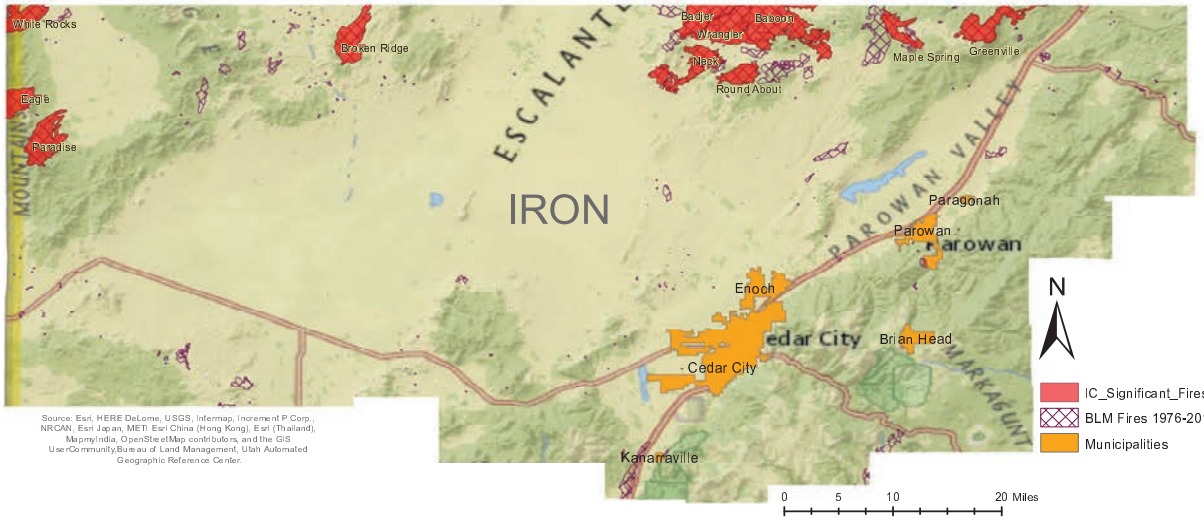
Iron County Landslide Mitigation Strategy #3	
Objective:	To reduce landslide risk as it relates to the built environment.
Action:	**Action 1**-Address landslide risk at the building/construction level by requiring all subdivision proposals to have a geotechnical report. **Action 2**-If jurisdiction does not have trained staff to review the geotechnical report, the jurisdiction can, upon request, have Utah Geological Survey (UGS) perform a review of the report.
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	Private funds/ developer; Local government operating budget; Utah Geologic Survey operating budget.
Responsible Agencies:	Local, jurisdictional level; Utah Geological Survey
Plan Goals Addresses:	**Action 1**-Prevention, Property Protection **Action 2**-Prevention, Property Protection, Partnership/Coordination
Priority:	High

Wildfire

HAZARD RISK ASSESSMENT

There have been approximately 600 BLM fires alone in Iron County over the last 39 years. While there have been large fires such as the Baboon and Eagle fires that burned thousands of acres the majority of fires are quite small, burning just a portion of an acre.

Iron County BLM Fires 1976-2015



There are many other agencies involved with wildfire that should not be disregarded because they have not been reported in this section. The tables and maps are designed to inform people that fires are a real threat and this map and table should and not be used as a complete history of wildfires in the area.

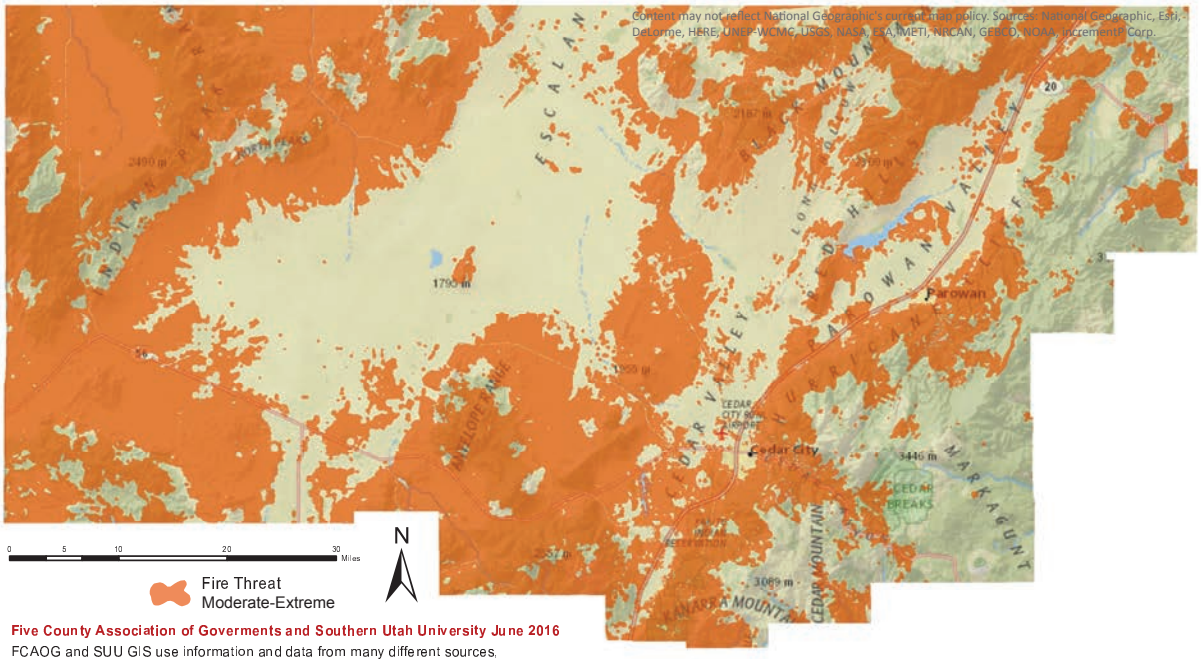
Significant BLM Wildland Fires 1976-2015 - Iron County			
Fire Name	**Year**	**Acres**	**Other Counties Effected**
Baboon	2012	19,778	Beaver
Eagle	2002	8,529	Lincoln NV
Wrangler	2011	8,455	Beaver
Badger	2006	7,953	Beaver
White Rocks	2012	6,251	Beaver/Lincoln NV
Paradise	2007	5,549	none
Greenville	2007	5,090	Beaver
Neck	2005	4,931	none
Broken Ridge	2009	4,929	Beaver
Maple Spring	2002	2,513	none
Round About	2012	2,458	none

Source: Bureau of Land Management, United States Geological Survey

The Baboon fire is one of the largest fires that Iron County has experienced in recent history burning more than 19,000 acres before it was extinguished. The fire burned over 17,000 acres in ten short hours, threatening powerlines, a natural gas pipeline, the Baboon repeater site, and closed portions of the Minersville Highway.

The following provides a summarization of fire threat in Iron County. Fire threat is defined as the likely hood of an acre burning.

Iron County Fire Threat



Five County Association of Goverments and Southern Utah University June 2016

FCAOG and SUU GIS use information and data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. Map data was used from UTAH AGRC (Automated Geographic Refrence Center) and DNR Fire threat layer. For specific data source information, please contact FCAOG.

Value of Structures at Risk - Wildfire - Iron County		
Type of Structure	**Market Value**	**Number of Structures**
Residential	$738,298,799	5,248
Commercial	$195,350,668	329
Agriculture	$63,277297	371
Total	$996,926,764	5,948

Source: Utah Department of Natural Resources, Iron County Tax Assessor, SUU GIS Lab

The analysis of structures at risk is defined by how many structures are within the medium to extreme fire threat boundary.

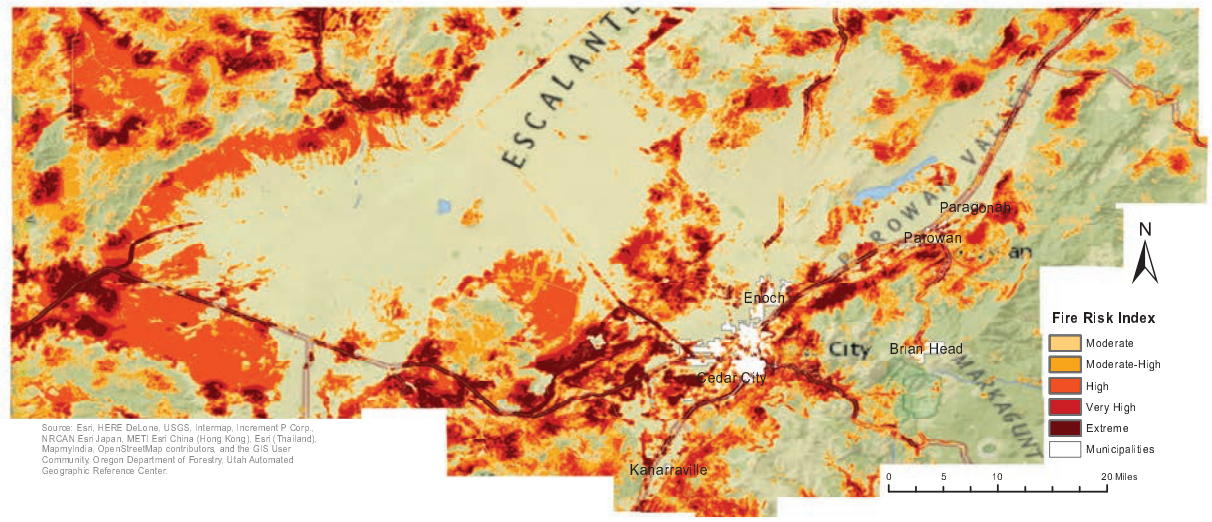
Infrastructure at Risk - Iron County	
Infrastructure	**Miles**
Major Roads	390.1
Rail	125.7
Transmission Lines	431.5
Source: Utah AGRC	

In addition to structures located within a defined hazard area, there is also an overwhelming amount (in terms of quantify and value) of infrastructure that is not captured by this analysis. This is in large part due to the fact that compilation of this data would be exhaustive; nevertheless, the following provides a summarization of additional infrastructure at risk from wildfire.

Miles of major roads were calculated using road centerline data. The types of roads used for the Major roads include: Interstates; US Highway, Separated; US Highway, Unseparated; Major State Highway, Separated; Major State Highway, Unseparated; Other State Highway, (Institutional); Ramps, Collectors; Major Local Roads, Paved.

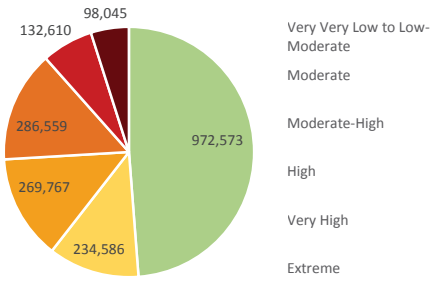
The following provides a summarization of fire risk in Iron County. Fire risk "represents the possibility of loss or harm occurring from a wildfire." (Oregon Department of Forestry) The county risk assessment values are based on suppression difficulty, wildland development areas, forest assets, drinking water importance areas (watersheds), and infrastructure assets.

Iron County Wildfire Risk

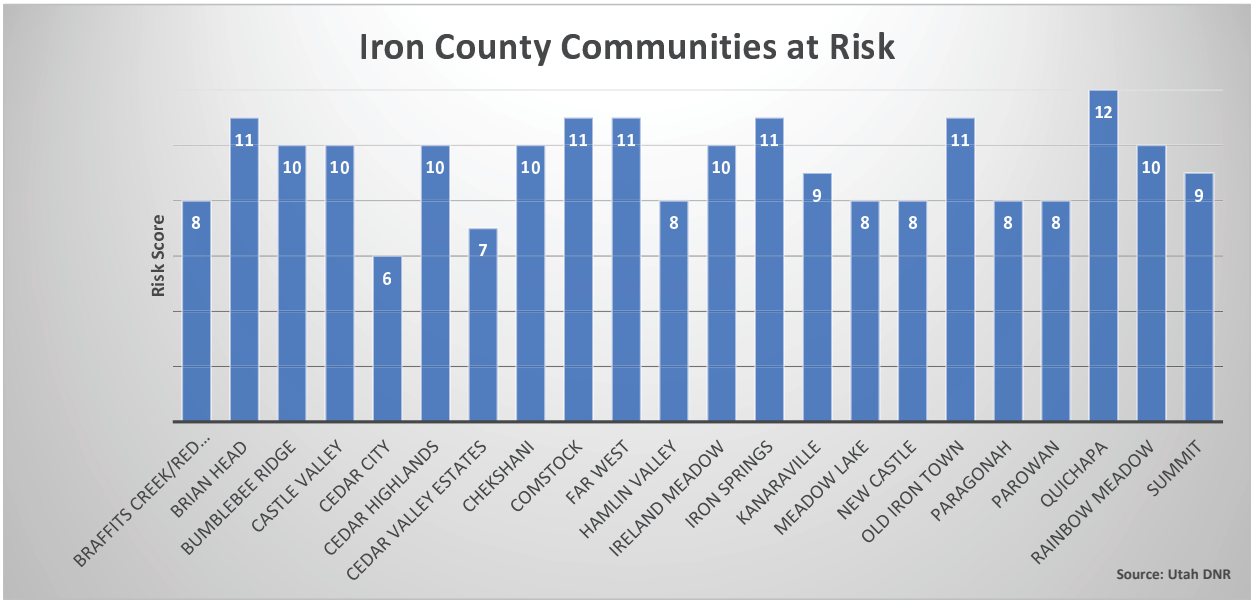


Much of the Riparian, Drinking Water Importance, and Forest Assets are in the higher elevations and areas which have a high suppression difficulty. Increased population has brought more development, which has increased the Wildland Development areas, making more infrastructure vulnerable to wildland fires.

Acres



The following is a summary of the Iron County Communities at risk.



Each community's risk in the county was determined using four categories, each category received a score between one and three, one being the lowest risk and three being the highest. When the scores are added together the minimum a community can receive is a three while the maximum score is twelve. The categories are Fire Occurrence, Fuel Hazards, Values Protected, and Fire Protection Capability.

SUMMARY

Hundreds of wildfires have occurred in Iron County including several fires that engulfed thousands of acres. Wildfire threat is ubiquitous in Iron County putting more than 5,900 hundred structures at risk valued at nearly one billion dollars. Additional assets at risk include hundreds of miles of roads, rail, and transmission lines; as well as wildland development areas, forest assets, riparian assets, and drinking water importance areas. There are currently 22 communities at risk from wild fire, twelve of which have scores that indicate high risk.

MITIGATION STRATEGY

Brian Head Wildfire Mitigation Strategy #1	
Objective:	Reduce the fuel contribution to potential wildfires. Increase safety from falling trees on streets and trails.
Action:	Clearing deadfall from street and trail rights-of-way.
Timeline:	September 2016-May 2017.
Estimated Cost:	$10,000 - $15,000
Possible Funding:	Wildland Fire revenue, general fund, State fire grants, FEMA funding.

Responsible Agencies:	Brain Head Public Safety, State Forestry and Fire, National Forest Service
Plan Goals Addresses:	Property Protection, Fire Breaks, a Reduction in natural fuels from deadfall.
Priority:	High

Kanarraville Wildfire Mitigation Strategy #1	
Objective:	Fuels reduction and defensible space tactics.
Action:	**Action 1**-Continue to place strategic fuel breaks throughout the focus area. **Action 2**-Encourage landowner mitigation and defensible space work.
Timeline:	Ongoing
Estimated Cost:	Unknown
Possible Funding:	Local government operating budget; Special Service District operating budget
Responsible Agencies:	Kanarraville
Plan Goals Addresses:	**Action 1**-Emergency Services, Environmental Protection, Prevention, Property Protection **Action 2**-Education/Outreach, Partnership/Coordination
Priority:	High

Parowan Wildfire Mitigation Strategy #1	
Objective:	Fuels reduction and defensible space tactics.
Action:	**Action 1**-Continue to place strategic fuel breaks throughout the focus area. **Action 2**-Encourage landowner mitigation and defensible space work.
Timeline:	Ongoing
Estimated Cost:	Unknown
Possible Funding:	Local government operating budget; Special Service District operating budget
Responsible Agencies:	Parowan
Plan Goals Addresses:	**Action 1**-Emergency Services, Environmental Protection, Prevention, Property Protection **Action 2**-Education/Outreach, Partnership/Coordination
Priority:	High

Iron County Wildfire Mitigation Strategy #1

Objective:	Promote public awareness campaign for property owners living in Wildland-Urban Interface areas.
Action:	Mailings; Printed Information; Public Service Announcements;
Timeline:	Ongoing
Estimated Cost:	Unknown
Possible Funding:	State and Federal wildfire grant programs
Responsible Agencies:	State and Federal & Local Government
Plan Goals Addresses:	Education/Outreach, Partnership/Coordination, Prevention, Property Protection
Priority:	High

Iron County Wildfire Mitigation Strategy #2	
Objective:	Ameliorate firefighting and access concerns related to heavy seasonal tourist traffic.
Action:	**Action 1**-Compliment fuels reduction work being done by the Park Service and Forest Service onto private lands. **Action 2**-Prevent fires on private lands which may spread onto federal lands.
Timeline:	Ongoing
Estimated Cost:	Unknown
Possible Funding:	Local government operating budget; Special Service District operating budget; private property owner
Responsible Agencies:	Community & local government entities; private property owner
Plan Goals Addresses:	**Action 1**-Emergency Services, Partnership/Coordination, Prevention, Property Protection **Action 2**-Emergency Services, Partnership/Coordination, Prevention, Property Protection
Priority:	High

Iron County Wildfire Mitigation Strategy #3	
Objective:	Fuels reduction and defensible space tactics.
Action:	**Action 1**-Continue to place strategic fuel breaks throughout the focus area. **Action 2**-Encourage landowner mitigation and defensible space work.
Timeline:	Ongoing
Estimated Cost:	Unknown
Possible Funding:	Local government operating budget; Special Service District operating budget
Responsible Agencies:	Community & local government entities.

Plan Goals Addresses:	**Action 1**-Emergency Services, Environmental Protection, Prevention, Property Protection **Action 2**-Education/Outreach, Partnership/Coordination
Priority:	High

Iron County Wildfire Mitigation Strategy #4	
Objective:	Provide training, equipment, and resources for fire departments to fight wildfires.
Action:	Enhance existing wildfire training programs, equipment procurement, and firefighting resources for wildfire suppression
Timeline:	Ongoing
Estimated Cost:	Unknown
Possible Funding:	State CIB funding; Federal wildfire grant programs
Responsible Agencies:	Federal, State, and Local Government
Plan Goals Addresses:	Emergency Services, Partnership/Coordination, Prevention, Property Protection
Priority:	High



Flood

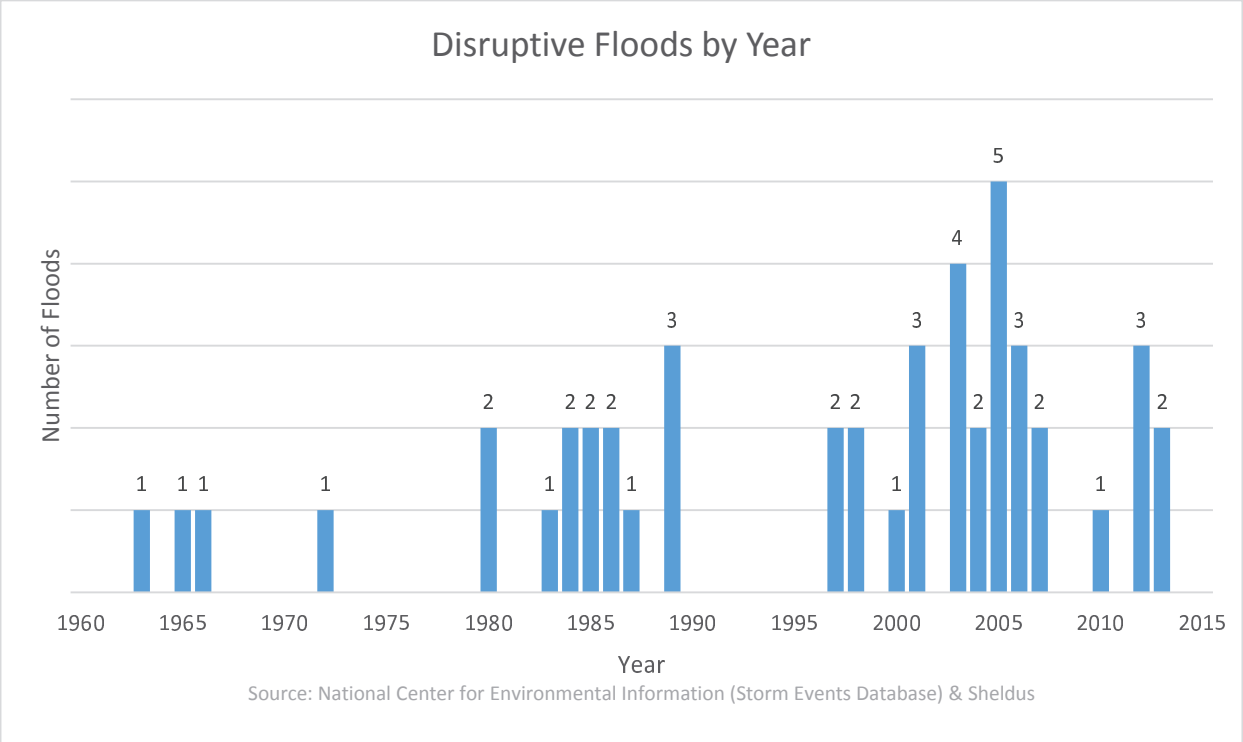
HAZARD RISK ASSESSMENT

Since 1960 there have been 47 flooding events which caused disturbance in Iron County recorded by the National Centers for Environmental Information's Storm Events Database and by the Spatial Hazard Events and Losses Database for the United States. (SHELDUS) This only accounts for a portion of flooding throughout the county as floods go unreported every year. The following table lists some of the most significant floods with quantitative value associated with the event. The list is in a numerical descending order with deaths and injuries listed as the most significant followed by property damage and crop damage.

Significant Floods - 1960-2015 - Iron County						
LOCATION	**BEGIN DATE**	**EVENT TYPE**	**DEATHS**	**INJURIES**	**ESTIMATED PROPERTY DAMAGE**	**ESTIMATED CROP DAMAGE**
Enoch/Cedar	8/17/2012	Flash Flood	0	0	$1,500,000	$0



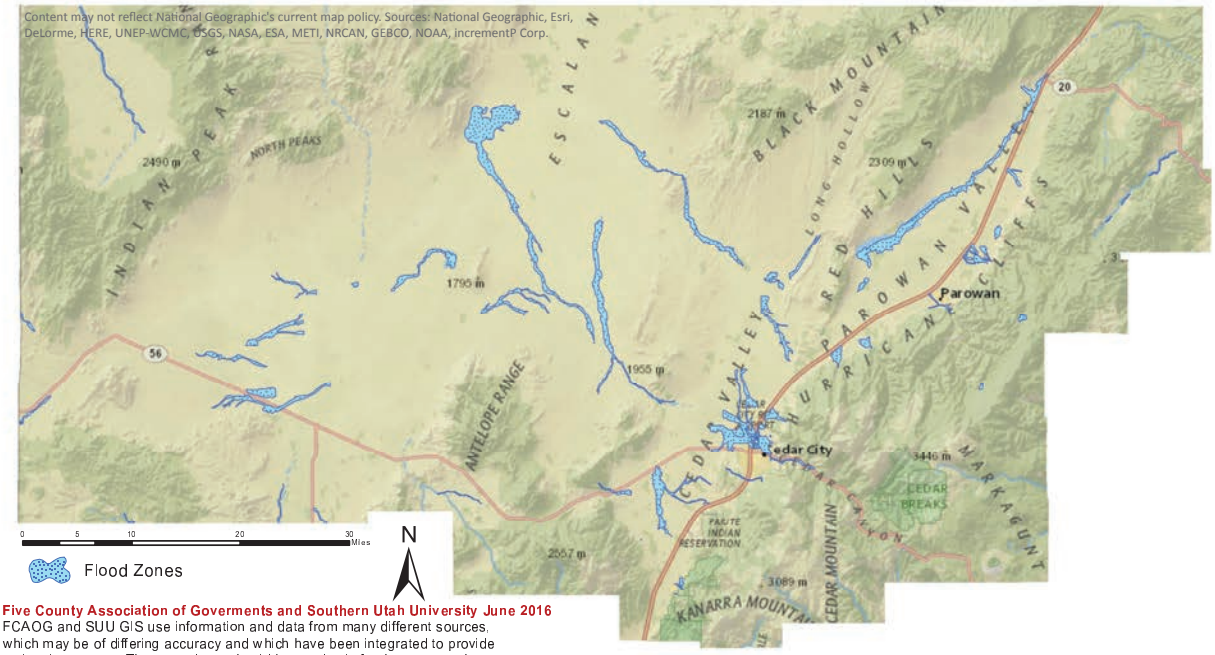
Cedar City/Coal Creek	10/21/2004	Flash Flood	0	0	$400,000	$0
Cedar City/Enoch	7/27/2013	Flash Flood	0	0	$400,000	$0
Cedar City	6/23/2000	Flash Flood	0	0	$50,000	$5,000
Cedar City/Fiddler's Canyon	8/9/2001	Flash Flood	0	0	$50,000	$0
Paragonah	9/8/1997	Flash Flood	0	0	$40,000	$0
Parowan/Yankee Meadow	8/23/2003	Flash Flood	0	0	$25,000	$5,000
Hamlin Valley	8/26/2007	Flash Flood	0	0	$10,000	$0
Source: NOAA-National Centers for Environmental Information (Storm Events Database)						



Since 1960 disruptive floods have been somewhat cyclical, with the number of events increasing between 2000 and 2005. The data does not provide reasons for this pattern, so in order to prevent speculation a study should be conducted to further understand all the reasons behind disruptive flooding events in Iron County.

The following depicts FEMS's 100 year flood plain in Iron County and a brief analysis of structures at risk.

Iron County Flood Zones



Five County Association of Goverments and Southern Utah University June 2016
FCAOG and SUU GIS use information and data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. Map data was used from UTAH AGRC (Automated Geographic Refrence Center) and FEMA flood zones layers. For specific data source information, please contact FCAOG.

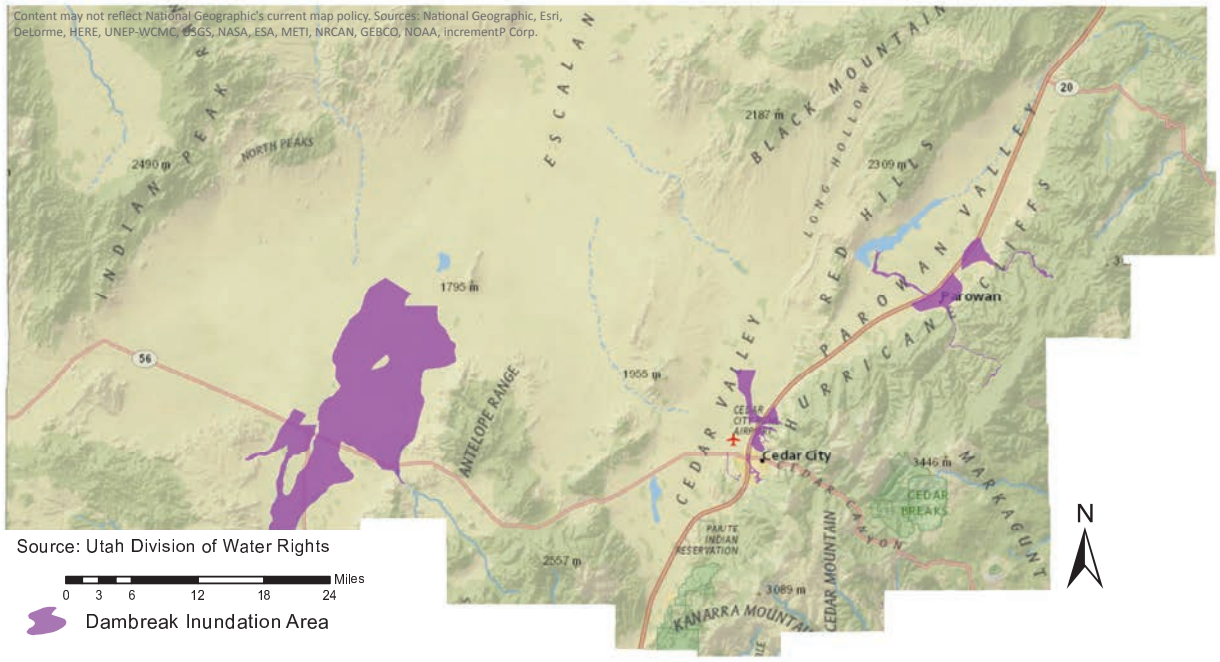
Value of Structures at Risk - Flood - Iron County		
Structure Type	**Market Value**	**Number of Structures**
Residential	$263,000,955	2,030
Commercial	$142,570,470	345
Agriculture	$6,829,768	115
Total	$412,401,193	2,490
Source: Iron County Tax Assessor, FEMA, SUU GIS Lab		

Dam failure has the potential to cause significant flooding and damage to communities downstream. The Utah Division of Water Rights and the state engineer list the dam hazard ranking to help communities understand the risk of dam failure inundation. The Hazard classification of dam risk is determined by the threat to human life and property damage in the event that a dam fails. The hazard ratings of inspected dams are listed on the following table.

Iron County Dam Hazard Classification			
Dam Name	**Hazard**	**Dam Name**	**Hazard**
CEDAR CITY - FIDDLER CANYON DB #2	HIGH	ASPEN LAKE	MOD
CEDAR CITY DRY CANYON DB	HIGH	BRIAN HEAD PHASE III	MOD
CEDAR CITY STEPHENS CANYON DB NORTH	HIGH	CEDAR CITY-GREENS LAKE NO.2	MOD
CEDAR CITY STEPHENS CANYON DB SOUTH	HIGH	CEDAR CITY-GREENS LAKE NO.3	MOD

LEIGH HILL RESERVOIR	HIGH	CEDAR CITY-GREENS LAKE NO.4	MOD
NEWCASTLE	HIGH	IRONTOWN DAM	MOD
RED CREEK (IRON)	HIGH	MEADOW LODGE LAKE	MOD
YANKEE MEADOW	HIGH		
Source: Utah Division of Water Rights-Dam Safety Database Information Viewer			

Iron County Dam Break Inundation Areas



Cedar City, Parowan, and Paragonah are all in dam break inundation areas. All three of these places are especially at risk as Cedar City has the largest population while nearly the entire town of both Parowan and Paragonah are completely within inundation areas. There is a large inundation area between the Antelope Range and Beryl Junction, and another area just outside of Enoch.

The following is a list of communities participating in the Nation Flood Insurance Program, FEMA's repetitive flood claims, and other FEMA claims.

Communities Participating in the National Flood Insurance Program (FEMA)				
Community	**Initial FHBM Identified**	**Initial FIRM Identified**	**Current Effective Map Date**	**Reg-Emerg Date**
Cedar City	1/23/1974	10/16/1984	10/16/1984	10/16/1984
Iron County	4/11/1978	7/17/1986	7/17/1986(M)	7/7/1986
Kanarraville	12/17/1976	No Data	(NSFHA)	12/11/1985
Paragonah	2/14/1975	2/14/1984	6/2/2005	9/24/1984
Parowan	2/14/1975	9/24/1984	6/2/2005	9/24/1984
FIRM - Flood Insurance Rate Map FHBM - Flood Hazard Boundary Map		(M) - No Elevation Determined Zones A,C,X NSFHA - No Special Flood Hazard Area, Zone C		

Source: FEMA National Flood Insurance Program Community Status Book Feb/2016

With the exception of Brian Head and Enoch all of the incorporated municipalities and Iron County are participating in the National Flood Insurance Program. Brian Head and Enoch are not listed as participating or not participating.

There are NO FEMA REPETITIVE FLOOD CLAIMS in Iron County.

The following table is a list of historical claims through FEMA's National Flood Insurance Program.

(Claims) FEMA Loss Statistics from Jan 1/1978 through Nov/30/2015 - Iron County					
Community Name	**Total Losses**	**Closed Losses**	**Open Losses**	**CWOP Losses**	**Total Payments**
Cedar City	5	4	0	1	$31,957.50
Iron County	8	7	0	1	$22,318.46
Parowan, City of	1	1	0	0	$5,985.46
Total	**14**	**12**	**0**	**2**	**$60,261.42**

Total Losses - All losses submitted regardless of the status.
Closed Losses - Losses that have been paid.
Open Losses - Losses that have not been paid.
CWOP Losses - Losses that have been closed without payment.
Total Payments - Total amount paid on losses.

Source: FEMA Policy and Claim Statistics for Flood Insurance

SUMMARY

Forty-seven have occurred and/or have been recorded in Iron County over the last half century. The recorded data indicates zero deaths and injuries from flooding but reports hundreds of thousands of dollars in property and crop damage. FEMA's 100 year flood areas are mapped along waterways in and near most of the towns and cities in Garfield County. Other flood ways include dam inundation zones which run through Cedar City, Paragonah, Parowan, and elsewhere in unincorporated county. There is currently over $412 million of structures in the 100 year floodplains.

There are no FEMA repetitive flood claims in the county and the communities participating in the National Flood Insurance Program are Cedar City, Kanarraville, Paragonah, Parowan, and Iron County. Since 1978 there has been three FEMA flood claim valued at more than $60,000.

MITIGATION STRATEGY

Brian Head Flood Mitigation Strategy #1	
Objective:	The objective resolves managing storm drains and flood plans by increasing infrastructure.
Action:	Construct a comprehensive storm drain master plan.

Timeline:	Septemeber 2016 - September 2017
Estimated Cost:	$40,000 - $55,000
Possible Funding:	General Fund, CIB Grant, other state or federal grant opportuntiies.
Responsible Agencies:	Brian Head Public Works
Plan Goals Addresses:	Control storm flows and runoff, protect property, ensure town access.
Priority:	High

Cedar City Flood Mitigation Strategy #1	
Objective:	Prevent Fiddlers Canyon flood waters from damaging homes and agricultural land.
Action:	Construct a channel from the west side of I-15 to the north route of the Coal Creek flood channel
Timeline:	5 years
Estimated Cost:	$2 million
Possible Funding:	Local government operating budget, state and federal flood programs
Responsible Agencies:	Local Government
Plan Goals Addresses:	Environmental Protection, Prevention, Property Protection
Priority:	High

Cedar City Flood Mitigation Strategy #2	
Objective:	Protect homes, businesses, and city infrastructure that is adjacent to Coal Creek
Action:	Construct berms, levees, and other channel improvements that will contain the 100-year flood within the channel. (Phase 3)
Timeline:	3-5 years
Estimated Cost:	$2.8 million
Possible Funding:	Cedar City operating budget, federal grant program
Responsible Agencies:	Cedar City Engineering Staff; Federal Agency and Contractor.
Plan Goals Addresses:	Prevention, Property Protection
Priority:	High

Enoch Flood Mitigation Strategy #1	
Objective:	Protect property from spring runoff and thundershowers
Action:	Design sediment debris basins east of I-15 to delay and meter flow of severe runoff. Obtain easements from private land owners and the BLM. Construct basins
Timeline:	10 Years

Estimated Cost:	$4.5 million
Possible Funding:	NRCS, Enoch City Storm Drainage Fund
Responsible Agencies:	Local, State, and Federal Governments
Plan Goals Addresses:	Prevention, Property Protection, Emergency Services, Environmental Protection, Partnership/Coordination
Priority:	High

Paragonah Flood Mitigation Strategy #1	
Objective:	Protect homes from Red Creek Flood Waters
Action:	Expand the existing Red Creek flood way from the mouth of the canyon to west of I-15. Iron County is responsible from the mouth of the canyon to the town boundary and again after it leaves the town boundary to west of I-15. Paragonah is responsible within the town boundary.
Timeline:	5 years
Estimated Cost:	$2 million
Possible Funding:	Utah Army National Guard 115th Engineer Battalion, 348 East Main Street, Lehi, UT 84043 will contribute equipment and personnel but no cash outlay; Iron County and Paragonah town will purchase necessary materials. Federal loans and grants as available.
Responsible Agencies:	Paragonah, Utah Army National Guard.
Plan Goals Addresses:	Partnership/Coordination, Prevention, Property Protection
Priority:	High

Iron County Flood Mitigation Strategy #1	
Objective:	Minimize future flood damage in throughout the County.
Action:	Nonstructural measures appear to be the most prudent option for the county to implement. Zoning to prevent development of structures near local flood zones, and be in compliance with federal set back standards.
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	Local government operating budget; State and Federal flood and planning grant programs
Responsible Agencies:	Local government
Plan Goals Addressed:	Emergency Services, Partnership/Coordination, Property Protection
Priority:	High

Iron County Flood Mitigation Strategy #2	
Objective:	To reduce flooding risk as it relates to the built environment.

Action:	Address flood control at the building/construction level by requiring all subdivision proposals to have a storm water drainage system.
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	Private funds/ developer.
Responsible Agencies:	Local (Iron County, Cedar City, Parowan City, Paragonah Town), jurisdictional level.
Plan Goals Addressed:	Environmental Protection, Prevention, Property Protection
Priority:	High

Iron County Flood Mitigation Strategy #3	
Objective:	To reduce flooding risk at the community level.
Action:	Clear debris and other material from all waterways.
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	Related public/private property owners.
Responsible Agencies:	Private property owners, irrigation companies, local jurisdictions.
Plan Goals Addresses:	Environmental Protection, Prevention, Property Protection
Priority:	High

Iron County Flood Mitigation Strategy #4	
Objective:	Maintain spring runoff or thundershower waters in the natural and historic Summit Canyon flood channel. Start state 3 and the new strategies west of I-15
Action:	By survey, mark upon the ground the natural channel. Then construct and/or open it up so when necessary it will convey flood waters. Rip-rap may be necessary at some locations. Some easements may be necessary.
Timeline:	Within the next 10 years
Estimated Cost:	$3 million
Possible Funding:	County Public Works and Engineer's budget.
Responsible Agencies:	County Engineer and Public Works personnel.
Plan Goals Addresses:	Environmental Protection, Partnership/Coordination, Prevention
Priority:	High

Iron County Flood Mitigation Strategy #5	
Objective:	Maintain spring runoff or thundershower waters in the natural and historic flood channel.

Action:	By survey, mark upon the ground the natural channel. Then construct and/or open it up so when necessary it will convey flood waters. Rip-rap may be necessary at some locations. Some easements may be necessary.
Timeline:	Within the next 5 years
Estimated Cost:	$5 million
Possible Funding:	County Public Works and Engineer's budget.
Responsible Agencies:	County Engineer and Public Works personnel.
Plan Goals Addresses:	Environmental Protection, Partnership/Coordination, Prevention
Priority:	High

Iron County.Flood Mitigation Strategy #6	
Objective:	Improve flood plain management activities by exceeding the minimum Nation Flood Insurance Program standards. Decrease flood insurance Rates,
Action:	Each community will voluntarily participate in the FEMA Community Rating system which will help to keep communities more safe, reduce flood insurance rates, and improve flood plain management activities. All jurisdictions not participating
Timeline:	Ongoing
Estimated Cost:	Variable
Possible Funding:	Local, State, and Federal Funding Sources
Responsible Agencies:	Local Government
Plan Goals Addressed:	Environmental Protection, Partnership/Coordination, Prevention, Property Protection
Priority:	High

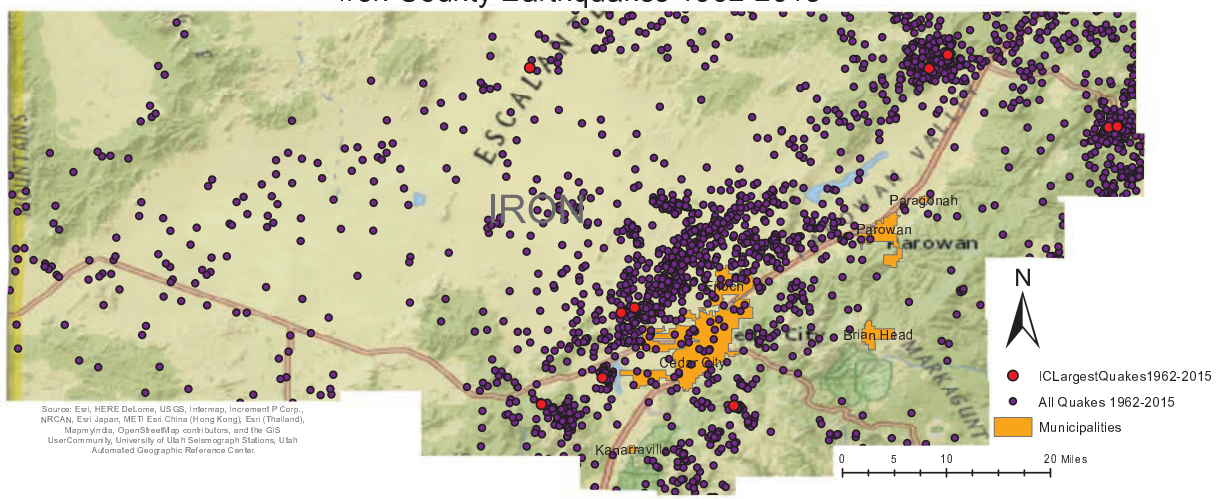
Iron County Flood Mitigation Strategy #7	
Objective:	Reduce flooding along SR-18 near the Shoal Creek/Newcastle Bench area.
Action:	Build and implement flood control measures to protect people and infrastructure and people.
Timeline:	Unknown
Estimated Cost:	Unknown
Possible Funding:	Local, State, and Federal Funding as available
Responsible Agencies:	Local Government
Plan Goals Addressed:	Prevention, Property Protection
Priority:	High

Earthquake

HAZARD RISK ASSESSMENT

An Earthquake releases built up energy when blocks of earth slip past each other. Earthquakes are a frequent occurrence in Iron County but are rarely large enough to be felt. Between 1962-2015 more than 2,000 earthquakes have transpired in the County. While less than 80 of those have been large enough to cause disturbance or be felt, none of the cataloged earthquakes have precipitated severe damage. Despite the lack of significant events in recent years there is still potential for a disastrous quake.

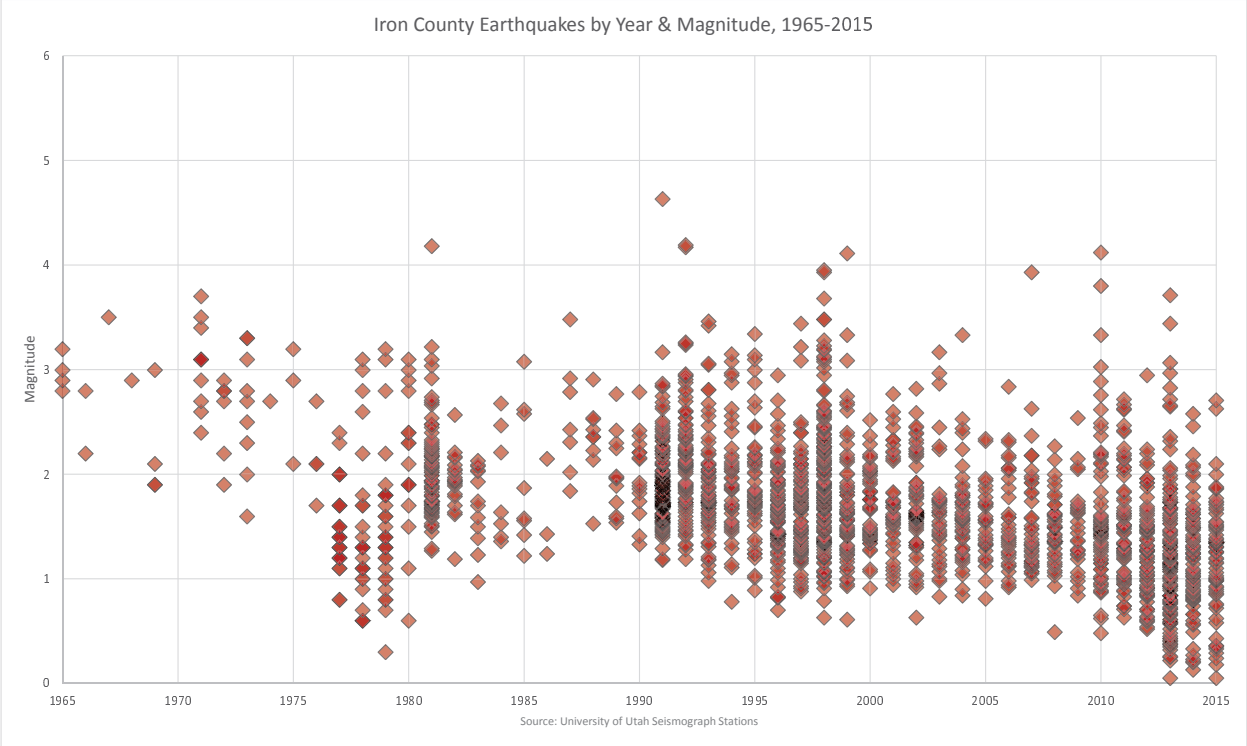
Iron County Earthquakes 1962-2015



Greatest Earthquakes 1962-2015 - Iron County		
Date	**Magnitude**	**Location**
4/20/1991	4.63	12.2 mi. North of Paragonah
6/29/1992	4.19	2.2 mi. Northwest of Cedar City
4/5/1981	4.18	7.2 mi. West-Southwest of Cedar City
6/29/1992	4.17	1.8 mi. Northwest of Cedar City
1/4/2010	4.12	3.8 mi. Southeast of Cedar City
10/22/1999	4.11	13.7 mi. North of Paragonah
1/30/1998	3.95	14.9 mi. East-Northeast of Paragonah
6/18/1998	3.93	15.5 mi. East-Northeast of Paragonah
8/18/2007	3.93	7.1 mi. Northeast of Lund

8/18/2010	3.8	1.3 mi. West of Cedar City
Source: Utah Seismograph Stations/University of Utah, Earthquakes measured using Local Magnitude (ML)		

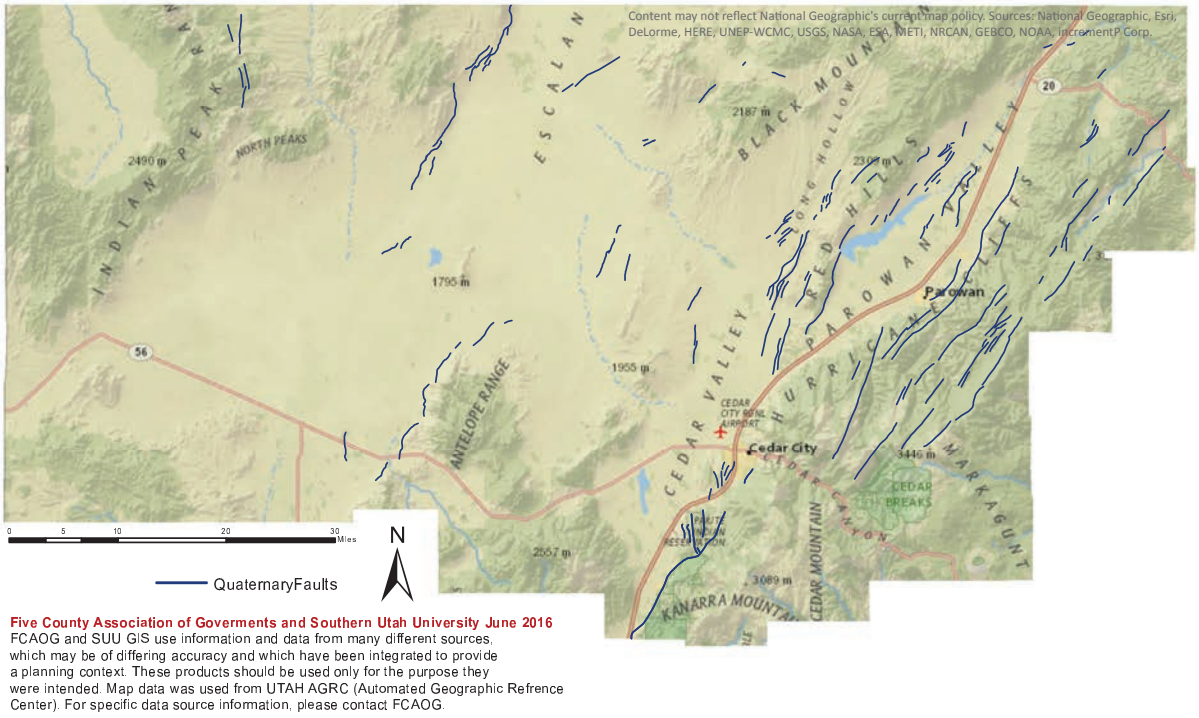
The majority of earthquakes in Garfield County occur right around the Cedar City Enoch area and the SR-95/I-15 interchange. The majority of these quakes are quite small with a median magnitude of 1.66. There have been about 76 earthquakes large enough to be felt, but very few reports on these earthquakes.



*The increasing number of earthquakes by year is likely contributed to more seismograph stations and equipment advances.

Earthquakes are not a predictable hazard. However, Geologic study of the recent geologic past can help reveal what can be expected for the future. The Charts provided depicting recent historical quakes are not intended to indicate the cycle of regional earthquakes and what to expect, but rather, to display that earthquakes are and will continue to be real threat

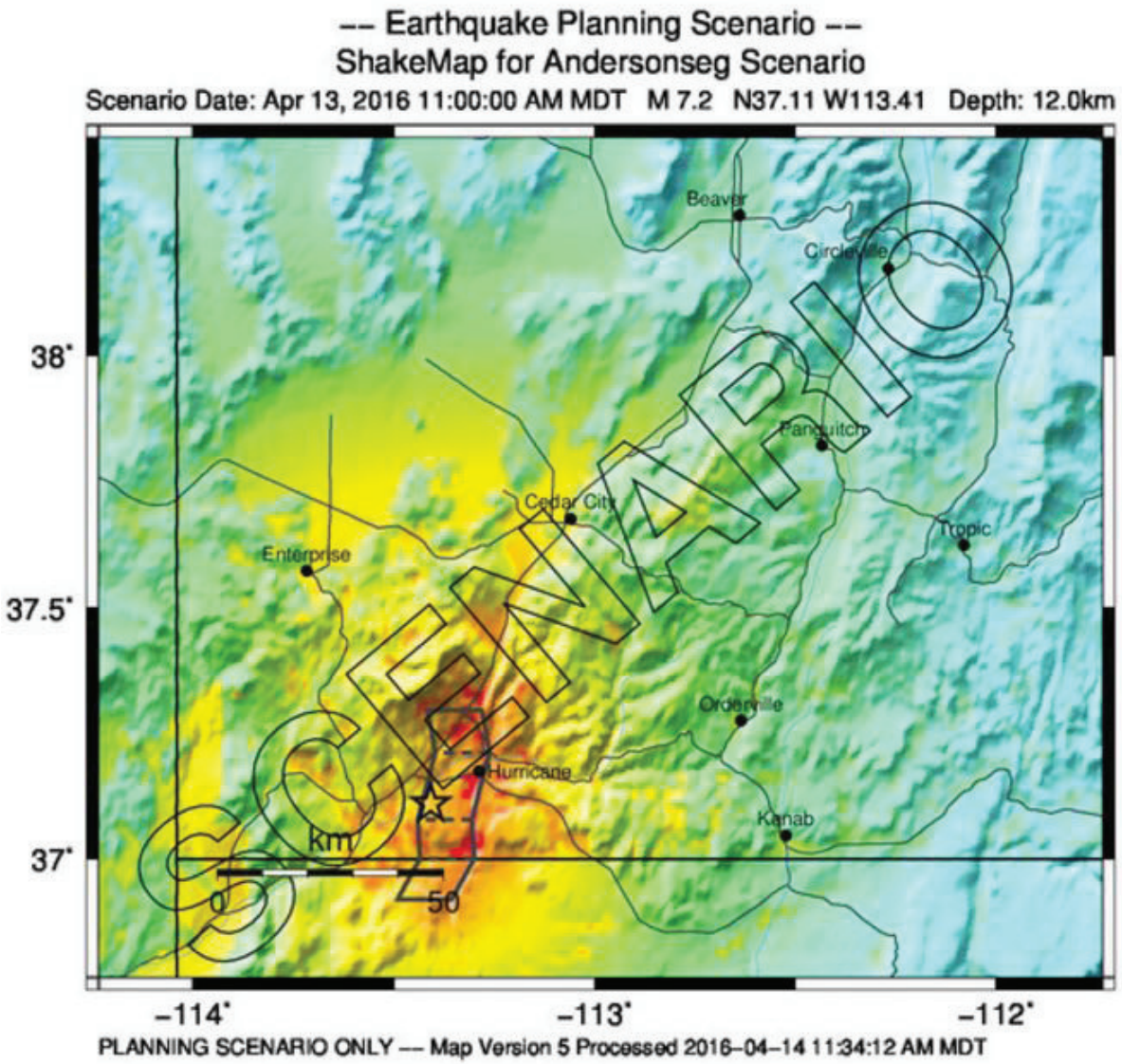
Iron County Fault



Five County Association of Goverments and Southern Utah University June 2016
FCAOG and SUU GIS use information and data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. Map data was used from UTAH AGRC (Automated Geographic Refrence Center). For specific data source information, please contact FCAOG.

The previous mitigation plan included an analysis for all structures within 1,000 feet of a fault. The problem with this type of analysis is that it only accounts for structures within this boundary. ShakeMap scenarios account for ground movement providing a more realistic scenario and analysis of structural damage resulting from an earthquake.

Due to time and resource constraints only one ShakeMap was produced. Because of these limitations the scenario with the fault segment able to produce the largest earthquake near the largest population was selected. In this scenario it is the Anderson Segment of the Hurricane Fault. It is the intent that future mitigation plans will include a ShakeMap scenario specific to Iron Count. In the scenario light to moderate damage will be felt as far north as Cedar City, and very light damage up to the northern border of the county.



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	*<0.1*	*0.5*	*2.4*	*6.7*	*13*	24	44	83	>156
PEAK VEL.(cm/s)	<0.07	0.4	1.9	5.8	*11*	*22*	*43*	*83*	*>160*
INSTRUMENTAL INTENSITY	I	II–III	IV	V	VI	VII	VIII	IX	X+

Scale based upon Wald, et al.; 1999

SUMMARY

Iron County is a geologically active county with over 2,000 earthquakes occurring since 1962. Only about 76 of the quakes have been large enough to be felt. The majority of the earthquakes are clustered around Cedar City and Enoch. There is currently no ShakeMap for Iron County, but the current scenario shows a possibility of a potential of moderate damage as far north as Cedar City.

MITIGATION STRATEGY

Earthquake mitigation strategies include general mitigation actions that agencies are capable of implementing during the next five years, given their existing resources and authorities. In addition to the earthquake mitigation strategies provided herewith, this Natural Hazard Mitigation Plan endorses any seismic mitigation proffered by the Utah Seismic Safety Commission. In particular, numerous and varied earthquake mitigation strategies are provided in *A Strategic Plan for Earthquake Safety in Utah (January, 1995)* completed by the Utah Seismic Safety Commission. It is highly recommended that jurisdictions whom desire to provide more specific earthquake mitigation strategies consult the aforementioned plan, which can be accessed at: http://ussc.utah.gov/.

Iron County Earthquake Mitigation Strategy #1	
Objective:	Promote building safety through non-structural improvements.
Action:	Increase public education related to earthquake hazards by distributing Utah Seismic Safety Commission informational brochures to County and City emergency management agencies.
Timeline:	Ongoing
Estimated Cost:	Very Minimal: request Utah Seismic Safety Commission to deliver brochures; and/or download brochures directly from: http://ussc.utah.gov/
Possible Funding:	County and City operating budget; Utah Seismic Safety Commission operating budget.
Responsible Agencies:	Local, jurisdictional level.
Plan Goals Addresses:	Education/Outreach, Partnership/Coordination
Priority:	Medium

Iron County Earthquake Mitigation Strategy #2	
Objective:	To reduce earthquake risk as it relates to the built environment.
Action:	Continued dedication/vigilance in enforcing the seismic standards established in the International Building Code (IBC).
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	County or City government operating budget (where applicable).
Responsible Agencies:	County or City government (where applicable).
Plan Goals Addresses:	Prevention, Property Protection
Priority:	High

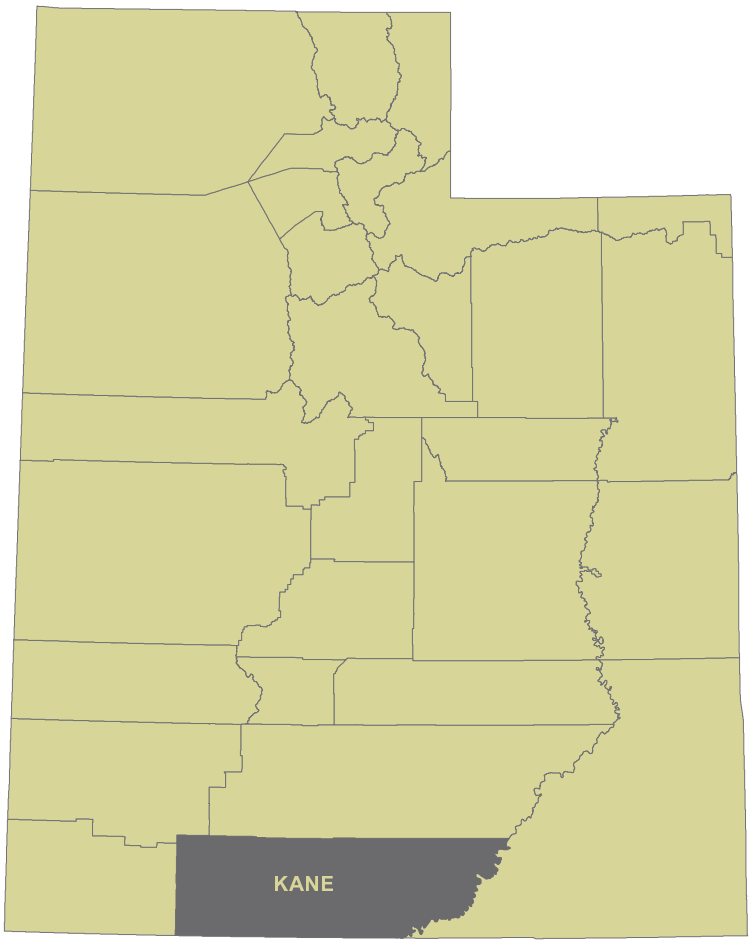
Iron County Earthquake Mitigation Strategy #3

Objective:	To reduce earthquake losses by mapping and identifying earthquake hazard areas.
Action:	**Action 1**-Utilize the Earthquake Risk Map provided in this plan as a tool to assess earthquake risks as it relates to any building/ subdivision proposals. If deemed necessary, jurisdiction should require the builder/developer to conduct a site-specific earthquake hazard identification/mapping study. **Action 2**-At the County level, contract with Utah Geological Survey (UGS) to formally study/map earthquake hazard areas.
Timeline:	**Action 1**-Ongoing **Action 2**- 3 to 5 years
Estimated Cost:	**Action 1**-$1,000 to $5,000 **Action 2**- $7,109 to $14,218 per jurisdiction (1995 cost as reflected in *A Strategic Plan for Earthquake Safety in Utah* adjusted for inflation)
Possible Funding:	**Action 1**-Private funds/ developer. **Action 2**- Local government operating budget; Utah Geologic Survey operating budget.
Responsible Agencies:	Local, jurisdictional level; Private property owner; Utah Geological Survey
Plan Goals Addresses:	**Action 1**-Prevention, Property Protection **Action 2**-Prevention, Property Protection, Partnership/Coordination
Priority:	Low

Kane County



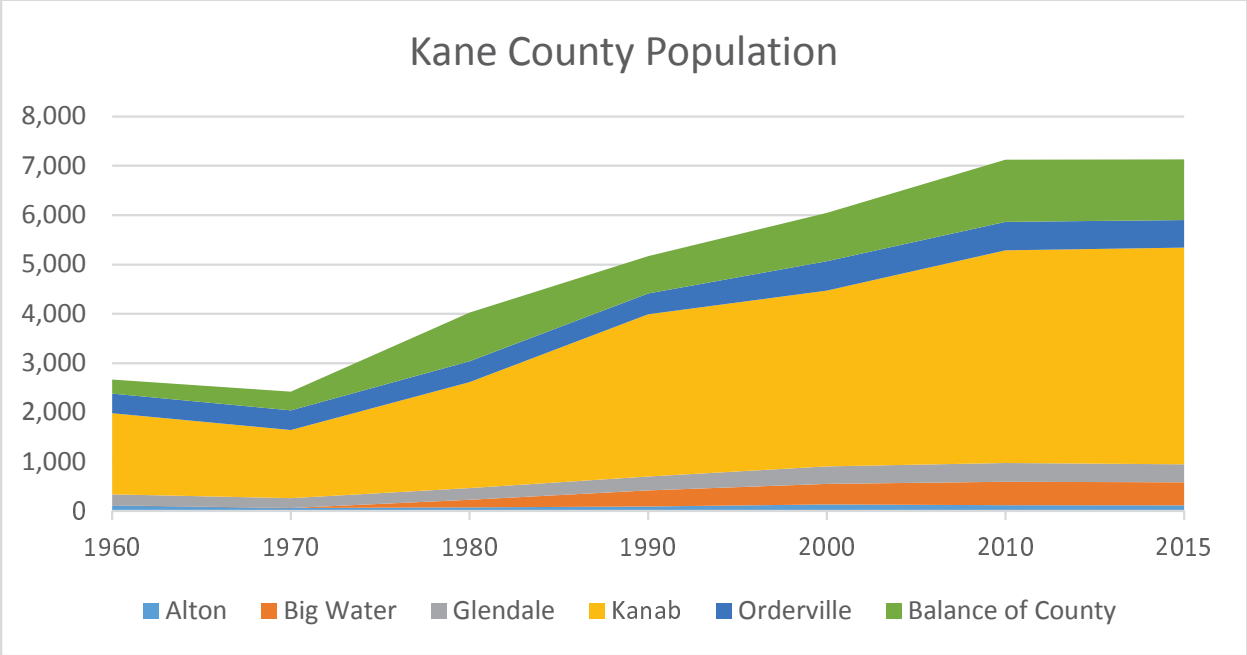
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Demographics

According to the U.S. Census Bureau, the county has a total area of 4,108 square miles. Lake Powell forms the county's eastern border, Arizona lies to the south, to the west is Washington County and on the north lies Garfield County. The Grand Staircase-Escalate National Monument covers much of the county. The rugged mountains and desert provides the county with 360 degrees of breath-taking scenery. Contributing to the beauty includes Parts of Bryce Canyon National Park, Zion National Park, and Glen Canyon National Recreation Area. One defining feature of Kane County is its remote character. Despite the relative remoteness, millions of visitors make their way to the county's myriad of natural attractions.

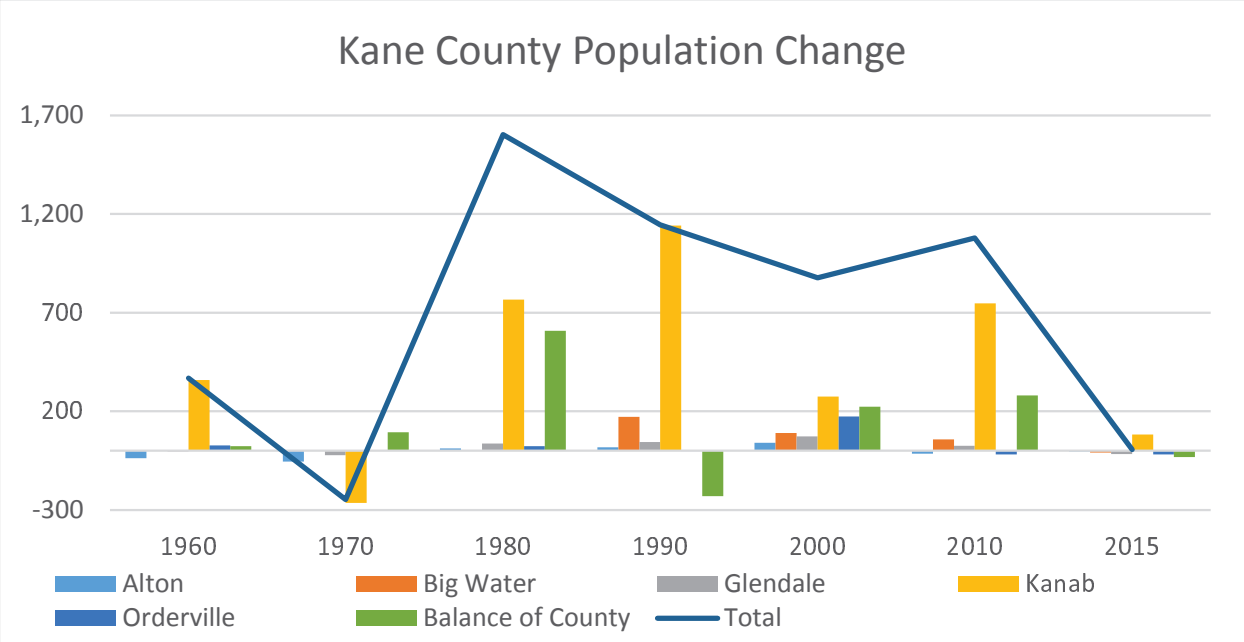
The reasons behind the regions growth are important, but the purpose for analyzing population in this document is to better inform decision makers about how many people could potentially be affected by a natural hazard.



Kane County Population by Incorporated Place							
City/Town	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2015**
Alton	116	62	75	93	134	119	116
Big Water	na	na	154	326	417	475	467
Glendale	223	200	237	282	355	381	365
Kanab	1,645	1,381	2,148	3,289	3,564	4,312	4,394
Orderville	398	399	423	422	596	577	559

Balance of County	285	379	987	757	980	1,261	1,230
Total	2,667	2,421	4,024	5,169	6,046	7,125	7,131
na: City/Town not yet incorporated							
Source: U.S. Census Bureau; Utah History Encyclopedia, Governor's Office of Management & Budget							

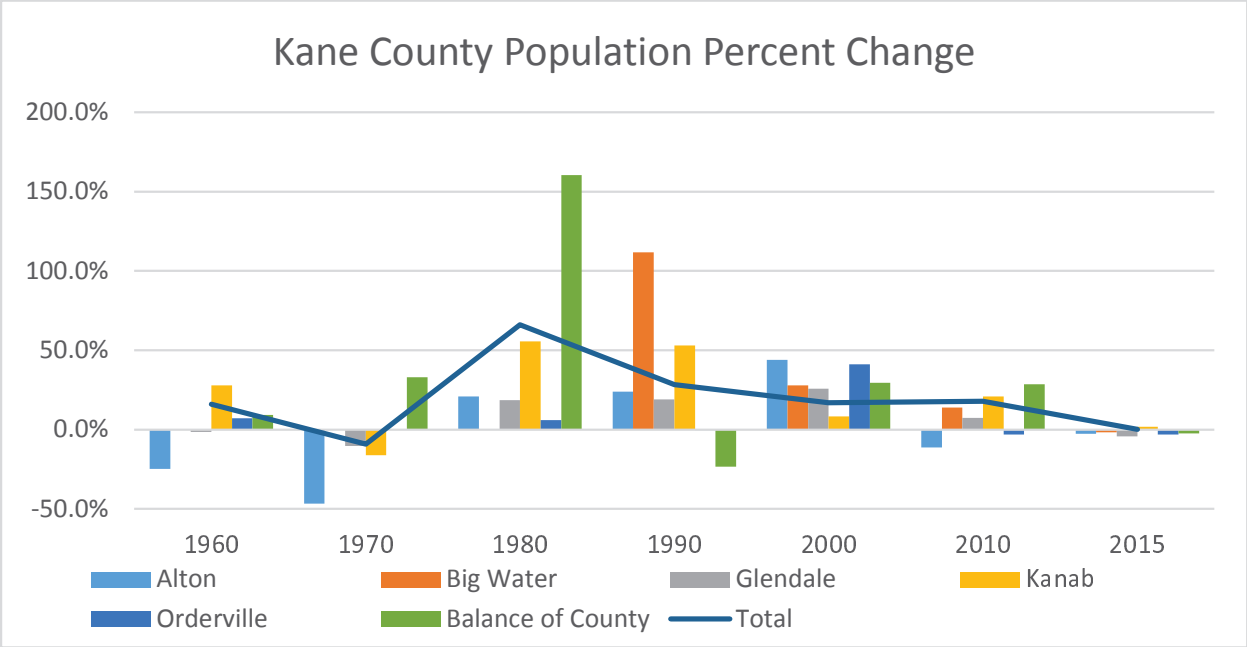
Kane County has increased its population by 4,464 people since 1960. 1980, 1990, and 2010 had the most growth, while 1970 had the least growth from the previous decade. Between 2010 and 2015 Kanab had enough growth to offset the declining population from the rest of the county.



Kane County Population Change							
City/Town	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2015**
Alton	-38	-54	13	18	41	-15	-3
Big Water	na	na	na	172	91	58	-8
Glendale	-3	-23	37	45	73	26	-16
Kanab	358	-264	767	1,141	275	748	82
Orderville	27	1	24	-1	174	-19	-18
Balance of County	24	94	608	-230	223	281	-31
Total	368	-246	1,603	1,145	877	1,079	6
na: Not available							
Source: U.S. Census Bureau; Utah History Encyclopedia, Governor's Office of Management & Budget							

Population change refers to the net increase or decrease of a population for a geographical area. Kane County has been growing relatively steady with 1960 to 1970 being the only decade that had a major population decrease within this study period. The county's population change

trends very closely to Kanab because a large proportion of the county's residents reside within its municipal boundary.



Kane County Population Percent Change							
City/Town	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2015**
Alton	-24.7%	-46.6%	21.0%	24.0%	44.1%	-11.2%	-2.5%
Big Water	na	na	na	111.7%	27.9%	13.9%	-1.7%
Glendale	-1.3%	-10.3%	18.5%	19.0%	25.9%	7.3%	-4.2%
Kanab	27.8%	-16.0%	55.5%	53.1%	8.4%	21.0%	1.9%
Orderville	7.3%	0.3%	6.0%	-0.2%	41.2%	-3.2%	-3.1%
Outside of Jurisdictions	9.2%	33.0%	160.4%	-23.3%	29.5%	28.7%	-2.5%
Total	16.0%	-9.2%	66.2%	28.5%	17.0%	17.8%	0.1%
na: Not available							
Source: U.S. Census Bureau; Utah History Encyclopedia, Governor's Office of Management & Budget							

The percent change is important to look at because it indicates the proportions of population change. For Example, The 54 people that moved out of Alton between 1960 and 1970 accounted for nearly half of Alton's population. While during that same decade Kanab lost 264 people which only accounted for 16% of Kanab's population.

After suffering from out-migration in the 1960's, Kane County has typically experienced faster than average population expansion. However, in the 1990s, Kane County's growth slowed. Between 1990 and 2000 the population grew by 17.2 percent, placing it in the bottom third of Utah's counties. Kane County growth during the 2000s didn't fare much better at only 11%; State of Utah growth for the same time period totaled 27%. The projected population increase from 2010

to 2020 is 26.9%, but the 2015 estimates are not keeping up with this projection. The projected increase in population is not expected to change the rural nature of the County. If the present population pattern continues, most of the population increase is expected to occur in established developed areas of the County.

The Kane County General Plan stipulates, “Intensive, urban-scale uses will be directed to municipalities where basic services can be accommodated. Land use policies and regulations will recognize and respect the constraints which natural hazards present to human use.” Growth as it relates to natural hazard conflicts is further managed through implementation of policy statements which stipulate “The County will address erosion control, salinity control, water quality impacts, and associated concerns when land use proposal are reviewed.” Additionally, the county endeavors to implement “conservation efforts (which) will focus on the rehabilitation of the land base in order to improve the functioning of natural systems for the benefit of residents and visitors.”

KANE COUNTY OVERVIEW

Kane County, located on the western side of the Colorado Plateau, encompasses approximately 3 million acres of some of the most remote and rugged lands in the United States. The county is a land of extremes in elevation, vegetation, precipitation and landscapes. The county is divided into four broad landscapes known from northwest to southeast as the High Southern Plateaus, the Grand Staircase, the Kaiparowits Plateau, and the Colorado River Canyons. Kane County lies across four broad watersheds, all part of the Colorado River system. Less than ten percent of the waterways found within the county are perennial streams.

Steep canyons, limited water, unique and isolated geologic substrates, and large fluctuations in climatic conditions have all influenced the composition, structure, and diversity within the county. Elevations in Kane County range from around 4,000 feet to over 9,000 feet. This wide range of elevation has marked influence on the climate of the County. Precipitation within the county varies from 7 to 18 inches annually. Winter-time precipitation varies from 4 to 12 inches and is the primary source of recharge of ground water systems.



Climate, elevation, and the presence of adequate water have determined the present day land ownership and land use patterns of Kane County. Almost 90 percent of the county land base remains in federal ownership. The land base which is privately owned is located along perennial water courses and at the base of high elevation forests. While agriculture has been an important base of economic activity in Kane County, the total amount of land devoted to agricultural pursuits is relatively minor. However, the majority of BLM and National Forest public lands have been included in livestock grazing allotments.
The construction of Glen Canyon Dam on the Colorado River in the late 1950’s created Lake Powell, as a result several communities surrounding the lake were established. Lake Powell is

a world class attraction which draws millions of visitors each year. Most of these visitors travel through the county to reach the lake. Presently, Kane County is heavily influenced by three major economic sectors: Trade, Services and Government. With Lake Powell and the Grand Staircase Escalante National Monument partially within its border, Kane County relies heavily on tourism. The county is experiencing moderate growth by attracting additional trade and service sector activity to support growing tourist activity. In addition, more and more people are relocating to the county for retirement living.

Problem Soils

HAZARD RISK ASSESSMENT

After reaching out to local governments, and several engineering and construction firms that deal directly with problem soils it is evident that very little data concerning structural damage due to problem soils is tracked recorded and/or reported.

Some mapping of problems soils have been done which helps to indicate where some problem soils lie. There is a chance that problem soils extend beyond the current engineering problem soils layer provided the Utah Automated Geographic Reference Center. As for the data available, below are the values of structures that lie within the problem soils areas for Kane County.

Kane County Problem Soils



Value of Structures at Risk - Problem Soils - Kane County		
Structure Type	Market Value	Number of Structures
Residential	$13,997,003	175
Commercial	$2,175,190	15

Agriculture	$480,764	11
Total	$16,652,957	201
Source: Problem Soils-AGRC, Tax Data-Kane County Tax Assessor, Analysis-SUU GIS Lab		

There is over $16 million of structures within the available hazardous soils map layer. This map is considered out dated, but it is currently the only hazardous soils map available for Kane County. Because detailed soil studies have not been conducted throughout the entire county, one should not assume that problem soils do not exist beyond the extent of this maps soils layer.

SUMMARY

Due to the lack of record keeping there is an undetermined number of structures that have been negatively affected by problem soils within Kane County. Detailed mapping of hazardous soils have not been produced within the county, and current maps indicate 201 structures at risk of problem soils valued at more than $16 million.

MITIGATION STRATEGY

Problem soils can pose a significant risk to the current/future built environment. Many of these risks can be dramatically reduced through proper assessment of the hazard and adherence to applicable mitigation measures. The mitigation strategies listed below identify cost effective measures that will yield measurable benefits toward reducing the risk of problem soils as they relate to the built environment. Further, these mitigation strategies include general actions that agencies are capable of implementing during the next five years, given their existing resources and authorities.

Big Water Problem Soils Mitigation Strategy #1	
Objective:	Minimize ground water contamination.
Action:	Site specific geological soil studies to prevent sewer leech field failures.
Timeline:	Ongoing
Estimated Cost:	$500-$1,500 per Unit
Possible Funding:	Home owners/Developers
Responsible Agencies:	Big Water
Plan Goals Addressed:	Reducing Public Health Hazards
Priority:	High

Kane County Problem Soils Mitigation Strategy #1	
Objective:	Lessen the risk to buildings from problem soils.

Action:	**Action 1**-Address problem soils at the building/construction level by requiring all subdivision proposals to have a geotechnical report. **Action 2**-If jurisdiction does not have trained staff to review the geotechnical report, the jurisdiction can, upon request, have Utah Geological Survey (UGS) perform a review of the report.
Timeline:	Ongoing
Estimated Cost:	$1,000 to $5,000
Possible Funding:	Private funds/ developer; Local government operating budget; Utah Geologic Survey operating budget.
Responsible Agencies:	Local, jurisdictional level; Utah Geological Survey
Plan Goals Addressed:	**Action 1**-Prevention, Property Protection **Action 2**-Partnership/Coordination, Prevention, Property Protection
Priority:	

Kane County Problem Soils Mitigation Strategy #2	
Objective:	Lessen the risk to buildings from collapsible and expansive soils.
Action:	Through mapping, identify areas which contain collapsible and expansive soils. Require soils testing at the building/construction level and ensure that engineer's recommendations are followed.
Timeline:	Ongoing
Estimated Cost:	$1,000 to $5,000
Possible Funding:	Private funds/ developer; Local government operating budget.
Responsible Agencies:	Local (especially Town of Big Water, Kanab City), jurisdictional level.
Plan Goals Addressed:	Prevention, Property Protection
Priority:	

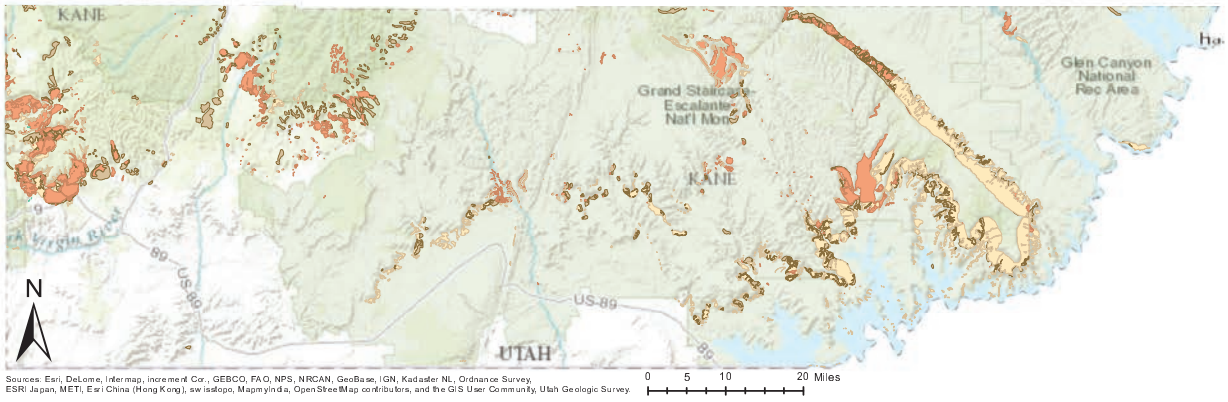


Landslide

HAZARD RISK ASSESSMENT

Landslides are prevalent anywhere there are steep and over steepened slopes, and Kane County is no exception. The Utah geologic Survey has mapped more than 2,800 historic and prehistoric landslides in the area, they are most prominent in and around Fifty Mile Mountain, Crotan Canyon, The Vermilion Cliffs, Clear Creek Mountain, and Paunsaugunt Plateau.

Kane County Landslides



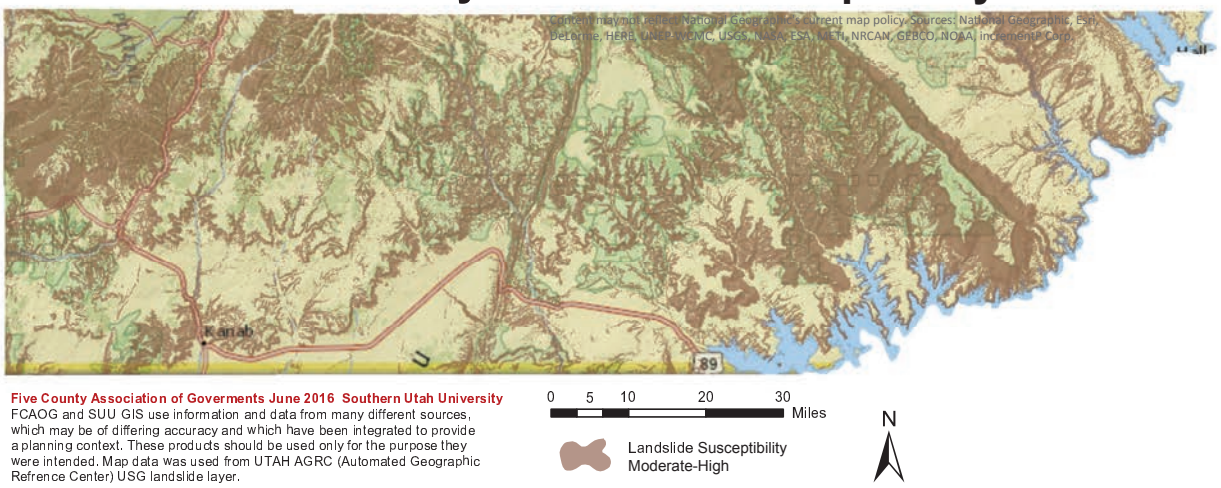
deep or unclassified landslide
landslide and/or landslide undifferentiated from talus, colluvial, rock-fall, glacial, and soil creep deposits
landslide undifferentiated from talus and/or colluvial deposits not classified
shallow landslide

Recording and archiving historic landslides in Utah is a feat that has not been thoroughly compiled into one place. Through the United States Geological Survey (USGS) and other state Surveys a landslide inventory pilot project was put together for several states including Utah for a period of time. Unfortunately the data was only gathered for landslides between 1850-1975 (See Table below). SHELDUS, USGS's Landslide Hazard Program, and NOAA's Storm Events Database are all places that have gathered data regarding recent landslides. Additional links are http://hvri.geog.sc.edu/SHELDUS/ and http://geology.utah.gov/

Kane County Landslides 1850-1978				
Event Year	**Location**	**Landslide Type**	**Cause**	**Source number**
1891	Black Ridge/Kane & Washington County	Landslide	Natural	6
1930	Black Ridge/Kane & Washington County	Landslide	Natural	5
1932	Big Meadow Wash on the Zion-Mt. Carmel Highway	Landslide	Natural	2
1942	Four Miles North of Glendale	Landslide	Natural	2
1947	Zion National Park/Kane or Iron County	Rock Slide	Natural	7
1952	Zion National Park/Kane or Iron County	Debris Flow	Natural	1
1983	Kane County	Landslides	Not specified	SHELDUS
1984	Kane County	Landslides	Not specified	SHELDUS
2005	Kane County	Landslide	Not specified	SHELDUS
2011	Kane County	NCDC Landslide	Not specified	SHELDUS
Source: 1, 2, 5, 6, 7 UGS newspaper reference number, see references & works cited page.				

While there has likely been more landslide occurrences in Kane County over the last 150 years than what is listed in the table above, many unseen and small landslides, or landslides far from communities go unreported. Knowing were landslides happen can help to keep people safe, but more importantly knowing the areas most susceptible to land sliding can keep people out of harm's way. Below is a map of landslide susceptibility In Kane County.

Kane County Landslide Susceptibility



Factors included in assessing landslide risk include built property distribution in the hazard area, the frequency of landslide or debris flow occurrences, slope steepness, and soil characteristics. The Landslide Susceptibility map was created using landslide susceptibility data from the Utah Geological Survey (UGS) and overlaying it with landslide data from the UGS. Areas where landslides exist are often some of the most vulnerable areas for future landslides. The Value of Structures at Risk data was created by overlaying county tax assessor data with moderate to high susceptibility data.

Value of Structures at Risk - Landslide - Kane County		
Type of Structure	**Market Value**	**Number of Structures**
Residential	135,336,912	1,351
Commercial	$78,798,611	54
Agriculture	$536,229	71
Total	**$214,671,752**	**1,476**
Source: Landslide Potential-Utah Geological Survey, Values-Beaver Co. Tax Assessor, Analysis-SUU GIS Lab, Parcels-AGRC		

SUMMARY

Well over 2,000 landslides have been mapped in Kane County, but very few historic landslides have been recorded. Despite the minimal amount of landslides that have occurred and/or have been recorded in the last 150 years, Kane County is home to vast amounts of land that is susceptible to the hazard.

MITIGATION STRATEGY

The mitigation strategies listed below identify cost effective measures that will yield measurable benefits toward reducing the risk of landslide hazards.

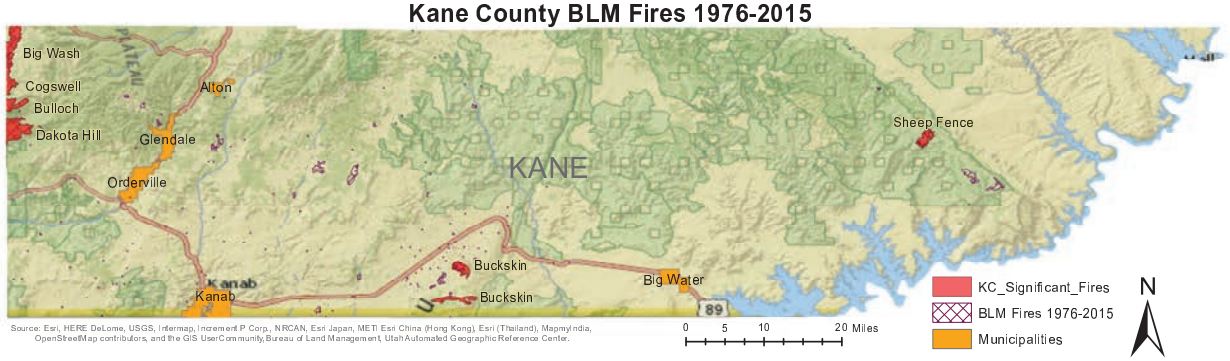
Kane County Landslide Mitigation Strategy #1	
Objective:	Increase the level of knowledge related to landslides.
Action:	Increase public education related to landslide hazards by distributing Utah Geological Survey (UGS) landslide informational brochures to local municipality level emergency management, engineering and planning departments.
Timeline:	Ongoing
Estimated Cost:	Very Minimal: request UGS to deliver brochures; and/or download brochures directly from: http://geology.utah.gov
Possible Funding:	Local, jurisdictional level.
Responsible Agencies:	Local, jurisdictional level.
Plan Goals Addressed:	Education/Outreach, Emergency Services, Partnership/ Coordination, Prevention
Priority:	Medium

Kane County Landslide Mitigation Strategy #2	
Objective:	To reduce landslide risk as it relates to the built environment.
Action:	**Action 1**-Address landslide risk at the building/construction level by requiring all subdivision proposals to have a geotechnical report. **Action 2**-If jurisdiction does not have trained staff to review the geotechnical report, the jurisdiction can, upon request, have Utah Geological Survey (UGS) perform a review of the report. **Action 3**-Drafting/updating zoning and/or landslide ordinances to prevent development of structures near debris flows, landslides, and rock fall areas.
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	Private funds/ developer; Local government operating budget; Utah Geologic Survey operating budget.
Responsible Agencies:	Local, jurisdictional level; Utah Geological Survey
Plan Goals Addressed:	Partnership/Coordination, Prevention, Property Protection
Priority:	High

HAZARD RISK ASSESSMENT

Kane County has not had as large of wildfires in recent history as many of the regions other counties, However, fire is still a real threat as Kane County has seen over BLM 600 fires alone, and many other fires on other agency and private lands. The majority of the fires burned only a few acres or less, but still have the potential to be a threat to the county's population.

Kane County BLM Fires 1976-2015



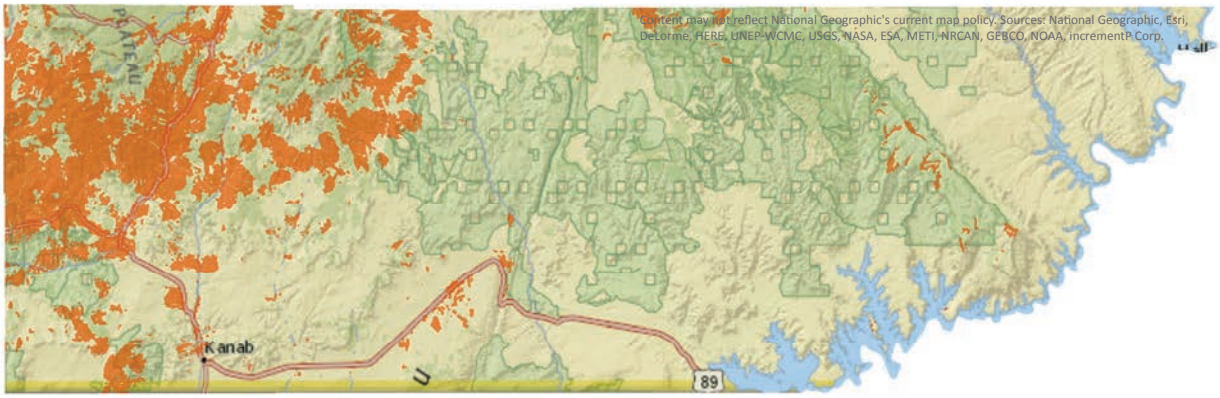
There are many other agencies involved with wildfire that should not be disregarded because they have not been reported in this section. The tables and maps are designed to inform people that fires are a real threat and this map and table should and not be used as a complete history of wildfires in the area.

Significant BLM Wildland Fires 1976-2015 - Kane County			
Fire Name	**Year**	**Acres**	**Other Counties Effected**
Dakota Hill	2007	7,026	Washington
Big Wash	2002	5,253	Iron/Washington
Cogswell	1997	4,385	Washington
Bulloch	1994	1,762	Washington
Buckskin	2006	1,437	none
Sheep Fence	2004	1,204	none
Buckskin	1998	1,108	none
Source: Bureau of Land Management			

Big Wash is not the largest known fire in Kane County, but it is considered significant because approximately 40 people had be evacuated and more than 30 homes were threatened by the fire. This fire is a good example of the wildfire costs because at just over 5,000 burned acres the suppression costs reached over a million dollars.

The following provides a summarization of fire threat in Kane County. Fire threat is defined as the likelihood of an acre burning.

Kane County Fire Threat



Value of Structures at Risk - Wildfire - Kane County		
Type of Structure	**Market Value**	**Number of Structures**
Residential	$114,697,339	1,215
Commercial	$22,926,337	56
Agriculture	$8,049,421	63
Total	$145,673,097	1,334
Source: Utah Department of Natural Resources, Kane County Tax Assessor, SUU GIS Lab		

The analysis of structures at risk is defined by how many structures are within the medium to extreme fire threat boundary.

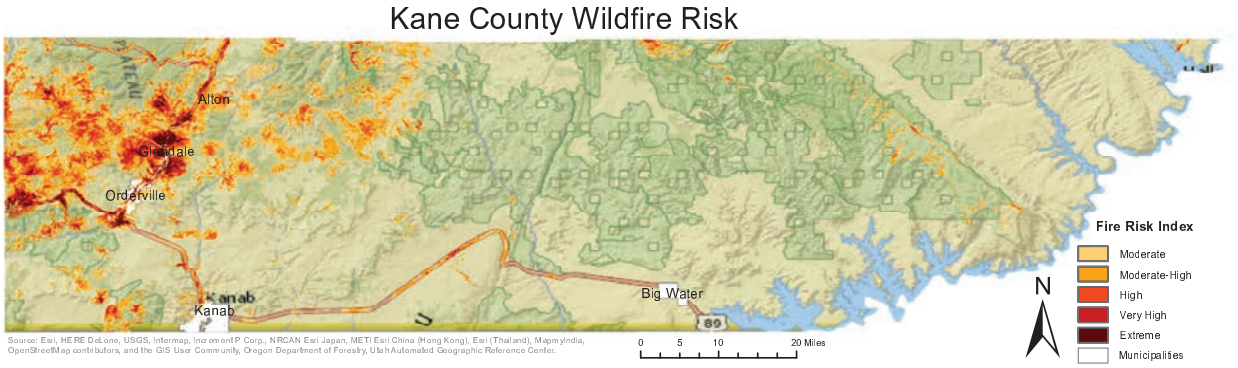
Infrastructure at Risk - Kane County	
Infrastructure	**Miles**
Major Roads	224.7
Rail	0
Transmission Lines	177.5
Source: Utah AGRC	

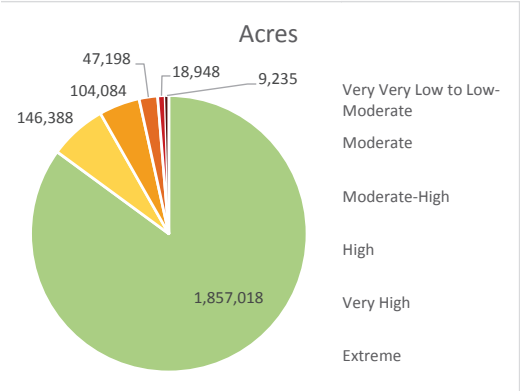
In addition to structures located within a defined hazard area, there is also an overwhelming amount _in terms of quantity and value) of infrastructure that is not captured by this analysis. This is in large part due to the fact that compilation of this data would be exhaustive; nevertheless, the following provides a summarization of additional infrastructure at risk from wildfire.

Miles of major roads were calculated using road centerline data. The types of roads used for the Major roads include: Interstates; US Highway, Separated; US Highway, Unseparated; Major State Highway, Separated; Major State Highway, Unseparated; Other State Highway, (Institutional); Ramps, Collectors; Major Local Roads, Paved.

The following provides a summarization of fire risk in Iron County. Fire risk "represents the possibility of loss or harm occurring from a wildfire." (Oregon Department of Forestry) The county risk assessment values are based on suppression difficulty, wildland development areas, forest

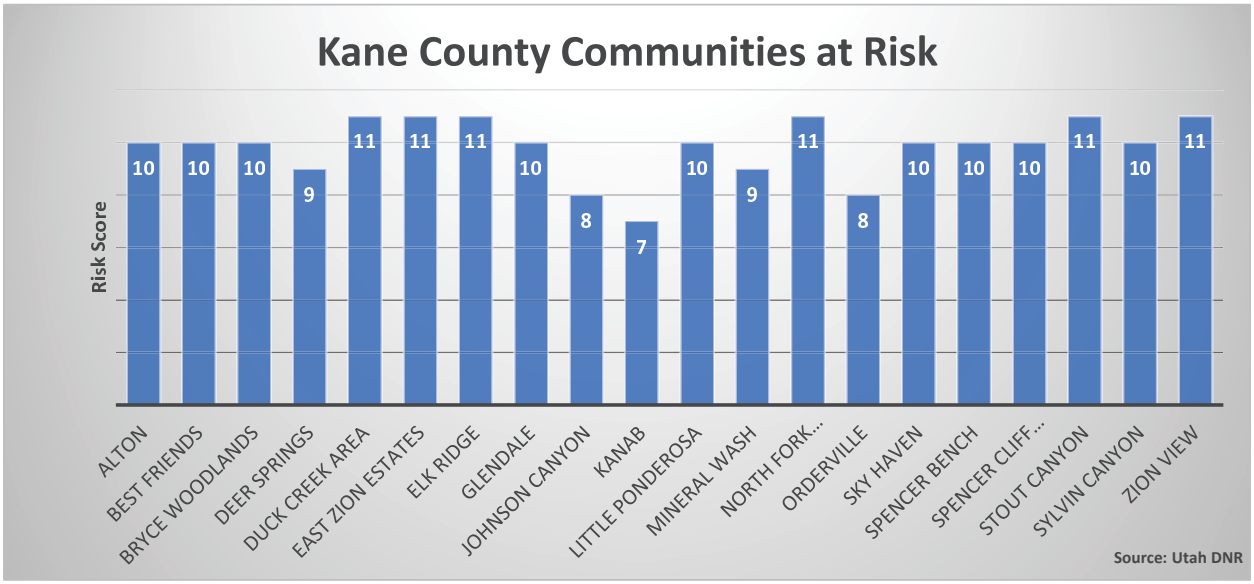
assets, drinking water importance areas (watersheds), and infrastructure assets.





The areas between Alton, Mt. Carmel Junction, and Zion National Park have the highest risk of loss or harm occurring from a wildfire. Even though this is not the most populated area of Kane County, the risk is high in this area because it contains some of the highest drinking water importance in the county. For this reason the drinking water is most likely to be impacted in the instance of wildfire.

The following is a summary of the Kane County Communities at Risk



Each community's risk in the county was determined using four categories, each category received a score between one and three, one being the lowest risk and three being the highest. When the scores are added together the minimum a community can receive is a three while the maximum score is twelve. The categories are Fire Occurrence, Fuel Hazards, Values Protected, and Fire

Protection Capability.

SUMMARY

Hundreds of wildfires have occurred in Kane County including many fires that engulfed several thousand acres. Wildfire threat is ubiquitous in Iron County putting more than 1,300 structures at risk valued at just over $145 million. Additional assets at risk include hundreds of miles of roads, rail, and transmission lines; as well as wildland development areas, forest assets, riparian assets, and drinking water importance areas. There are currently 20 communities at risk from wild fire, 14 of which have scores that indicate high risk.

MITIGATION STRATEGY

Kane County Wildfire Mitigation Strategy #1	
Objective:	Promote public awareness campaign for property owners living in Wildland-Urban Interface areas. Work along with Home Owners associations.
Action:	Mailings; Printed Information; Public Service Announcements; Comply with the Wildland-Urban Interface Code (WUI)
Timeline:	Ongoing
Estimated Cost:	Unknown
Possible Funding:	State and Federal wildfire grant programs,
Responsible Agencies:	State and Federal government, Forestry Fire and State Lands, Local HOA's, Cedar Mountain Fire Protection District.
Plan Goals Addressed:	Education/Outreach, Partnership/Coordination, Prevention, Property Protection
Priority:	High

Kane County Wildfire Mitigation Strategy #2	
Objective:	Fuels reduction and defensible space tactics.
Action:	Continue interagency fuels projects, education, and mitigation throughout the focus area.
Timeline:	Ongoing
Estimated Cost:	Unknown
Possible Funding:	Local government operating budget; Special Service District operating budget, forestry Fire, and State Lands.
Responsible Agencies:	Community & local government entities (especially Alton Town, Glendale Town, Orderville Town), private property owner,
Plan Goals Addressed:	Education/Outreach, Partnership/Coordination, Prevention, Property Protection
Priority:	High



Kane County Wildfire Mitigation Strategy #3	
Objective:	Ameliorate access concerns.
Action:	**Action 1**-Increase ingress/egress into private property/subdivisions. **Action 2**-Coordinate the roadwork being done by private land owners with the work being done by the National Park Service and the Bureau of Land Management.
Timeline:	Unknown (dependent upon available funding)
Estimated Cost:	Unknown
Possible Funding:	Local government operating budget; Special Service District operating budget; private property owner; Federal Government
Responsible Agencies:	Community & Local, and Federal government entities; private property owner
Plan Goals Addressed:	**Action 1**-Emergency Services, Partnership/Coordination, Prevention, Property Protection **Action 2**-Emergency Services, Partnership/Coordination, Prevention, Property Protection
Priority:	High



Flood

HAZARD RISK ASSESSMENT

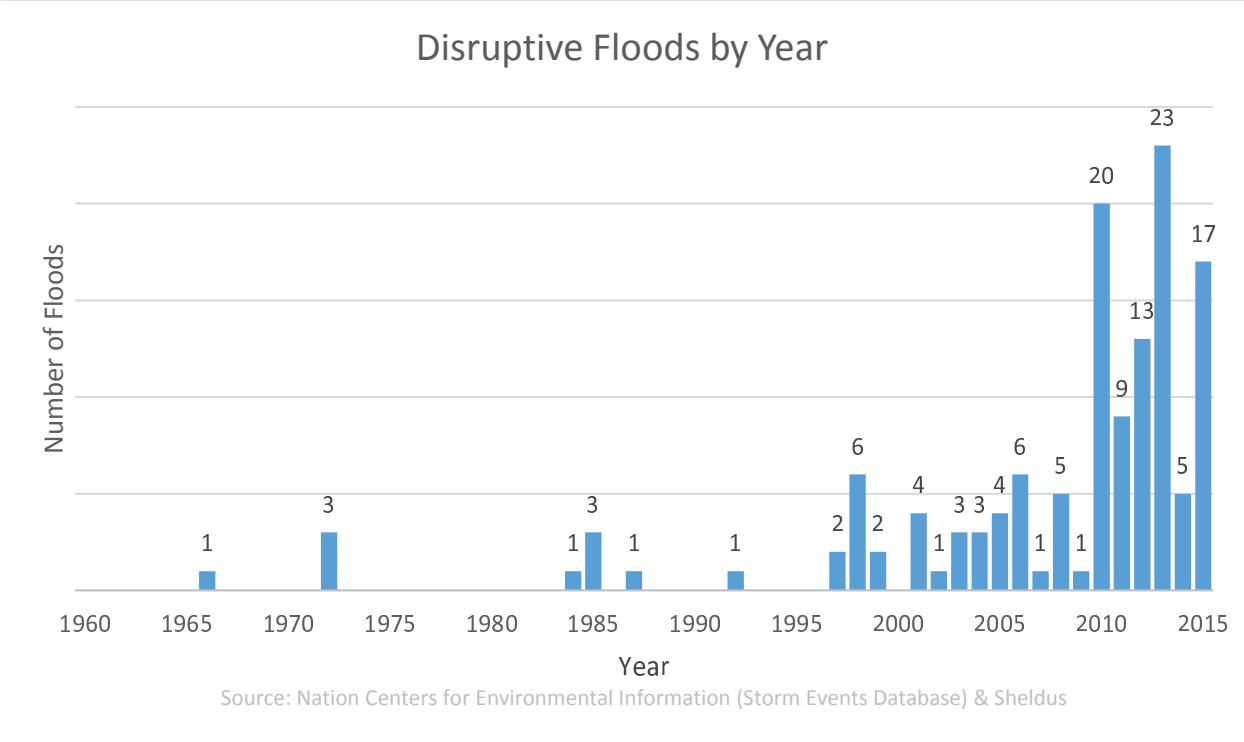
Since 1960 there have been 135 flooding events which caused disturbance in Kane County recorded in the National Centers for Environmental Information's Events Database and in the Spatial Hazard Events and Losses Database for the United States. (SHELDUS) This only accounts for a portion of flooding throughout the county as floods go unreported/undocumented every year. The following table lists some of the most significant floods with quantitative values associated with the event. The list is in a numerical descending order with deaths and injuries listed as the most significant followed by property damage and crop damage.

Significant Floods - 1960-2015 - Kane County						
LOCATION	**BEGIN DATE**	**EVENT TYPE**	**DEATHS**	**INJURIES**	**ESTIMATED PROPERTY DAMAGE**	**ESTIMATED CROP DAMAGE**
Glen Canyon	9/5/1998	Flash Flood	1	0	$0	$3,000



Kanab/Orderville/ Glendale	12/19/2010	Flood	0	0	$800,000	$0
Grand Staircase/Kanab/ Zion National park	9/10/2013	Flood	0	0	$185,000	$0
Johnson Canyon	8/22/2003	Flash Flood	0	0	$50,000	$0
Wahweap Creek	6/6/2015	Flash Flood	0	0	$50,000	$0
Kanab	9/1/1998	Flash Flood	0	0	$30,000	$2,000
Kanab	9/11/1997	Flash Flood	0	0	$30,000	$0
Croton Canyon/Grand Staircase-Escalante	7/29/2010	Flash Flood	0	0	$20,000	$0
Wahweep Wash/ Johnson Canyon	10/5/2010	Flood	0	0	$20,000	$0
Big Water/Wahweap Creek	6/5/2015	Flash Flood	0	0	$20,000	$0
Wahweap Creel/Paria	10/5/2006	Flash Flood	0	0	$15,000	$0

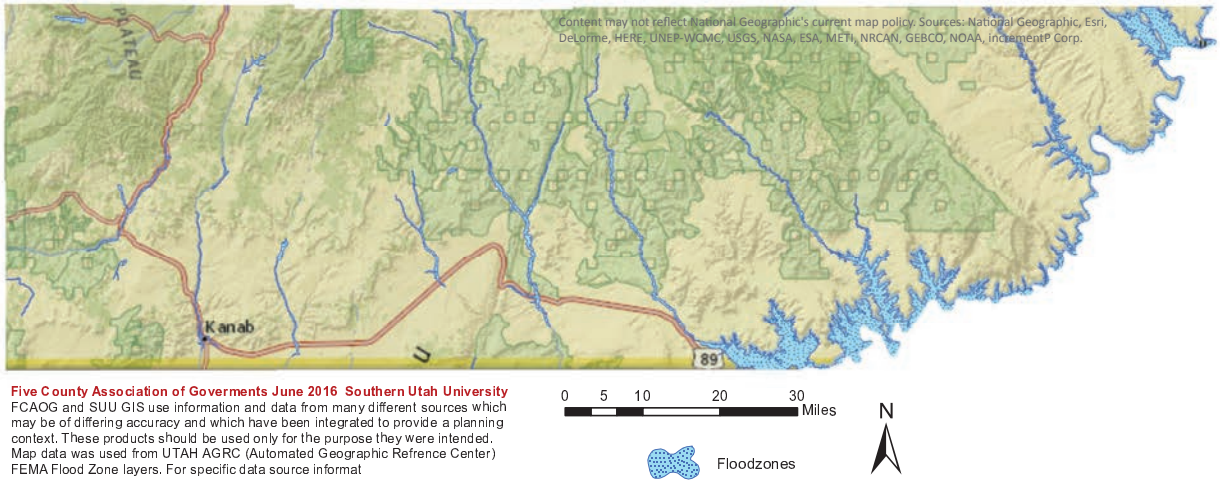
Source: NOAA-National Centers for Environmental Information (Storm Events Database)



The number of disruptive floods have increased significantly during and after the mid 1990's. The data provided does not indicate why this is occurring, so in order to prevent speculation, a study should be conducted to further understand all the reasons behind disruptive flooding events in Kane County.

The following depicts FEMA's 100 year flood plain in Kane County and a brief analysis of structures at risk.

Kane County Flood Zone



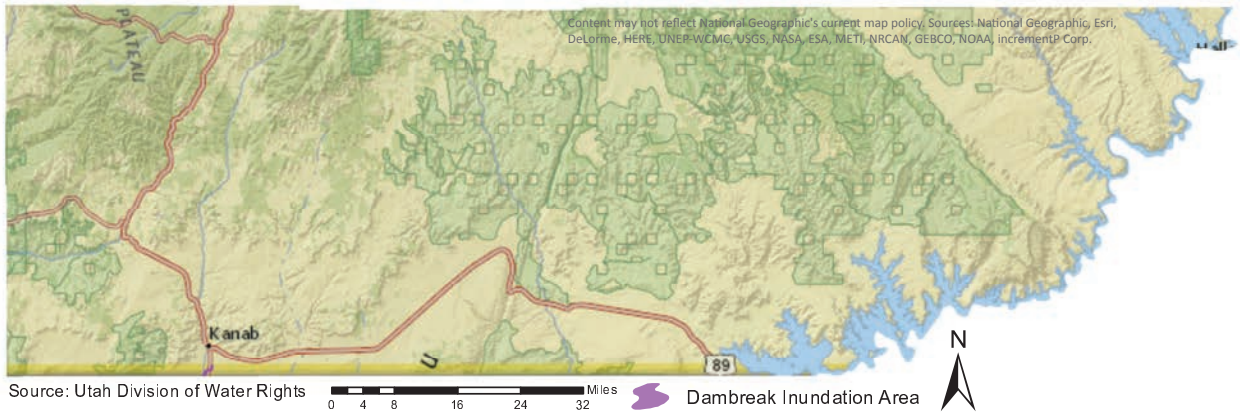
Value of Structures at Risk - Flood - Kane County		
Structure Type	**Market Value**	**Number of Structures**
Residential	$32,810,419	288
Commercial	$11,078,175	39
Agriculture	$1,958,709	47
Total	$45,847,303	374
Source:		

Dam failure has the potential to cause significant flooding and damage to communities downstream. The Utah Division of Water Rights and the state engineer list the dam hazard ranking to help communities understand the risk of dam failure inundation. The Hazard classification of dam risk is determined by the threat to human life and property damage in the event that a dam fails. The hazard ratings of inspected dams for moderate and high risk dams are listed on the following table.

Kane County Dam Hazard Classification			
Dam Name	**Hazard**	**Dam Name**	**Hazard**
ALTON RESERVOIR	HIGH	KANAB CITY-TOM'S CANYON FLOOD CONTROL	HIGH
JACKSON FLAT RESERVOIR	HIGH	DUCK CREEK	MOD

Source: Utah Division of Water Rights-Dam Safety Database Information Viewer

Kane County Dam Break Inundation Areas



The mapped dam inundation zones are minor as the only area cuts through a small portion of Kanab's airport and SR-89.

The following is provides a list of communities participating in the National Flood Insurance Program, FEMA's repetitive flood claims, and other FEMA claims.

There are NO REPETITIVE FLOOD CLAIMS in Kane County.

Communities Participating in the National Flood Insurance Program (FEMA)				
Community	**Initial FHBM Identified**	**Initial FIRM Identified**	**Current Effective Map Date**	**Reg-Emerg Date**
Alton	No Data	No Data	(NSFHA)	7/10/1985
Glendale	4/2/1976	5/1/1986	5/1/1986(L)	5/1/1986
Kanab	10/29/1976	8/19/1985	8/19/1985(M)	8/19/1985
Kane County	1/10/1978	7/1/1986	7/1/1986(L)	7/1/1986
Orderville	2/4/1977	No Data	(NSFHA	2/2/1984
FIRM - Flood Insurance Rate Map FHBM - Flood Hazard Boundary Map		(M) - No Elevation Determined Zones A,C,X NSFHA - No Special Flood Hazard Area, Zone C (L) - Original FIRM by Letter Zone A,C,X		
Source: FEMA National Flood Insurance Program Community Status Book Feb/2016				

All of the communities in Kane County are participating in the National Flood Insurance Program with the exception of Big Water, which is not listed as not participating or participating.

(Claims) FEMA Loss Statistics from Jan 1/1978 through Nov/30/2015 - Kane County					
Community Name	**Total Losses**	**Closed Losses**	**Open Losses**	**CWOP Losses**	**Total Payments**

Kane County	4	2	0	2	$20,587.41
Total	**4**	**2**	**0**	**2**	**$20,587.41**

Total Losses - All losses submitted regardless of the status.
Closed Losses - Losses that have been paid.
Open Losses - Losses that have not been paid.
CWOP Losses - Losses that have been closed without payment.
Total Payment - Total amount paid on losses.

Source: FEMA Policy and Claim Statistics for Flood Insurance

A total of four FEMA flood claims have been tallied in the county, totaling $20,587. There have been no claims in the county's incorporated municipalities.

SUMMARY

One hundred thirty-five flooding events have occurred and/or have been recorded in Kane County over the last half century. The recorded data indicates one death, zero injuries, and well over $1 million in property and crop damage. FEMA's 100 year flood areas are mapped along waterways in and near most of the towns and recreation areas in Kane County. Other flood ways include dam inundation zones which run through a small portion of Kanab. There are currently 374 structures valued at more than $45 million in the 100 year flood plains.

There are no FEMA repetitive flood claims in the county and the communities participating in the National Flood Insurance Program are Alton, Glendale, Kanab, Orderville, and Kane County. Since 1978 there have been four FEMA flood claims valued at more than $20,000.

MITIGATION STRATEGY

Kanab Flood Mitigation Strategy #1	
Objective:	Minimize flood damage in Kanab and the surrounding development.
Action:	Construct a levee along the creek through the north and east part of town, a distance of about 8,000 ft.
Timeline:	Contingent on funding
Estimated Cost:	$610,000
Possible Funding:	Local government operating budget, state and federal flood programs
Responsible Agencies:	Kanab
Plan Goals Addressed:	Prevention, Property Protection
Priority:	High

Kanab Flood Mitigation Strategy #2	
Objective:	Minimize flood damage in Kanab and the surrounding development.
Action:	Install adequate storm drainage for excess flows
Timeline:	Contingent on funding

Estimated Cost:	$1.5 million
Possible Funding:	Local government operating budget, state and federal flood programs
Responsible Agencies:	Kanab
Plan Goals Addressed:	Prevention, Property Protection
Priority:	High

Kanab Flood Mitigation Strategy #3	
Objective:	Minimize future flooding along Stout Canyon Road, House Rock Road, Barracks Road, and Spring Drive
Action:	Build and implement flood control measures, and infrastructure.
Timeline:	Unknown
Estimated Cost:	Unknown
Possible Funding:	Local, State, and Federal Funding as available
Responsible Agencies:	Kanab
Plan Goals Addressed:	Prevention, Property Protection
Priority:	Medium

Kanab Flood Mitigation Strategy #4	
Objective:	City Wide Flood Control
Action:	Build and implement flood control measures, and infrastructure.
Timeline:	Unknown
Estimated Cost:	Unknown
Possible Funding:	Local, State, and Federal Funding as available
Responsible Agencies:	Kanab
Plan Goals Addressed:	Prevention, Property Protection
Priority:	Medium

Kanab Flood Mitigation Strategy #5	
Objective:	Flood Control in Pugh Canyon near the Kanab Golf Course.
Action:	Build and implement flood control measures, and infrastructure.
Timeline:	5 years
Estimated Cost:	$1.9 million
Possible Funding:	Local, State, and Federal Funding as available
Responsible Agencies:	Kanab
Plan Goals Addressed:	Prevention, Property Protection
Priority:	High

Kanab Flood Mitigation Strategy #6	
Objective:	Flood Control in the Ranchos Subdivision area
Action:	Build and implement flood control measures, and infrastructure.
Timeline:	5 years
Estimated Cost:	$3.6 million
Possible Funding:	Local, State, and Federal Funding as available
Responsible Agencies:	Kanab
Plan Goals Addressed:	Prevention, Property Protection
Priority:	High

Kane County Flood Mitigation Strategy #1	
Objective:	Minimize future flood damage in the unincorporated County.
Action:	Nonstructural measures appear to be the most prudent option for the county to implement. Zoning to prevent development of structures near all rivers, creeks, and lakes (100' min. setback).
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	Local government operating budget; State and Federal flood and planning grant programs
Responsible Agencies:	Local government
Plan Goals Addressed:	Emergency Services, Partnership/Coordination, Property Protection
Priority:	High

Kane County Flood Mitigation Strategy #2	
Objective:	To reduce flooding risk as it relates to the built environment.
Action:	Address flood control at the building/construction level by requiring all subdivision proposals to have a storm water drainage system.
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	Private funds/ developer.
Responsible Agencies:	Local (especially Kanab City, Orderville Town, Glendale Town), jurisdictional level.
Plan Goals Addressed:	Environmental Protection, Prevention, Property Protection
Priority:	High

Kane County Flood Mitigation Strategy #3	
Objective:	To reduce flooding risk at the community level.
Action:	Clear debris and other material from all waterways.

Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	Related public/private property owners.
Responsible Agencies:	Private property owners, irrigation companies, local jurisdictions.
Plan Goals Addressed	Environmental Protection, Prevention, Property Protection
Priority:	High

Kane County Flood Mitigation Strategy #4	
Objective:	Promote participation in the National Flood Insurance Program (NFIP) throughout the county.
Action:	Create outreach document promoting flood insurance and include in local newspaper(s), libraries, and other public buildings.
Timeline:	1 year
Estimated Cost:	Minimal
Possible Funding:	Local government operating budget; State and Federal flood grant programs
Responsible Agencies:	County Floodplain Administrator, State Floodplain Manager, Department of Homeland Security.
Plan Goals Addressed:	Education/Outreach, Partnership/Coordination, Prevention, Property Protection
Priority:	High

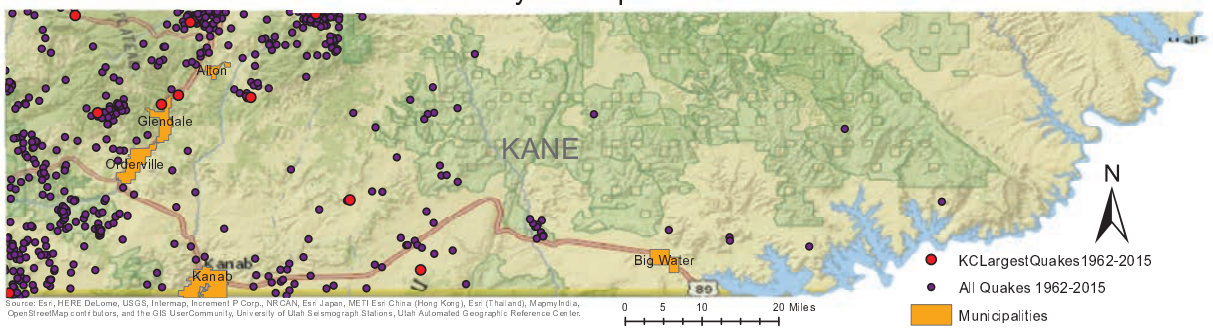
Kane County Flood Mitigation Strategy #5	
Objective:	Improve flood plain management activities by exceeding the minimum Nation Flood Insurance Program standards. Decrease flood insurance Rates.
Action:	Each community will voluntarily participate in the FEMA Community Rating system which will help to keep communities more safe, reduce flood insurance rates, and improve flood plain management activities.
Timeline:	Ongoing
Estimated Cost:	Variable
Possible Funding:	Local, State, and Federal Funding Sources
Responsible Agencies:	Local Government
Plan Goals Addressed:	Environmental Protection, Partnership/Coordination, Prevention, Property Protection
Priority:	High

Earthquake

HAZARD RISK ASSESSMENT

An Earthquake releases built up energy when blocks of earth slip past each other. Earthquakes are a frequent occurrence in Kane County but are rarely large enough to be felt. Between 1962 and 2015 more than 500 earthquakes have transpired in the County. While a small handful of those have been large enough to cause disturbance, none of the cataloged earthquakes have precipitated severe damage. Despite the lack of significant events in recent years there is still potential for a disastrous quake.

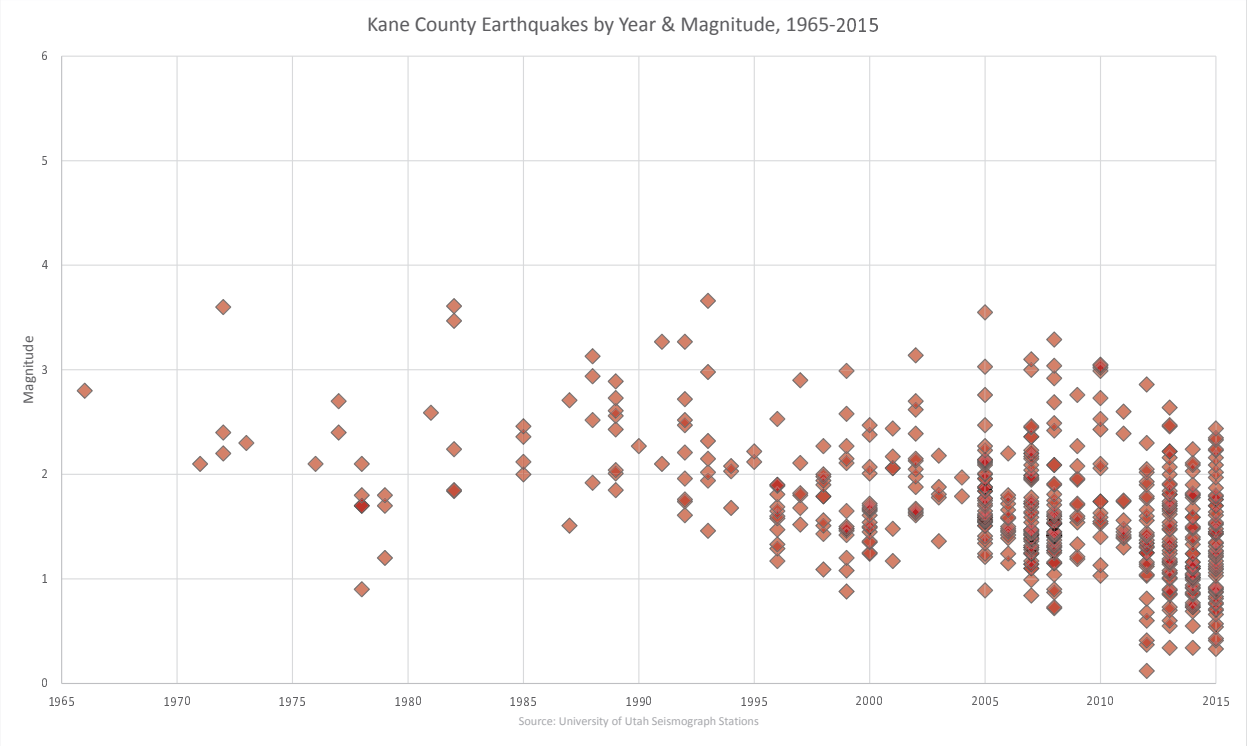
Kane County Earthquakes 1962-2015



Greatest Earthquakes 1962-2015 - Kane County		
Date	**Magnitude**	**Location**
5/27/1993	3.66	21.1 mi. East of Kanab
3/5/1982	3.61	0.3 mi. Northwest of Glendale
11/16/1972	3.6	14.5 mi. Northwest of Glendale
6/24/2005	3.55	6.2 mi. North-Northwest of Alton
2/12/1982	3.47	0.1 mi. North of Glendale
8/28/2008	3.29	10.8 mi. Northeast of Alton
7/24/1991	3.27	4.4 mi. Southeast of Alton
9/19/1992	3.27	15.7 mi. Northeast of Kanab
1/8/2002	3.14	4.8 mi. West of Glendale
1/2/1988	3.13	17.6 mi. West of Kanab
Source: Utah Seismograph Stations/University of Utah, Earthquakes measured using Local Magnitude (ML)		

The majority of earthquakes in Kane County occur on the western side of the county between Alton and the southwest corner of the county. The majority of these quakes are quite small with a median magnitude of 1.61. There have been about 18 earthquakes large enough to be felt,

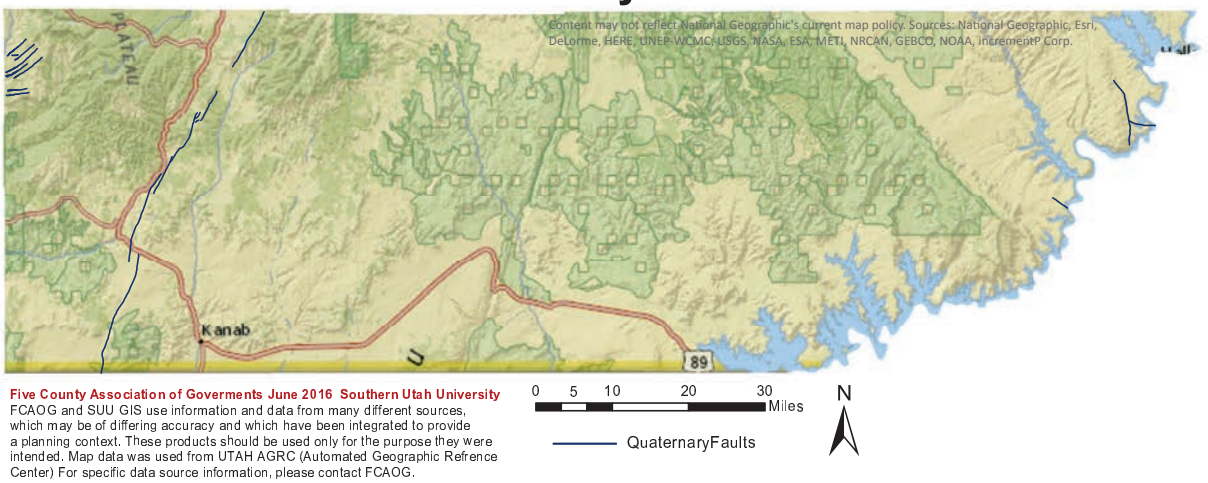
but there are very few reports on these quakes.



*The increasing number of earthquakes by year is likely contributed to more seismograph stations and equipment advances.

Earthquakes are not a predictable hazard. However, Geologic study of the recent geologic past can help reveal what can be expected for the future. The Charts provided depicting recent historical quakes are not intended to indicate the cycle of regional earthquakes and what to expect, but rather, to display that earthquakes are and will continue to be real threat.

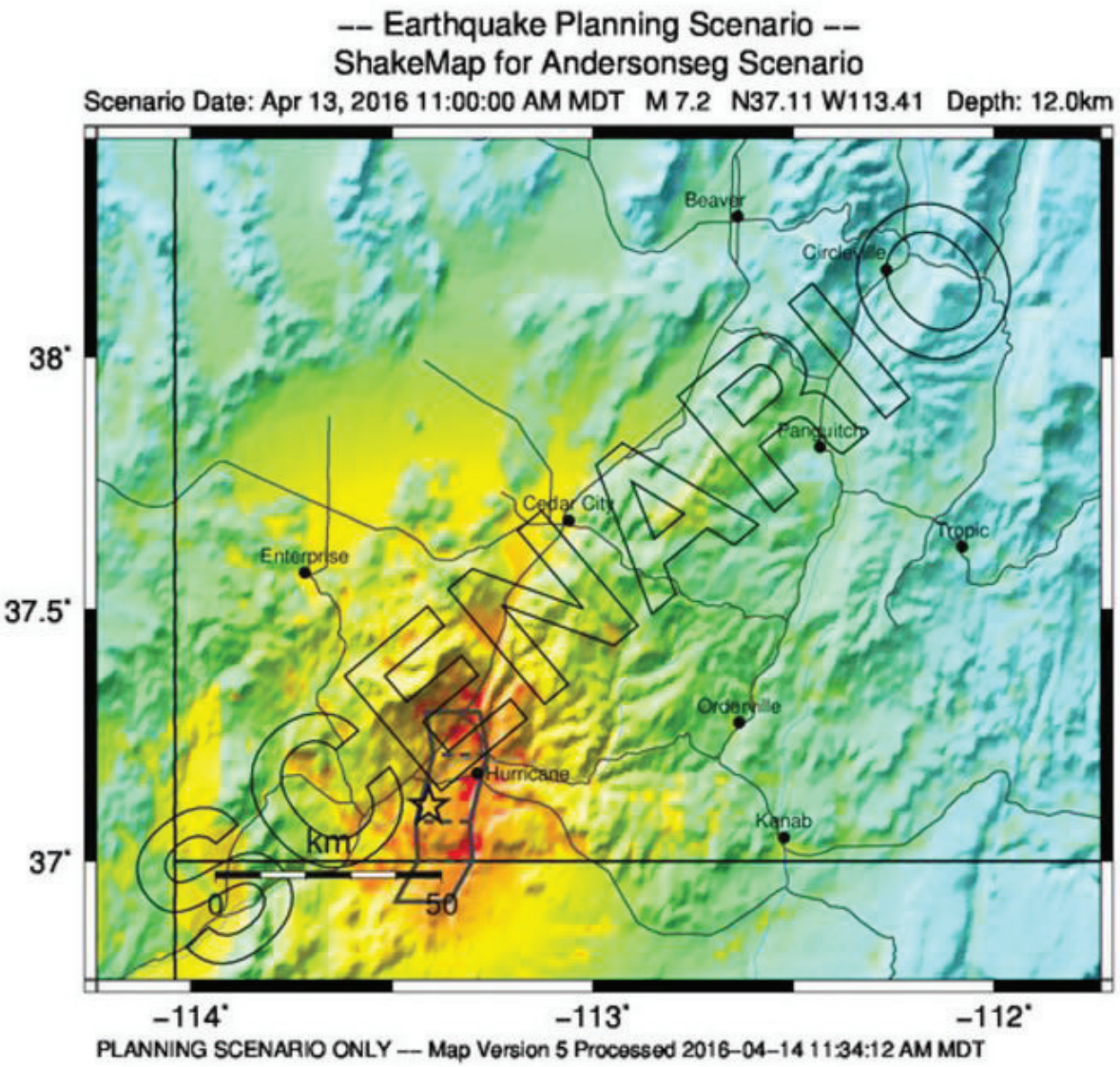
Kane County Faults



The previous mitigation plan included an analysis for all structures within 1,000 feet of a fault. The problem with this type of analysis is that it only accounts for structures within this

boundary. ShakeMap scenarios account for ground movement providing a more realistic scenario and analysis of structural damage resulting from an earthquake.

Due to time and resource constraints only one ShakeMap was produced. Because of these limitations the scenario with the fault segment able to produce the largest earthquake near the largest population was selected. In this scenario it is the Anderson Segment of the Hurricane Fault. It is the intent that future mitigation plans will include a ShakeMap scenario specific to Kane County. In the scenario light to moderate damage will be felt east of Kanab and as far north as Alton.



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	*<0.1*	*0.5*	*2.4*	*6.7*	*13*	24	44	83	>156
PEAK VEL.(cm/s)	<0.07	0.4	1.9	5.8	*11*	*22*	*43*	*83*	*>160*
INSTRUMENTAL INTENSITY	I	II–III	IV	V	VI	VII	VIII	IX	X+

Scale based upon Wald, et al.; 1999

SUMMARY

Kane County is a geologically active county with over 500 earthquakes occurring since 1962. Only a handful of these quakes have been large enough to be felt. The majority of the earthquakes are clustered near the western boarder of the county. There is currently no ShakeMap scenario for Kane County, but the current scenario shows a possibility of potential damage as far north as Alton, and reaching east of Kanab.

MITIGATION STRATEGY

Earthquake mitigation strategies include general mitigation actions that agencies are capable of implementing during the next five years, given their existing resources and authorities. In addition to the earthquake mitigation strategies provided herewith, this Natural Hazard Mitigation Plan endorses any seismic mitigation proffered by the Utah Seismic Safety Commission. In particular, numerous and varied earthquake mitigation strategies are provided in *A Strategic Plan for Earthquake Safety in Utah (January, 1995)* completed by the Utah Seismic Safety Commission. It is highly recommended that jurisdictions whom desire to provide more specific earthquake mitigation strategies consult the aforementioned plan, which can be accessed at: http://ussc.utah.gov/.

Kane County Earthquake Mitigation Strategy #1	
Objective:	Promote building safety through non-structural improvements.
Action:	Increase public education related to earthquake hazards by distributing Utah Seismic Safety Commission informational brochures to County and City emergency management agencies.
Timeline:	Ongoing
Estimated Cost:	Very Minimal: request Utah Seismic Safety Commission to deliver brochures; and/or download brochures directly from: http://ussc.utah.gov/
Possible Funding:	County and City operating budget; Utah Seismic Safety Commission operating budget.
Responsible Agencies:	Local, jurisdictional level.
Plan Goals Addressed:	Education/Outreach, Partnership/Coordination
Priority:	Medium

Kane County Earthquake Mitigation Strategy #2	
Objective:	To reduce earthquake risk as it relates to the built environment.
Action:	Continued dedication/vigilance in enforcing the seismic standards established in the International Building Code (IBC).
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	County or City government operating budget (where applicable).
Responsible Agencies:	County or City government (where applicable).
Plan Goals Addressed:	Prevention, Property Protection
Priority:	High

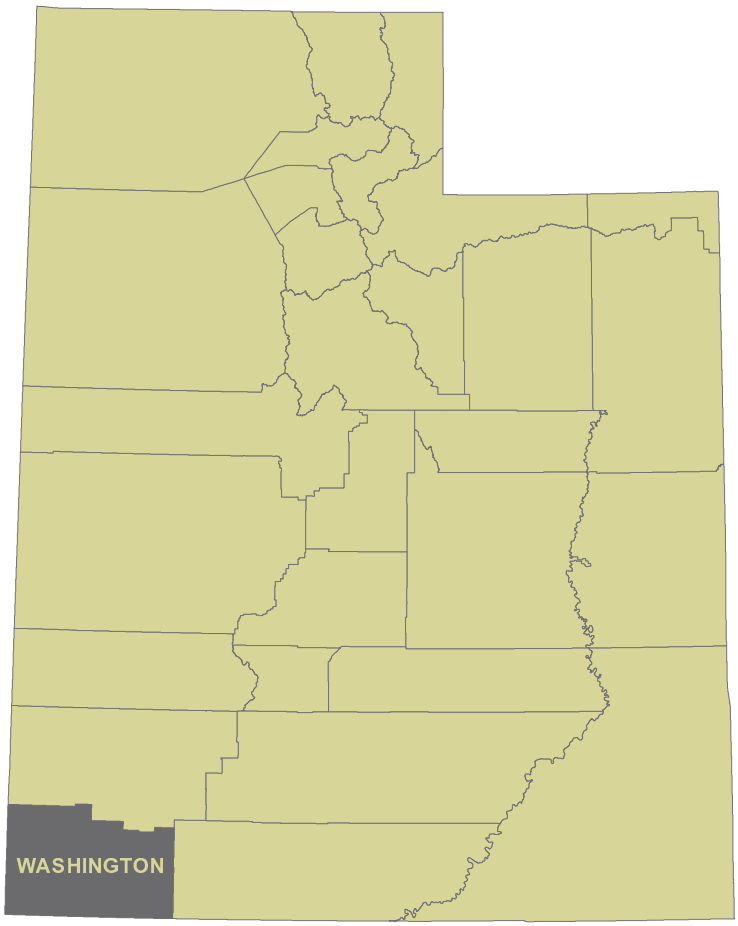
Kane County Earthquake Mitigation Strategy #3	
Objective:	To reduce earthquake losses by mapping and identifying earthquake hazard areas.

Action:	**Action 1**-Utilize the Earthquake Risk Map provided in this plan as a tool to assess earthquake risks as it relates to any building/ subdivision proposals. If deemed necessary, jurisdiction should require the builder/developer to conduct a site-specific earthquake hazard identification/mapping study. **Action 2**-At the County level, contract with Utah Geological Survey (UGS) to formally study/map earthquake hazard areas.
Timeline:	**Action 1**-Ongoing **Action 2**-3 to 5 years
Estimated Cost:	**Action 1**-$1,000 to $5,000 **Action 2**-$7,109 to $14,218 per jurisdiction (1995 cost as reflected in *A Strategic Plan for Earthquake Safety in Utah* adjusted for inflation)
Possible Funding:	**Action 1**-Private funds/ developer. **Action 2**-Local government operating budget; Utah Geologic Survey operating budget.
Responsible Agencies:	Local, jurisdictional level; Private property owner; Utah Geological Survey
Plan Goals Addressed:	**Action 1**-Prevention, Property Protection **Action 2**-Partnership/Coordination, Prevention, Property Protection
Priority:	Low



Washington County

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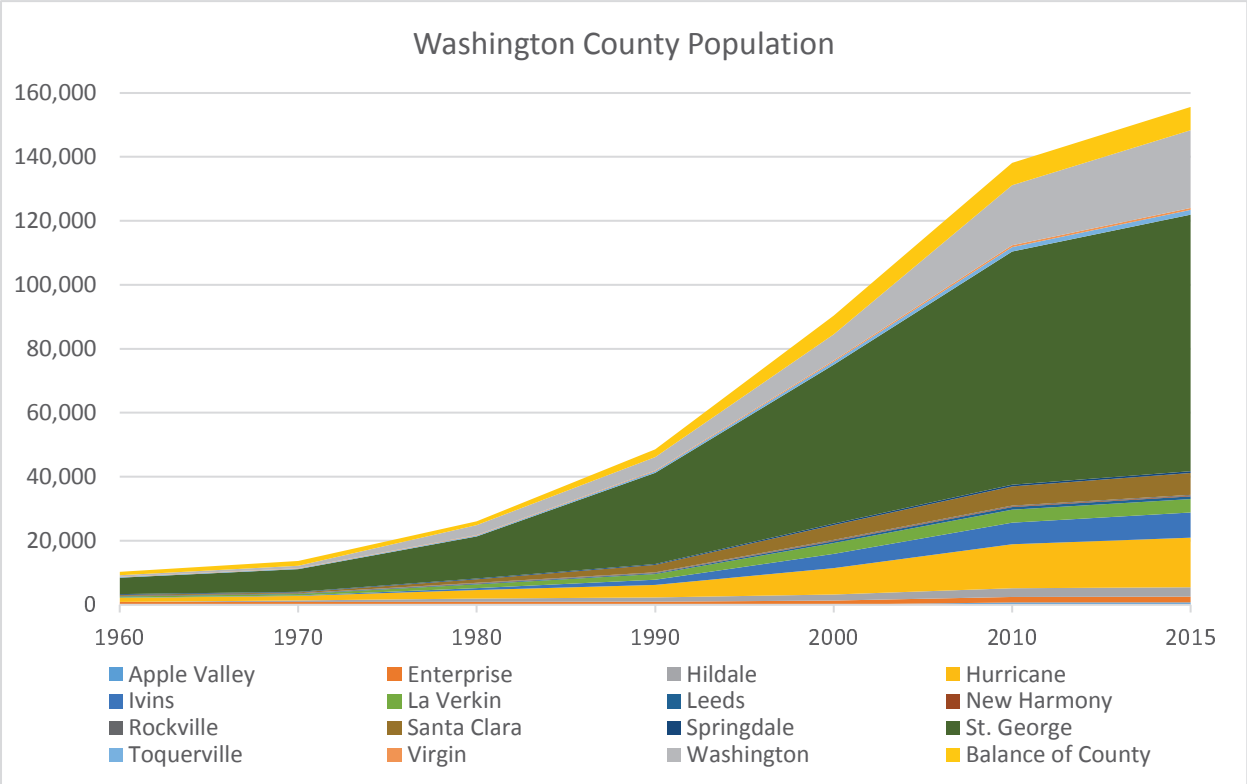
Demographics

Washington County is bordered on the north by Iron County, on the east by Kane County, on the south by Mohave County Arizona, and on the west by Lincoln County Nevada. Within Washington County there are several federal and state highways, the principle highway is Interstate 15 (I-15) and State Routes 9, 17, 18, and 59. St. George, the County seat, is the southernmost city in Utah along the I-15 corridor. I-15 runs generally in a southwest-northeast direction and provides direct access to the prominent metropolitan regions of Las Vegas and Salt Lake.

Washington County is known as “Utah’s Dixie” because of its warm climate. The St. George Metropolitan Area, is a business and cultural center for southwestern Utah. Washington County is a major gateway to Zion National Park which is located in the eastern part of the county. The trademark of Washington County is its geology. Within the St. George Metropolitan Area, red bluffs make up the northern part of the area. The northeastern edges of the Mojave Desert are visible to the south. Zion National Park can be seen to the east, and the Pine Valley Mountains rise elegantly to the north and northwest. With hot summers and mild winters, the climate has more in common with the Deserts to the Southwest than the rest of the state.

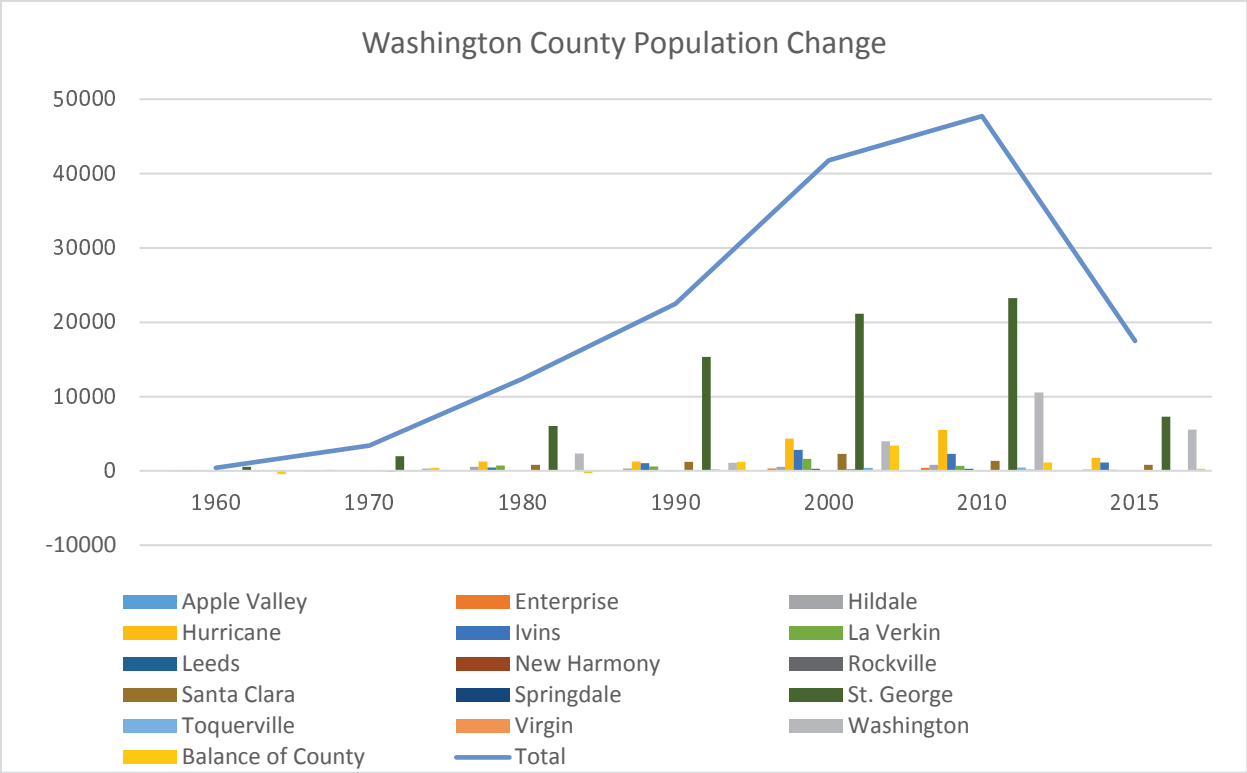


The reasons behind the region's growth are important, but the purpose for analyzing population in this document is to better inform decision makers about how many people could potentially be affected by a natural hazard.



Washington County Population by Incorporated Place							
City/Town	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2015**
Apple Valley	na	na	na	na	na	701	718
Enterprise	859	844	905	936	1,285	1,711	1,799
Hildale	na	480	1,009	1,325	1,895	2,726	2,927
Hurricane	1,251	1,408	2,660	3,915	8,250	13,748	15,501
Ivins	77	137	600	1,630	4,450	6,753	7,876
La Verkin	365	463	1,174	1,771	3,392	4,060	4,193
Leeds	109	151	218	254	547	820	842
New Harmony	105	78	117	101	190	207	211
Rockville	na	na	156	182	247	245	262
Santa Clara	291	271	1,091	2,322	4,630	6,003	6,841
Springdale	248	182	258	275	457	529	556
St. George	5,130	7,097	13,146	28,502	49,663	72,897	80,202
Toquerville	197	185	277	488	910	1,370	1,493
Virgin	124	119	169	229	394	596	604
Washington	445	750	3,092	4,198	8,186	18,761	24,299
Balance of County	1,070	1,504	1,193	2,432	5,858	6,988	7,278
Total	**10,271**	**13,669**	**26,065**	**48,560**	**90,354**	**138,115**	**155,602**
na: City/Town not yet incorporated							
Source: U.S. Census Bureau; Utah History Encyclopedia, 2015 American Community Survey							

St. George, Washington, and Hurricane are the largest three municipalities in the county and St. George city makes up just over half of the county's population. Due to the size of St. George the county population trends more with it than any other cities or towns in the county.



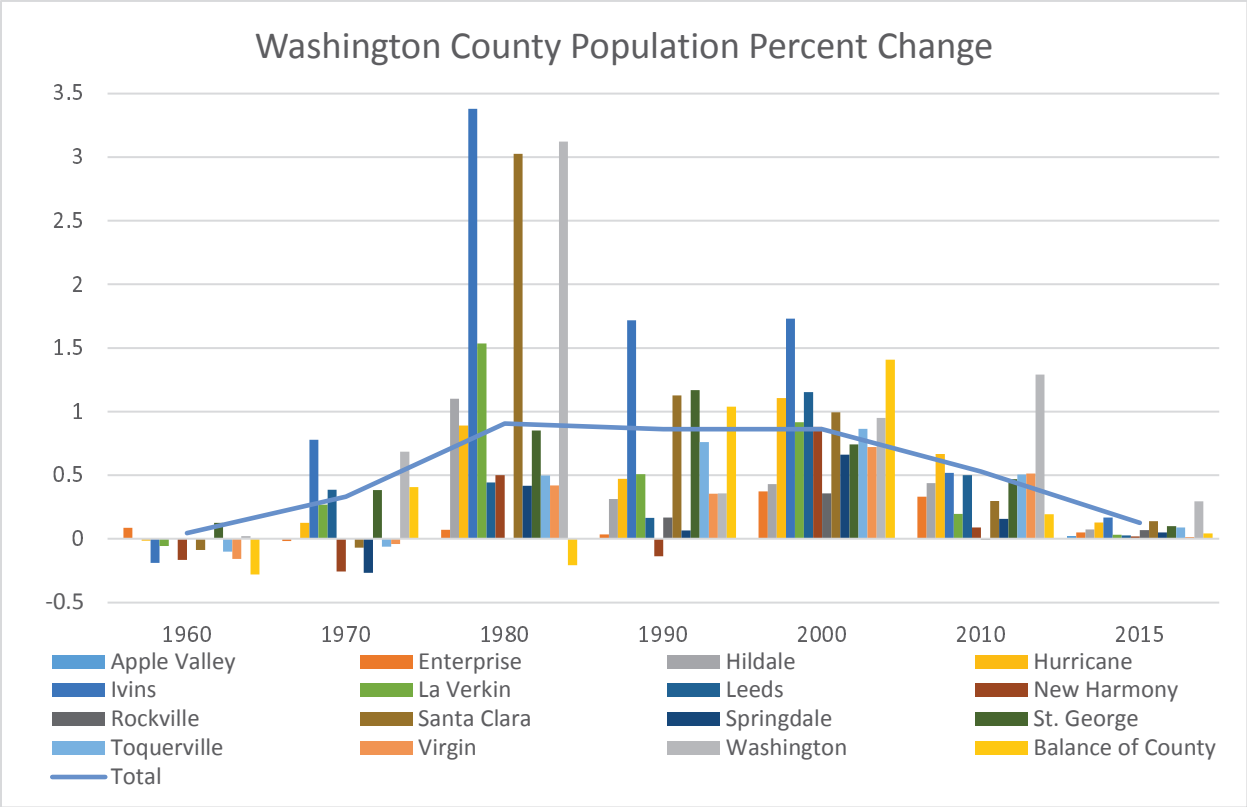
Washington County Population Change							
City/Town	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2015**
Apple Valley	na	na	na	na	na	na	17
Enterprise	69	-15	61	31	349	426	88
Hildale	na	na	529	316	570	831	201
Hurricane	-20	157	1,252	1,255	4,335	5,498	1,753
Ivins	-18	60	463	1,030	2,820	2,303	1,123
La Verkin	-22	98	711	597	1,621	668	133
Leeds	na	42	67	36	293	273	22
New Harmony	-21	-27	39	-16	89	17	4
Rockville	na	na	na	26	65	-2	17
Santa Clara	-28	-20	820	1,231	2,308	1,373	838
Springdale	na	-66	76	17	182	72	27
St. George	568	1,967	6,049	15,356	21,161	23,234	7,305
Toquerville	-22	-12	92	211	422	460	123
Virgin	-23	-5	50	60	165	202	8

Washington	10	305	2,342	1,106	3,988	10,575	5,538
Balance of County	-415	434	-311	1,239	3,426	1,130	290
Total	**435**	**3,398**	**12,396**	**22,495**	**41,794**	**47,761**	**17,487**

na: Not available

Source: U.S. Census Bureau; Utah History Encyclopedia, 2015 American Community Survey

Population change refers to the net increase or decrease of a population for a geographical area. The county had rapid population growth between 1970 and 2010. The downward slope on the population chart between 2010 and 2015 indicates that the population is still growing but not as fast as it did during the previous decade.



Washington County Population Percent Change							
City/Town	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2015**
Apple Valley	na	na	na	na	na	na	2.4%
Enterprise	8.7%	-1.7%	7.2%	3.4%	37.3%	33.2%	5.1%
Hildale	na	na	110.2%	31.3%	43.0%	43.9%	7.4%
Hurricane	-1.6%	12.5%	88.9%	47.2%	110.7%	66.6%	12.8%
Ivins	-18.9%	77.9%	338.0%	171.7%	173.0%	51.8%	16.6%
La Verkin	-5.7%	26.8%	153.6%	50.9%	91.5%	19.7%	3.3%
Leeds	na	38.5%	44.4%	16.5%	115.4%	49.9%	2.7%
New Harmony	-16.7%	-25.7%	50.0%	-13.7%	88.1%	8.9%	1.9%

Rockville	na	na	na	16.7%	35.7%	-0.8%	6.9%
Santa Clara	-8.8%	-6.9%	302.6%	112.8%	99.4%	29.7%	14.0%
Springdale	na	-26.6%	41.8%	6.6%	66.2%	15.8%	5.1%
St. George	12.5%	38.3%	85.2%	116.8%	74.2%	46.8%	10.0%
Toquerville	-10.0%	-6.1%	49.7%	76.2%	86.5%	50.5%	9.0%
Virgin	-15.6%	-4.0%	42.0%	35.5%	72.1%	51.3%	1.3%
Washington	2.3%	68.5%	312.3%	35.8%	95.0%	129.2%	29.5%
Balance of County	-27.9%	40.6%	-20.7%	103.9%	140.9%	19.3%	4.1%
Total	**4.4%**	**33.1%**	**90.7%**	**86.3%**	**86.1%**	**52.9%**	**12.7%**
na: Not Available							
Source: U.S. Census Bureau; Utah History Encyclopedia, 2015 American Community Survey							

The percent of change is important to look at because it indicates what percent of the total population is increasing or decreasing. For Example, the 1,753 increase in Hurricane's population accounted for a 12.8% population increase, while during the same period of time the 10% increase in St. George accounted for 7,305 people. Both communities experienced similar proportions of growth but the number of people varied greatly.

The Governor's Office of Planning and Budget predicts continued growth in Utah's Dixie over the next 20 years. The projected population increase from 2010 to 2020 is 66.5%, but the 2015 estimates are not keeping up with this projection. If population projections for the county are in fact realized, the area will transform into a populated metropolitan area which will sprawl into outlying communities.

The Washington County General Plan classifies open space areas, which include: public lands, drainage channels and washes, unstable soils, reservoirs, steep slopes, etc. In terms of open space land preservation, the County General Plan provides as a goal, "Identify open space areas… and provide protection from development in the areas identified. Areas that may be hazardous in nature and are of an open space character should be maintained as open space in order to protect the health, safety, and welfare of the present and future residents..." Growth as it relates to natural hazard conflicts is further managed through implementation of policy statements which: disallow development within identified FEMA 100-year floodplains; implementing greater setbacks from major washes, streams, and drainage channels; encourage public lands to incorporate a buffer zone between private and public lands; and, incorporation of wildfire protection measures.

WASHINGTON COUNTY OVERVIEW

Washington County is at the intersection of three distinct landscapes; namely, the Great Basin, the Colorado Plateau, and the Mohave Desert. While the geography of these three differ, they have aridity in common. The Virgin River, Santa Clara River, and Ash Creek feed from precipitation and snow-melt at higher elevations, and are the lifeblood of this region.

Washington County elevations range from 2,178 to 10,194 feet above sea level. The lowest point in the state of Utah is in the Beaver Dam Wash where wash waters seasonally flow out of Utah

into Arizona. Washington County averages eight inches of annual precipitation, temperature ranges from an average low in January of 25 degrees and the average high in July of 97 degrees. The majority of the county population base is located in the St. George Metropolitan Statistical Area.

There are many identifiable communities in Washington County, the majority of which are incorporated like St. George City, while other such as Gunlock are unincorporated. Residential development in the county is strong and primarily within incorporated communities. A majority of the industrial and commercial activities in the county are found in the St. George, Washington City, and Hurricane

While many people are relocating to the area for the wealth of public lands and recreation offerings, the limited quantity of private land is a constraint to growth. In addition to the National Parks, recreation on BLM and US Forest Service lands are a major draw for new residents and visitors alike. There are substantial amounts of private lands near, adjacent to, or within forest lands, which makes managing the urban-forest interface a critical issue. The current water supply will prove to be a limit to growth unless conservation standards are implemented or untapped water sources, such as the Colorado River or agriculture water is used for municipal and industrial purposes. The County Water Conservation District supports the opportunity for improved management and development to increase water quantity, which will undoubtedly permit continued growth.



Problem Soils

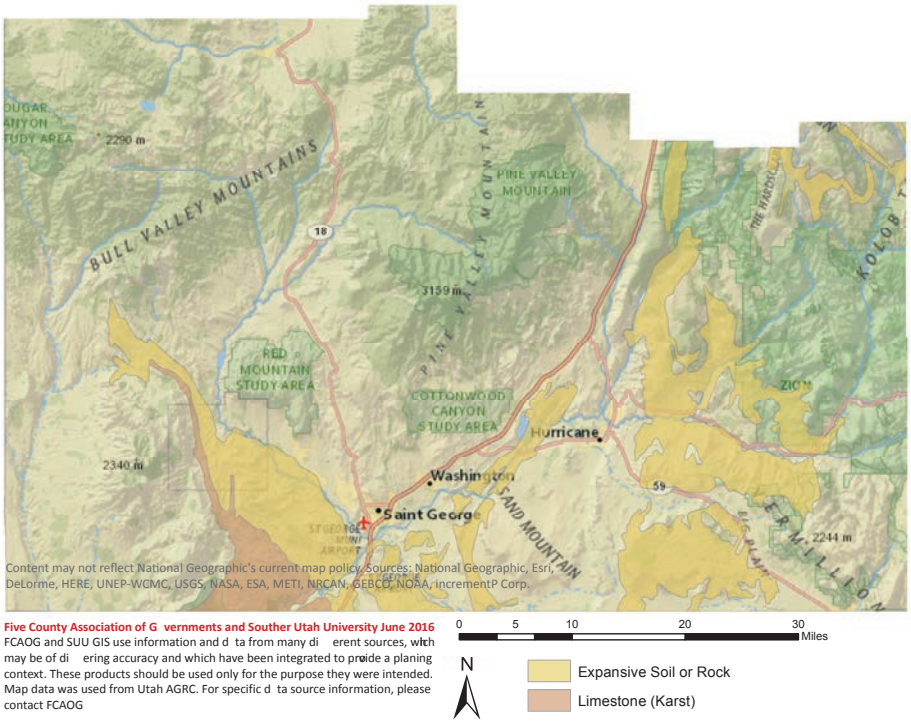
HAZARD RISK ASSESSMENT

After reaching out to local governments, and several engineering and construction firms that deal directly with problem soils it is evident that very little data concerning structural damage due to problem soils is tracked recorded and/or reported.

Very little mapping of problems soils have been done which helps to indicate where some problem soils lie. There is a chance that problem soils extend beyond the current engineering problem soils layer provided the Utah Automated Geographic Reference Center. As for the data available, below are the values of structures that lie within the problem soils areas for Washington County.



Washington County Problem Soils



Value of Structures at Risk - Problem Soils - Washington County		
Structure Type	Market Value	Number of Structures
Residential	$1,258,875,905	7,707
Commercial	$182,409,965	176
Agriculture	$9,921,340	79
Total	$1,451,207,210	7,962
Source: Problem Soils-AGRC, Tax Data-Washington County Tax Assessor, Analysis-SUU GIS Lab		

There is nearly $1.5 billion of structures within the available hazardous soils map layer. This map is considered out dated, but it is currently one of the only hazardous soils maps that includes areas outside of the St. George-Hurricane Metropolitan Area, Zion National Park, and State Route 9. Conducting an analysis using the more detailed maps that exist for these areas may have resulted in different numbers, and the intent is to use such maps for future plans. Additional soil maps are available at http://geology.utah.gov/map-pub/maps/geologic-hazard-maps/ .

SUMMARY

Due to the lack of record keeping there is an undetermined number of structures that have been negatively affected by problem soils within Washington County. Detailed mapping of hazardous soils have been produced in several key areas of the county. The map used for this assessment used the Hazardous soils map from the Utah Automated Geographical Reference Center. The assessment indicates that nearly $1.5 billion of structures are at risk from problem soil in

Washington County.

MITIGATION STRATEGY

Problem soils can pose a significant risk to the current/future built environment. Many of these risks can be dramatically reduced through proper assessment of the hazard and adherence to applicable mitigation measures. The mitigation strategies listed below identify cost effective measures that will yield measurable benefits toward reducing the risk of problem soils as they relate to the built environment. Further, these mitigation strategies include general actions that agencies are capable of implementing during the next five years, given their existing resources and authorities.

Ivins Problem Soils Mitigation Strategy #1	
Objective:	Lessen the risk to buildings from problem soils.
Action:	**Action 1**-Address problem soils at the building/construction level by requiring all subdivision proposals to have a geotechnical report. **Action 2**-If jurisdiction does not have trained staff to review the geotechnical report, the jurisdiction can, upon request, have Utah Geological Survey (UGS) perform a review of the report.
Timeline:	**Action 1**-Ongoing **Action 2**-Ongoing
Estimated Cost:	**Action 1**-$1,000 to $5,000 **Action 2**-Minimal
Possible Funding:	Private funds/ developer; Local government operating budget; Utah Geologic Survey operating budget.
Responsible Agencies:	Ivins
Plan Goals Addressed:	Property Protection, Prevention, Partnership/Coordination
Priority:	Medium

Washington County Problem Soils Mitigation Strategy #1	
Objective:	Lessen the risk to buildings from problem soils.
Action:	**Action 1**-Address problem soils at the building/construction level by requiring all subdivision proposals to have a geotechnical report. **Action 2**-If jurisdiction does not have trained staff to review the geotechnical report, the jurisdiction can, upon request, have Utah Geological Survey (UGS) perform a review of the report.
Timeline:	**Action 1**-Ongoing **Action 2**-Ongoing
Estimated Cost:	**Action 1**-$1,000 to $5,000 **Action 2**-Minimal
Possible Funding:	Private funds/ developer; Local government operating budget; Utah Geologic Survey operating budget.

Responsible Agencies:	Local Jurisdictions
Plan Goals Addressed:	Property Protection, Prevention, Partnership/Coordination
Priority:	Medium

Washington County Problem Soils Mitigation Strategy #2	
Objective:	Lessen the risk to buildings from collapsible and expansive soils.
Action:	Through mapping, identify areas which contain collapsible and expansive soils. Require soils testing at the building/construction level and ensure that engineer's recommendations are followed.
Timeline:	Ongoing
Estimated Cost:	$1,000 to $5,000
Possible Funding:	Private funds/ developer; Local government operating budget.
Responsible Agencies:	Local, jurisdictional level.
Plan Goals Addressed:	Property Protection, Prevention
Priority:	Medium

Landslide

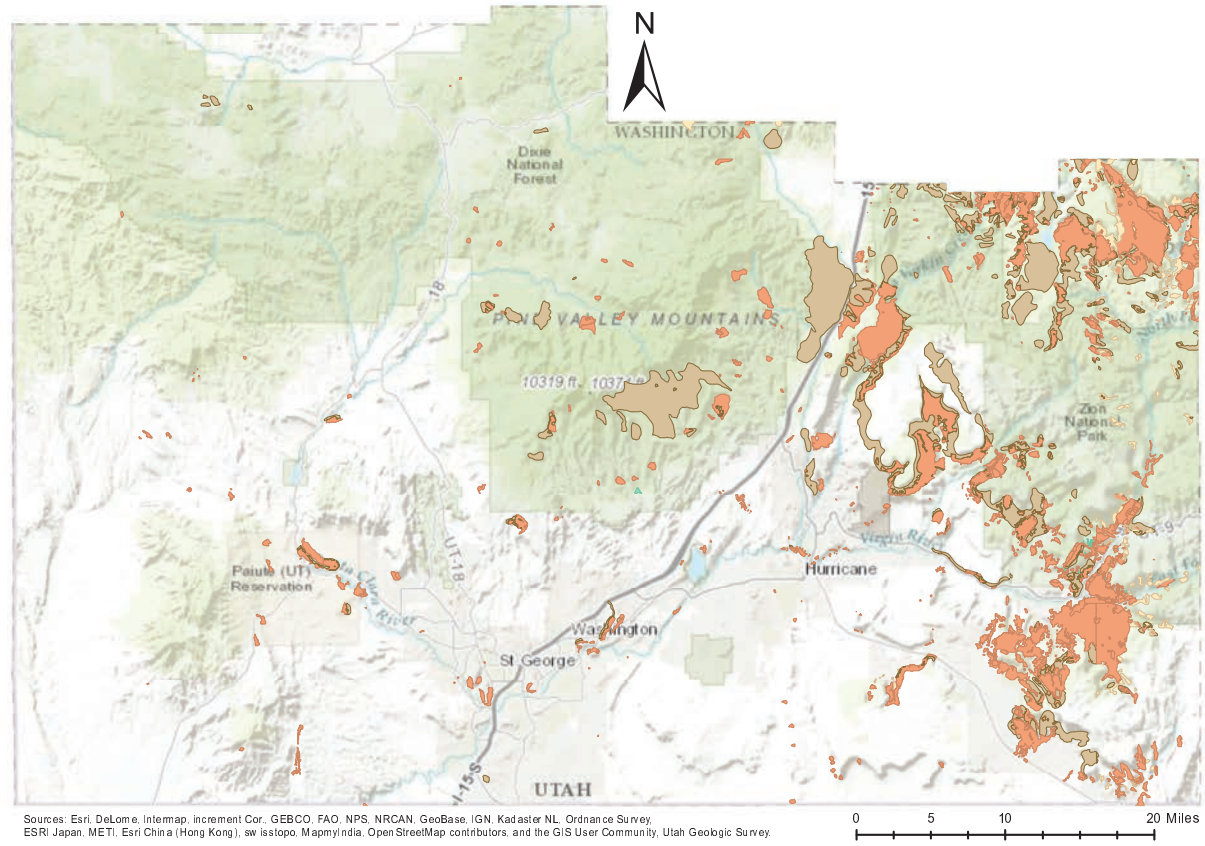
HAZARD RISK ASSESSMENT

Landslides are prevalent anywhere there are steep and over steepened slopes, and Washington County is no exception. The Utah geologic Survey has mapped more than 1,500 historic and prehistoric landslides in the area, they are most prominent in and around Kolob Terrace, The Hardscrabble, Zion Canyon, Canaan Mountain, Black Ridge, and the Pine Valley Mountains.



B2

Washington County Landslides



deep or unclassified landslide
landslide and/or landslide undifferentialed from talus, colluvial, rock-fall, glacial, and soil creep deposits
landslide undifferentiated from talus and/or colluvial deposits not classified
shallow landslide

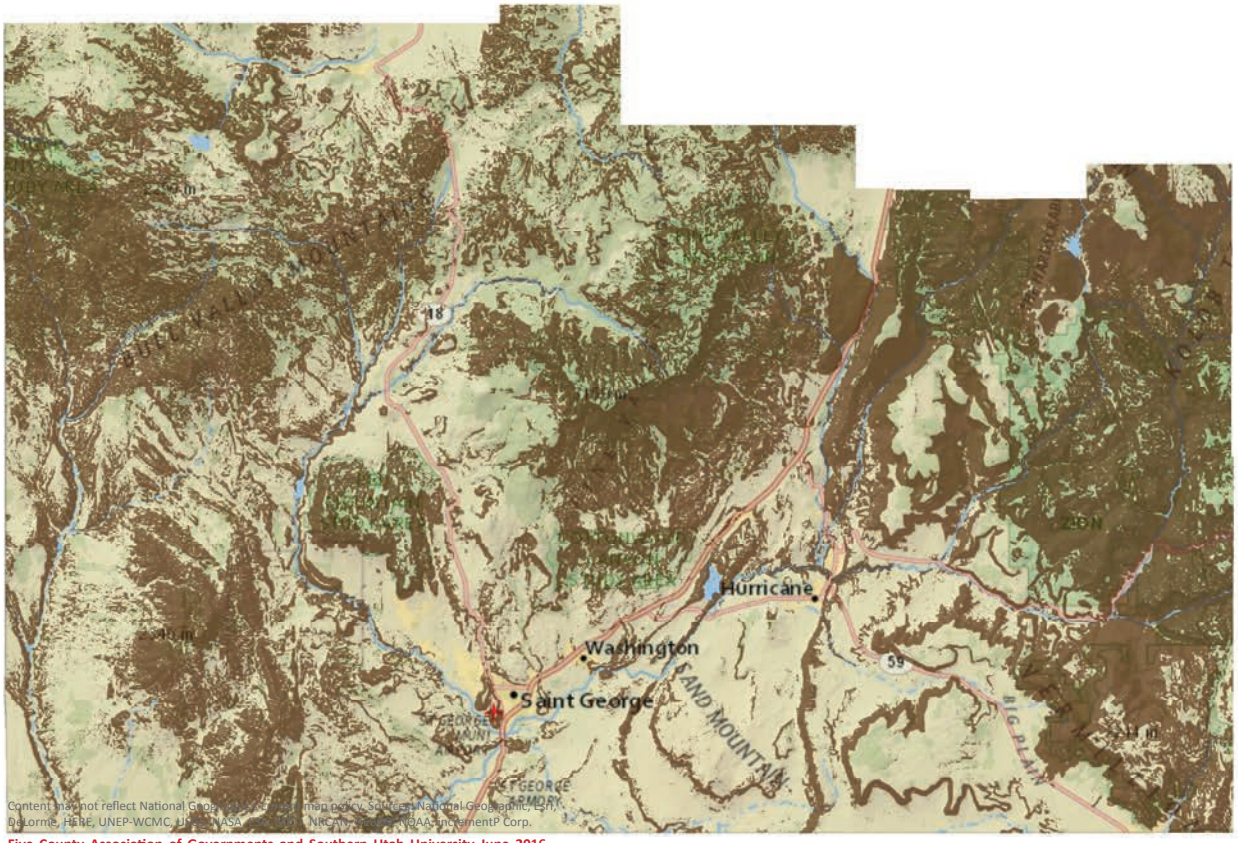
Recording and archiving historic landslides in Utah is a feat that has not been thoroughly compiled into one place. Through the United States Geological Survey (USGS) and other state Surveys a landslide inventory pilot project was put together for several states including Utah for a period of time. Unfortunately the data was only gathered for landslides between the years 1850-1975 (See Table below). SHELDUS, USGS's Landslide Hazard Program, and NOAA's Storm Events Database are all places that have gathered data regarding recent landslides. Additional links are http://hvri.geog.sc.edu/SHELDUS/ and http://geology.utah.gov/

Washington County Landslides 1850-1978				
Event Year	**Location**	**Landslide Type**	**Cause**	**Source number**
1915	St. George and Cottonwood Canal	Landslide	Human	8
1920	Zion National Park	Debris Flow	Natural	8
1930	Andersen Ranch in Zion National Park	Debris Flow	Natural	9
1941	Zion National Park	Landslide	Natural	3

1953	Grafton	Debris Flow	Natural	1
1954	Hurricane	Debris Flow	Natural	1
1955	Near Rockville	Debris Flow	Natural	1
1983	Washington County	NCDC_Landslide	Not specified	SHELDUS
1984	Washington County	Landslides	Not specified	SHELDUS
2011	Washington County	Landslides	Not specified	SHELDUS
2013	Rockville	Rockfall	Not specified	UGS
Source: 1,3,8,9 UGS newspaper reference number, see references & works cited page. SHELDUS				

While there has likely been more landslide occurrences in Washington County over the last 150 years than what is listed in the table above, many unseen and small landslides, or landslides far from communities go unreported. Knowing were landslides have happen can help to keep people safe, but more importantly knowing the areas most susceptible to land sliding can keep people out of harm's way. Below is a map of landslide susceptibility in Kane County.

Washington County Landslide Susceptibility



Five County Association of Governments and Southern Utah University June 2016
FCAOG and SUU GIS use information and data from many different sources which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose hey were intended. Map data was used from the Utah AGRC for and UGS Landslide layer. For specific data source information, please contact FCAOG

0 5 10 20 30 Miles

Landslide Susceptibility
Med-High

N

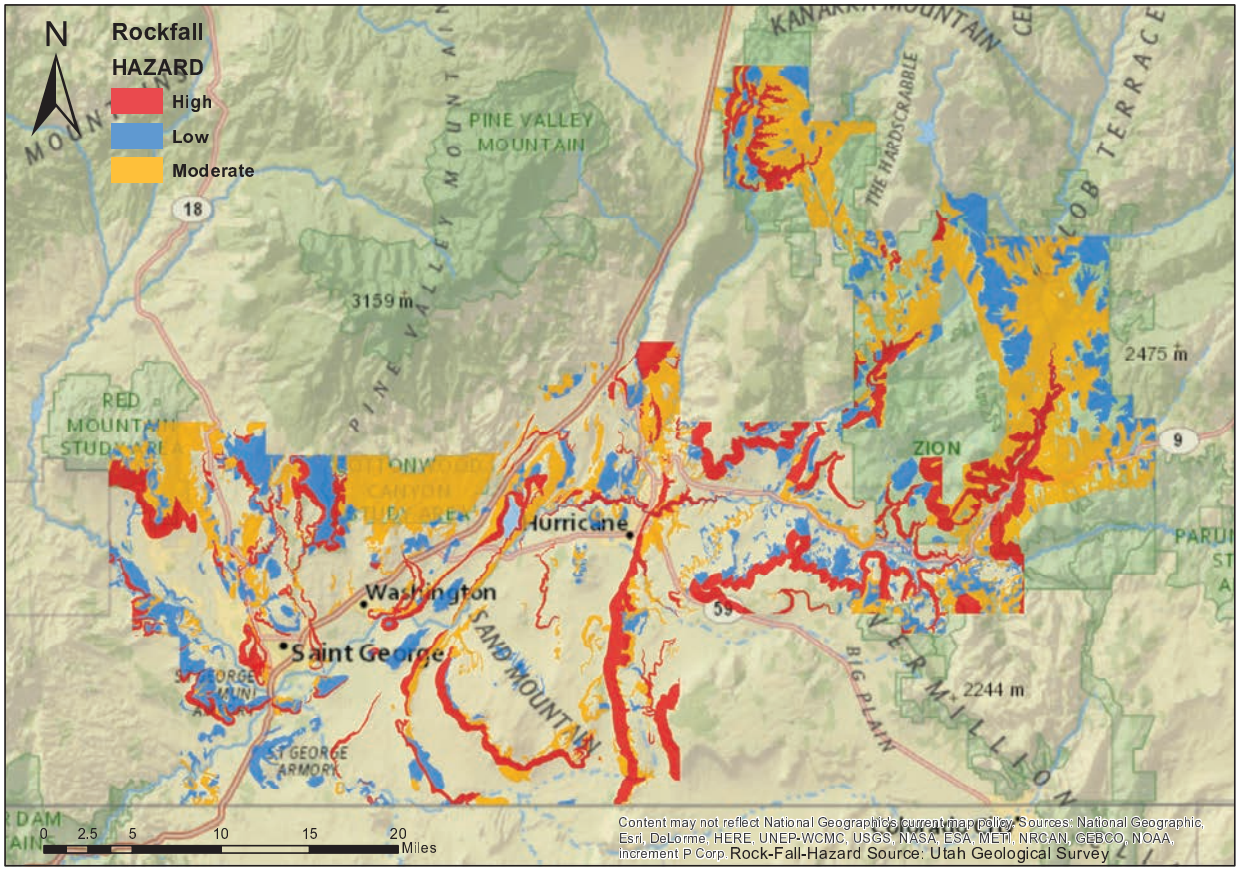
Factors included in assessing landslide risk include built property distribution in the hazard area, the frequency of landslide or debris flow occurrences, slope steepness, and soil characteristics. The Landslide Susceptibility map was created using landslide susceptibility data from the Utah Geological Survey (UGS) and overlaying it with landslide data from the UGS. Areas where landslides exist are often some of the most vulnerable areas for future landslides. The Value of Structures at Risk data was created by overlaying county tax assessor data with moderate to high susceptibility data.

Value of Structures at Risk - Landslide - Washington County		
Type of Structure	**Market Value**	**Number of Structures**
Residential	$1,343,669,300	6,754
Commercial	$316,394,600	402
Agriculture	$18,183,400	144
Total	**$1,678,247,300**	**7,300**
Source: Landslide Potential-Utah Geological Survey, Values-Beaver Co. Tax Assessor, Analysis-SUU GIS Lab, Parcels-AGRC		



Rockfall is a subcategory of landslide where rocks fall from a cliffs or cut slopes. This is the most common type of landslide in the St. George-Hurricane Metropolitan area and much Washington County's most visited areas. For this reason, William R. Lund, Tyler R. Knudsen, Garrett S. Vice, and Lucas M. Shaw of the Utah Geological Survey (UGS) created a detailed rock fall hazard maps for a several areas of the county. The following map was created using data from their maps. The original maps can be found at http://geology.utah.gov/map-pub/maps/geologic-hazard-maps/#toggle-id-27 .

Rock-Fall-Hazard Map for the St. George-Hurricane Metropolitan Area, The SR-9 Corridor, and Zion National Park



SUMMARY

Over 1,500 landslides have been mapped in Washington County, but very few historic landslides have been recorded. Despite the minimal amount of landslides that have occurred and/or have been recorded in the last 150 years, Washington County is home to vast amounts of land that is susceptible to the hazard. Because rockfall is the most prominent type of landslide in the county, and in effort to keep people out of harms way geologists have done detailed study and mapping for this hazard throughout much of the county.

MITIGATION STRATEGY

The mitigation strategies listed below identify cost effective measures that will yield measurable benefits toward reducing the risk of landslide hazards.

Rockville Landslide Mitigation Strategy #1	
Objective:	Stabilize or limit the potential for damage from rock fall
Action:	Protect or relocate structures located in the high rick fall hazard area north of SR-9 in Rockville, Utah

Timeline:	This is a long term strategy with undetermined time lines.
Estimated Cost:	Unknown
Possible Funding:	Local funding, state and federal grant funds as available.
Responsible Agencies:	Town of Rockville, Washington County, Bureau of Land Management, other Local Governments.
Plan Goals Addressed:	Emergency Services, Prevention, Property Protection, Partnership/ Coordination.
Priority:	High

Springdale Landslide Mitigation Strategy #1	
Objective:	To reduce landslide risk as it relates to the built environment in Town of Springdale.
Action:	Adopt zoning regulations to prevent development of structures in identified rock fall or geologically unstable areas to minimize losses in the unincorporated areas of Washington County.
Timeline:	5 years
Estimated Cost:	Minimal
Possible Funding:	Private funds/ developer; Local government operating budget; Utah Geologic Survey operating budget.
Responsible Agencies:	Local, jurisdictional level; Utah Geological Survey
Plan Goals Addressed:	Property Protection, Prevention, Partnership Coordination
Priority:	High

Washington City Landslide Mitigation Strategy #1	
Objective:	Stabilize the landslide on Telegraph Road, and repair the road to a safe operating condition.
Action:	Stabilize the road to stop future movement, and repair the road surface to a level and safe condition.
Timeline:	Repair needs to be immediately to prevent loss of life and property.
Estimated Cost:	$2,000,000
Possible Funding:	City Funds, Possible grant/loan
Responsible Agencies:	Local government, Any Other Agency that can Provide Assistance.
Plan Goals Addressed:	Prevention, Property Protection, Environmental Protection
Priority:	High

Washington County Landslide Mitigation Strategy #1	
Objective:	Increase the level of knowledge related to landslides.

Action:	Increase public education related to landslide hazards by distributing Utah Geological Survey (UGS) landslide informational brochures to local municipality level emergency management, engineering and planning departments.
Timeline:	Ongoing
Estimated Cost:	Very Minimal: request UGS to deliver brochures; and/or download brochures directly from: http://geology.utah.gov
Possible Funding:	Local, jurisdictional level.
Responsible Agencies:	Local, jurisdictional level.
Plan Goals Addressed:	Education/Outreach, Emergency Services, Partnership/ Coordination, Prevention
Priority:	High

Washington County Landslide Mitigation Strategy #2	
Objective:	To reduce landslide risk as it relates to the built environment.
Action:	**Action 1**-Address landslide risk at the building/construction level by requiring all subdivision proposals to have a geotechnical report. **Action 2**-If jurisdiction does not have trained staff to review the geotechnical report, the jurisdiction can, upon request, have Utah Geological Survey (UGS) perform a review of the report. **Action 3**-Drafting/updating zoning and/or landslide ordinances to prevent development of structures near debris flows, landslides, and rock fall areas.
Timeline:	**Action 1**-Ongoing **Action 2**-Ongoing **Action 3**-Minimal
Estimated Cost:	**Action 1**-Minimal **Action 2**-Minimal **Action 3**-Minimal
Possible Funding:	Private funds/ developer; Local government operating budget; Utah Geologic Survey operating budget.
Responsible Agencies:	Local, jurisdictional level; Utah Geological Survey
Plan Goals Addressed:	Pertnership/Coordination, Prevention, Property Protection
Priority:	High

Washington County Landslide Mitigation Strategy #3	
Objective:	Prevent damage to structures from rock fall in unincorporated areas of Washington County.
Action:	Adopt zoning regulations to prevent development of structures in identified rock fall or geologically unstable areas to minimize losses in the unincorporated areas of Washington County.

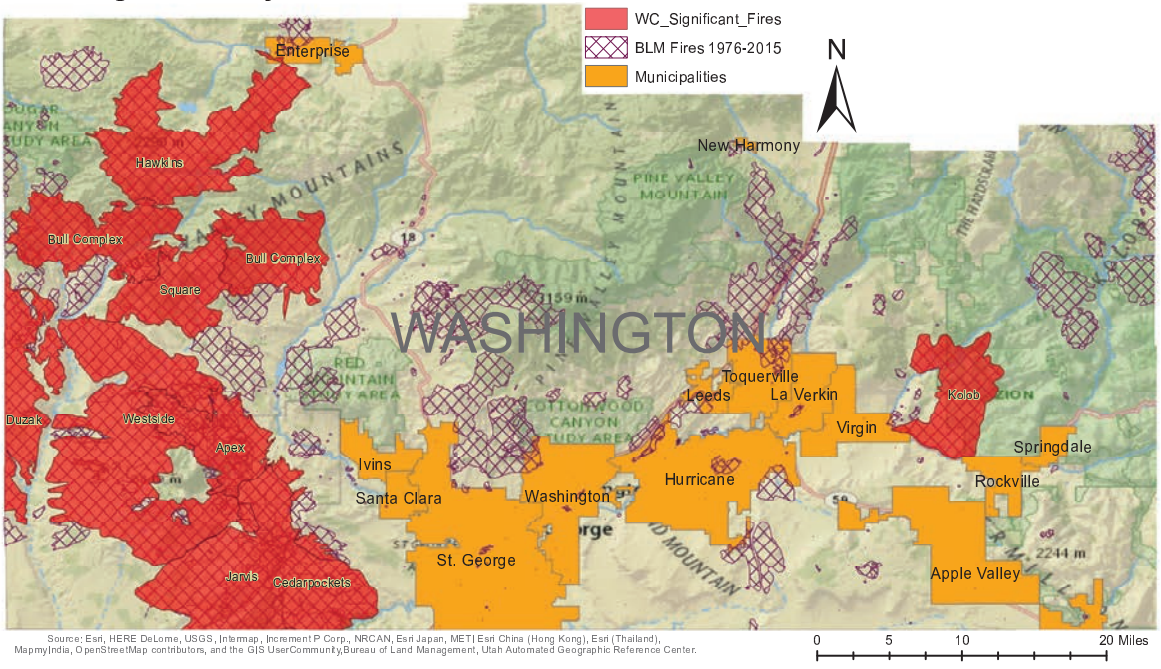
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	Private funds/ developer; Local government operating budget; Utah Geologic Survey operating budget.
Responsible Agencies:	Local, jurisdictional level; Utah Geological Survey
Plan Goals Addressed:	Education/Outreach, Environmental Protection, Partnership Coordination, Property Protection, Prevention
Priority:	High

Wildfire

HAZARD RISK ASSESSMENT

A large portion of Washington County has been consumed by wildland fires and many of these fires have been within the Wildland-Urban Interface and city boundaries. Like the other counties in the region Washington has seen hundreds of fires within the last 39 years. The majority of these fire have burned only a few acres or less, while many have burned tens of thousands of acres.

Washington County BLM Fires 1976-2015



Source: Esri, HERE DeLorme, USGS, Intermap, Increment P Corp., NRCAN, Esri Japan, METI Esri China (Hong Kong), Esri (Thailand), MapmyIndia, OpenStreetMap contributors, and the GIS UserCommunity,Bureau of Land Management, Utah Automated Geographic Reference Center.

There are many other agencies involved with wildfire that should not be disregarded because they have not been reported in this section. The tables and maps are designed to inform people that fires are a real threat and this map and table should and not be used as a complete history of wildfires in the area.

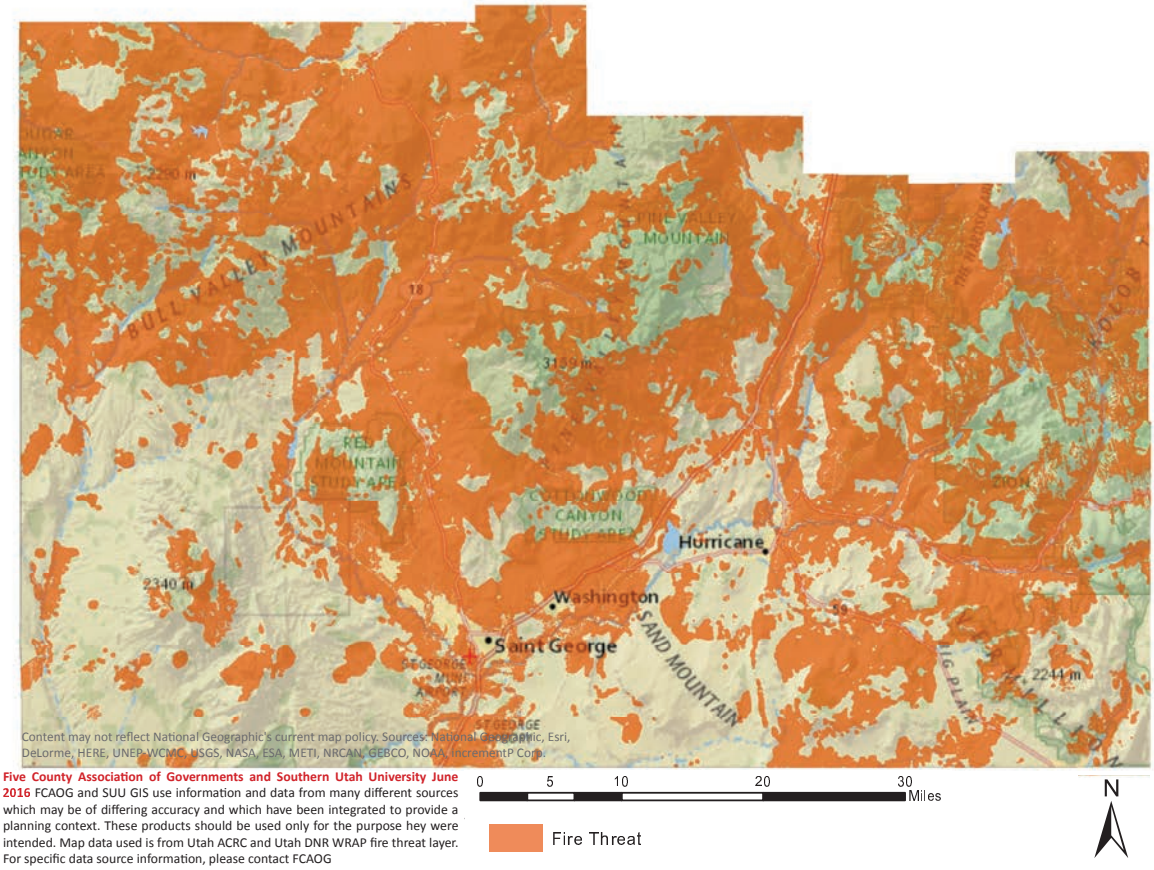
Significant BLM Wildland Fires 1976-2015 - Washington County			
Fire Name	**Year**	**Acres**	**Other Counties Effected**
Westside	2005	66,900	none
Jarvis	2006	50,697	Mohave AZ
Hawkins	2004	35,427	none
Apex	2003	29,930	none
Bull Complex	2006	23,404	none
Duzak	2005	19,295	none
Bull Complex	2006	18,044	none
Kolob	2006	17,632	none
Square	2004	17,146	none
Cedar Pockets	1995	12,789	Mohave AZ
Source: Bureau of Land Management			

The Westside Fire is one of the largest fires in Washington County history. It developed fast and quickly burned 66,900 acres. With the fire raging and 300 firefighters on the scene, the priority level quickly increased. Along with the 300 fire fighters, there was one heavy air tanker and 12 fire trucks to help suppress the blaze.

A lightning caused fire burned much of the summer just two miles south of Pine Valley. The fire burned 2,299 acres, cost $14 million, residents were given a voluntary evacuation, and put nearly 500 structures at risk. Although this fire was not as large as many of the other wildland fires in Washington County, it is a good reminder how quickly wildfire can put in people in danger.

The following provides a summarization of fire threat in Washington County. Fire threat is defined as the likelihood of an acre burning.

Washington County Fire Threat



Five County Association of Governments and Southern Utah University June 2016 FCAOG and SUU GIS use information and data from many different sources which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose hey were intended. Map data used is from Utah ACRC and Utah DNR WRAP fire threat layer. For specific data source information, please contact FCAOG

Value of Structures at Risk - Wildfire - Washington County		
Type of Structure	**Market Value**	**Number of Structures**
Residential	$4,902,165,200	22,864
Commercial	$772,896,700	1,299
Agriculture	$31,730,800	344
Total	$5,706,792,700	24,507
Source: Utah Department of Natural Resources, Washington County Tax Assessor, SUU GIS Lab		

The analysis of structures at risk is defined by how many structures are within the medium to extreme fire threat boundary.

Infrastructure at Risk - Washington County	
Infrastructure	**Miles**
Major Roads	398.9
Rail	0
Transmission Lines	177.5
Source: Utah AGRC	

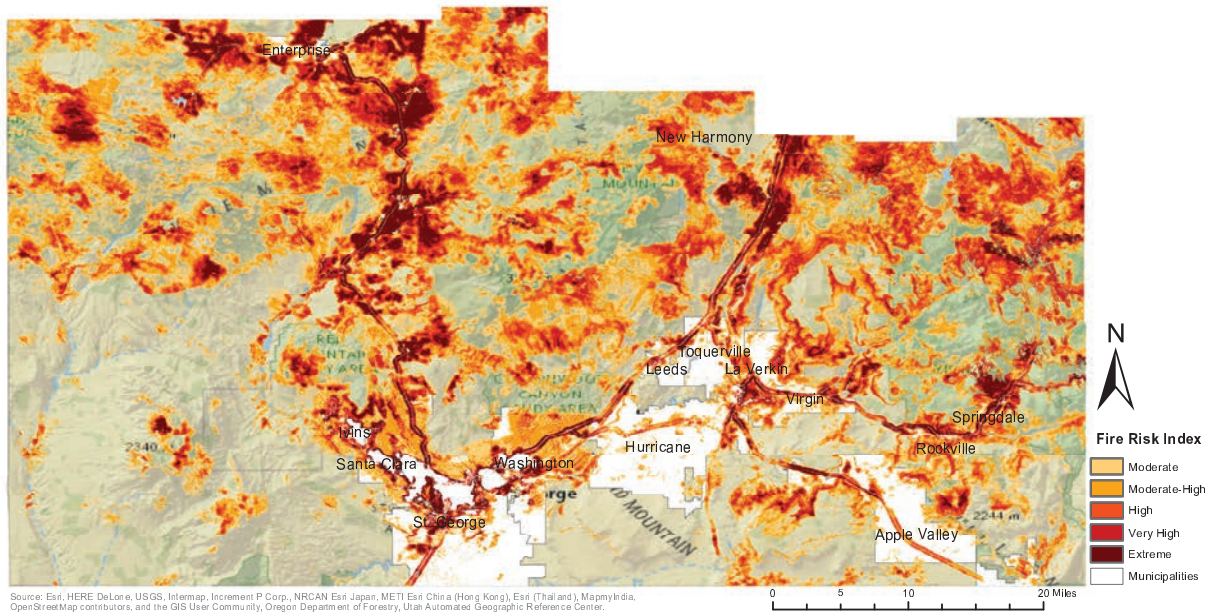
In addition to structures located within a defined hazard area, there is also an overwhelming amount (in terms of quantity and value) of infrastructure that is not captured by this analysis. This is in large part due to the fact that compilation of this data would be exhaustive; nevertheless, the Infrastructure at Risk table provides a summarization of additional

infrastructure at risk from wildfire.

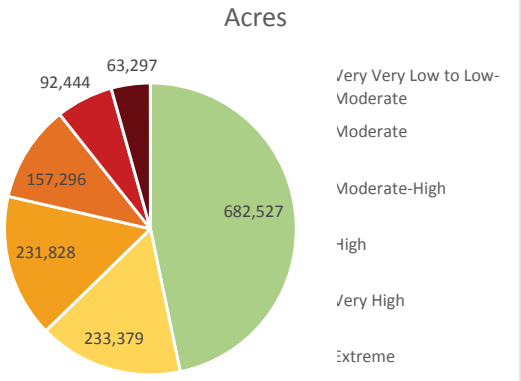
Miles of major roads were calculated using road centerline data. The types of roads used for the Major roads include: Interstates; US Highway, Separated; US Highway, Unseparated; Major State Highway, Separated; Major State Highway, Unseparated; Other Sate Highway, (Institutional); Ramps, Collectors; Major Local Roads, Paved;

The following provides a summarization of fire risk in Washington County. Fire risk "represents the possibility of loss or harm occurring from a wildfire." (Oregon Department of forestry) The county risk assessment value are based on suppression difficulty, wildland development areas, forest assets, drinking water importance areas (watersheds), and infrastructure assets.

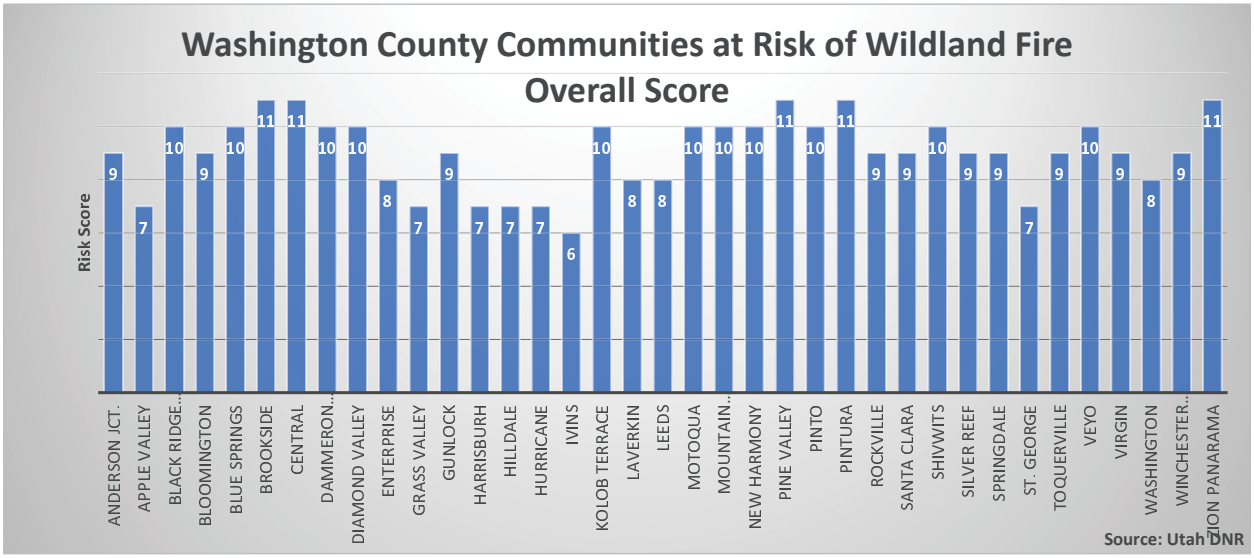
Washington County Wildfire Risk



The higher elevations outside of the urban portions of Washington County contribute much of the Forest, Riparian, and Drinking Water Assets, thus creating a higher risk for these areas. There are also many areas just outside of the cities that are higher risk, this is because the urban wildland interface has grown, and is intruding into areas that are more vulnerable to catching fire.



The following is a summary of the Washington County Communities at risk.



Each community's risk in the county was determined using four categories, each category received a score between one and three, one being the lowest risk and three being the highest. When the scores are added together the minimum a community can receive is a three while the maximum score is twelve. The categories are Fire Occurrence, Fuel Hazards, Values Protected, and Fire Protection Capability.

SUMMARY

Hundreds of wildfires have occurred in Washington County many of which engulfed thousands of acres. Wildfire threat is ubiquitous in Washington County putting more than 24,000 at risk valued well over $5 billion. Additional assets at risk include wildland development areas, forest assets, riparian assets, drinking water importance areas, and hundreds of miles of roads and transmission lines. There are currently 37 communities at risk from wildfire, many of which have scores that indicate high risk.

MITIGATION STRATEGY

Washington County Wildfire Mitigation Strategy #1	
Objective:	Promote public awareness campaign for property owners living in Wildland-Urban Interface areas; Adhere to the Wildland-Urban Interface Code
Action:	Mailings; Printed Information; Public Service Announcements; Social Media; Building code inspections.
Timeline:	Ongoing
Estimated Cost:	Unknown
Possible Funding:	State and Federal wildfire grant programs
Responsible Agencies:	State and Federal government, Fire Districts

Plan Goals Addressed:	Education/Outreach, Partner/Coordination, Prevention, Property Protection
Priority:	High

Washington County Wildfire Mitigation Strategy #2	
Objective:	Fuels reduction.
Action:	**Action 1**-Continue interagency fuel treatments that are adjacent to and within communities at risk. **Action 2**-Develop cheatgrass focus areas, to include fire tolerant vegetation and strategic fuel breaks to protect communities at risk. **Action 3**-Encourage landowner mitigation and defensible space work. **Action 4**-Increase fuels reduction (mowing, fuel breaks/green stripping) along major highways to decrease fire starts off the interstate.
Timeline:	All Ongoing
Estimated Cost:	All Unknown
Possible Funding:	Local government operating budget; Special Service District operating budget; private property owner
Responsible Agencies:	Community & local government entities; private property owner
Plan Goals Addressed:	**Action 1**-Education/Outreach, Partner/Coordination, Prevention, Property Protection **Action 2**-Education/Outreach, Partner/Coordination, Prevention, Property Protection, Environmental Protection **Action 3**-Education/Outreach, Partner/Coordination, Prevention, Property Protection **Action 4**-Education/Outreach, Partner/Coordination Prevention, Property Protection, Environmental Protection
Priority:	High

Washington County Wildfire Mitigation Strategy #3	
Objective:	Develop and update the existing community fire plans
Action:	Look for funding and interest among the communities to update their plans.
Timeline:	Unknown (dependent upon funding and community interest)
Estimated Cost:	Unknown
Possible Funding:	Local government operating budget; Special Service District operating budget; private property owner
Responsible Agencies:	Community & local government entities; private property owner
Plan Goals Addressed:	Education/Outreach, Partner/Coordination, Prevention, Property Protection, Emergency Services

Priority:	High

Washington County Wildfire Mitigation Strategy #4	
Objective:	Provide early warning for wildfire in the Kolob Mountain area.
Action:	Develop and provide an early warning system for the Kolob Mountain area for use in wildland fire emergencies.
Timeline:	This is a long term strategy with undetermined time lines.
Estimated Cost:	Unknown
Possible Funding:	Local private and government funding, state and federal grant funds as available.
Responsible Agencies:	Washington County, Utah Forestry Fire and State Lands, Zion National Park, Hurricane Valley Fire District, and other Local Governments.
Plan Goals Addressed:	Emergency Services, Prevention, Property Protection, Environmental Protection, Partnership/Coordination.
Priority:	High

Washington County Wildfire Mitigation Strategy #5	
Objective:	Provide early warning for wildfire in the Pinto area.
Action:	Develop and provide an early warning system for the Pinto area for use in wildland fire emergencies.
Timeline:	This is a long term strategy with undetermined time lines.
Estimated Cost:	Unknown
Possible Funding:	Local private and government funding, state and federal grant funds as available.
Responsible Agencies:	Washington County, Utah Forestry Fire and State Lands, US Forest Service, Bureau of Land Management, and other Local Governments.
Plan Goals Addressed:	Emergency Services, Prevention, Property Protection, Environmental Protection, Partnership/Coordination.
Priority:	High

Washington County Wildfire Mitigation Strategy #6	
Objective:	Reduce the potential of the threat to life and property from wildland fires.
Action:	Develop, enhance and maintain firebreaks around the unincorporated communities in the Wildland-Urban Interface throughout Washington County.
Timeline:	This is a long term strategy with undertermined time lines.
Estimated Cost:	Unknown

Possible Funding:	Local private and government funding, state and federal grant funds as available.
Responsible Agencies:	Washington County, Utah Forestry Fire and State Lands, Zion National Park, US Forest Service, US Bureau of Land Management, Local Fire Districts, and other Local governments.
Plan Goals Addressed:	Emergency Services, Prevention, Property Protection, Environmental Protection, Partnership/Coordination.
Priority:	High



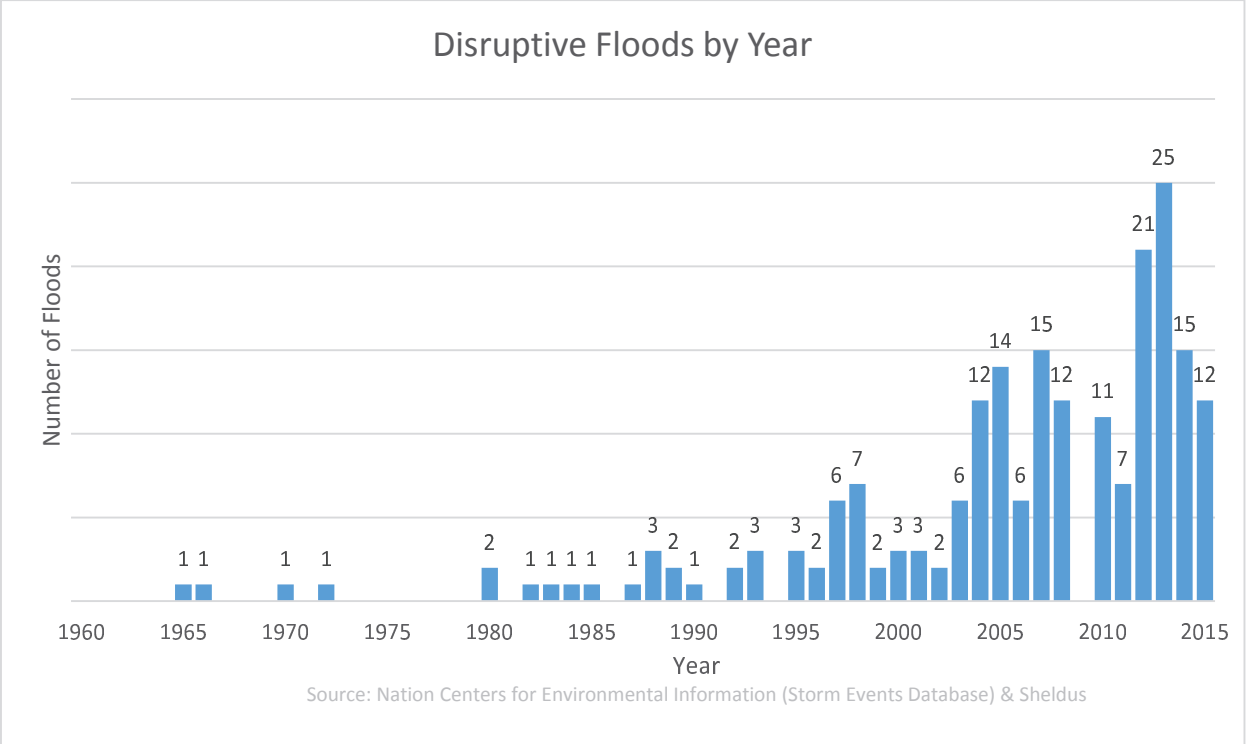
Flood

HAZARD RISK ASSESSMENT

Since 1960 there have been 206 flooding events which caused disturbance in Washington County recorded by the National Centers for Environmental Information's Storm Events Database and by the Spatial Hazard Events and Loses Database for the United States. (SHELDUS) This only accounts for a portion of flooding though out the county as floods go undocumented or unreported every year. The following table lists some of the most significant floods with quantitative values associated with the event. The list is in a numerical descending order with deaths and injuries listed as the most significant followed by property damage and crop damage.

Significant Floods - 1996-2015 - Washington County						
LOCATION	BEGIN DATE	EVENT TYPE	DEATHS	INJURIES	ESTIMATED PROPERTY DAMAGE	ESTIMATED CROP DAMAGE
Hildale	9/14/2015	Flash Flood	13	3	$750,000	$0
Zion National Park	9/14/2015	Flash Flood	7	0	$0	$0
Zion National Park	7/27/1998	Flash Flood	2	0	$0	$200
Santa Clara River/ Virgin River	1/10/2005	Flood	1	6	$300,000,000	$0
Zion Nation Park/ Enterprise/Ivins/Santa Clara/St. George	9/27/2014	Flash Flood	1	0	$350,000	$0
Zion National Park	5/13/2001	Flash Flood	1	0	$0	$0

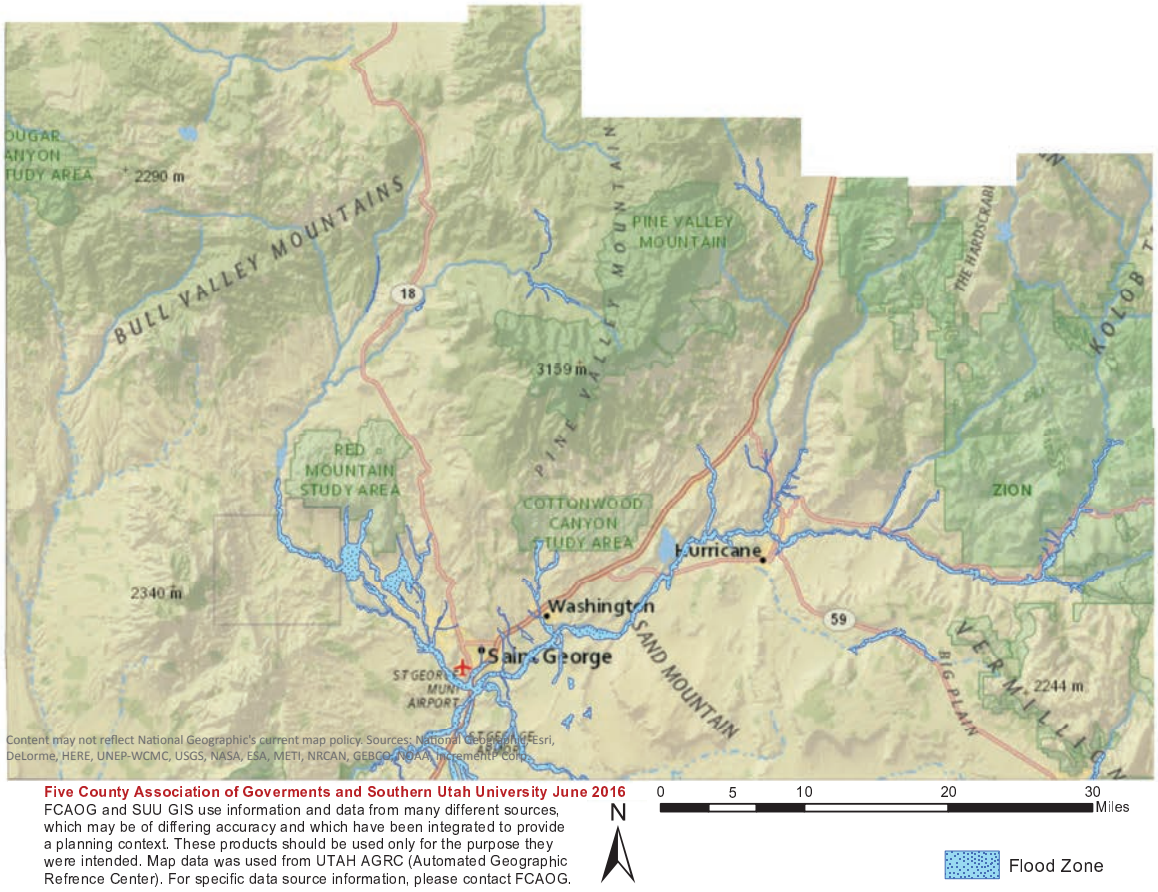
La Verkin	8/1/2012	Flash Flood	1	0	$0	$0
St. George	1/3/1997	Flash Flood	0	11	$5,000,000	$0
Zion National Park	7/24/2010	Flash Flood	0	3	$0	$0
Dameron Valley/St. George area	11/21/1996	Flash Flood	0	2	$5,000,000	$0
Santa Clara/Virgin Rivers	12/19/2010	Flood	0	0	$19,700,000	$0
Santa Clara (Tuacahn)	9/11/2012	Flash Flood	0	0	$7,500,000	$0
Source: NOAA-National Centers for Environmental Information (Storm Event Database)						



Since 1960 disruptive floods have increased significantly during and after the mid 1990's. The data provided does not indicate why this is occurring, so in order to prevent speculation, a study should be conducted to further understand all the reasons behind disruptive flooding events in Washington County.

The following depicts FEMA's 100 year flood plain in Washington County and a brief analysis of structures at risk.

Washington County Flood Zone

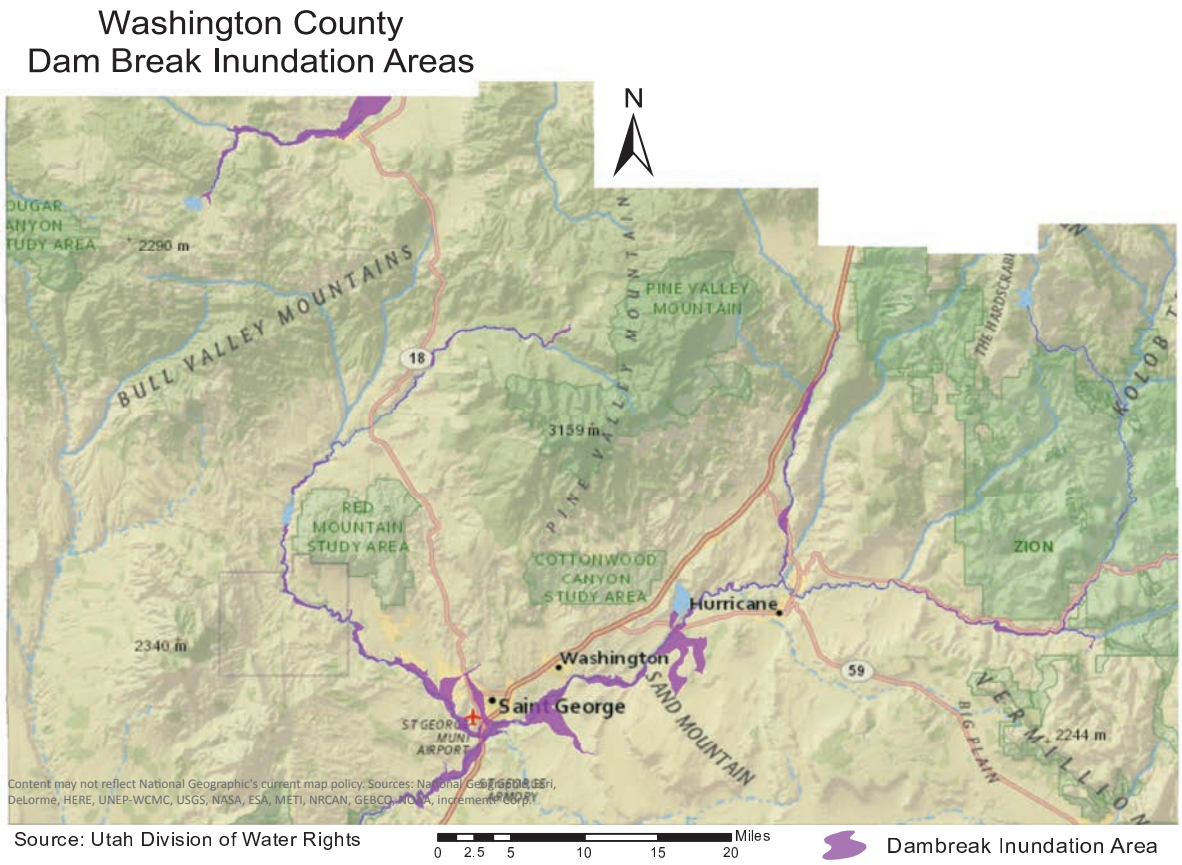


Value of Structures at Risk - Flood - Washington County		
Structure Type	**Market Value**	**Number of Structures**
Residential	$1,756,890,240	8,687
Commercial	$294,807,500	331
Agriculture	$12,696,900	106
Total	$2,064,394,640	9,124
Source:		

Dam failure has the potential to cause significant flooding and damage to communities downstream. The Utah Division of Water Rights and the state engineer list the dam hazard ranking to help communities understand the risk of dam failure inundation. The Hazard classification of dam risk is determined by the threat to human life and property damage in the event that a dam fails. The hazard ratings of inspected dams for moderate and high risk dams are listed on the following table.

Washington County Dam Hazard Classification			
Dam Name	**Hazard**	**Dam Name**	**Hazard**
ASH CREEK	HIGH	STUCKI DEBRIS	HIGH
BAKER	HIGH	TUACAHN WASH LOWER DETENTION BASIN	HIGH
ENTERPRISE (LOWER)	HIGH	WARNER DRAW	HIGH
ENTERPRISE (UPPER)	HIGH	BLUE SPRINGS	MOD
GUNLOCK	HIGH	FROG HOLLOW	MOD
GYPSUM WASH	HIGH	GRASS VALLEY	MOD
IVINS BENCH	HIGH	IVINS SCS-1	MOD
KOLOB CREEK	HIGH	IVINS SCS-2	MOD
QUAIL CREEK	HIGH	IVINS SCS-3	MOD
QUAIL CREEK SOUTH DAM	HIGH	IVINS SCS-4	MOD
SAND HOLLOW NORTH DAM	HIGH	IVINS SCS-5	MOD
SAND HOLLOW WEST DAM	HIGH	IVINS SCS-6	MOD
SOUTH CREEK - WASHINGTON COUNTY	HIGH	PINE VALLEY	MOD
ST. GEORGE CITY - NAVAJO D.B.	HIGH	TUACAHN WASH UPPER DETENTION BASIN	MOD
ST. GEORGE CITY-CITY CREEK D.B.	HIGH		
Source: Utah Division of Water Rights-Dam Safety Database Information Viewer			





The mapped dam inundation zones indicate that dam failure can cause significant damage in Washington County due to the number of people and communities downstream. The inundation zones cover the majority of incorporated municipalities and many small unincorporated communities within the county.

The following provides a list of communities participating in the National Flood Insurance Program, FEMA's repetitive flood claims, and other FEMA claims.

There have been TWO REPETITIVE LOSS FLOOD CLAIMS in Washington County. CAC date 11/23/2015, CAV date 04/07/2011.

Communities Participating in the National Flood Insurance Program (FEMA)				
Community	**Initial FHBM Identified**	**Initial FIRM Identified**	**Current Effective Map Date**	**Reg-Emerg Date**
Apple Valley	No Data	4/2/2009	4/2/2009	9/24/2012
Enterprise	8/16/1974	4/1/1987	4/2/2009	4/1/1987
Hurricane	7/12/1977	4/2/2009	4/2/2009	4/1/1987
Ivins	9/12/1975	4/2/2009	4/2/2009	8/23/1982
LaVerkin	7/2/1976	4/2/2009	4/2/2009	2/2/1984
Leeds	4/2/1976	4/2/2009	4/2/2009	2/2/1984

New Harmony	No Data	4/2/2009	4/2/2009	3/5/2010
Rockville	No Data	4/2/2009	4/2/2009	12/10/2009
Santa Clara	6/4/1976	8/5/1986	4/2/2009	8/5/1986
Springdale	5/10/1977	4/2/2009	4/2/2009	4/17/2009
St. George	8/6/1974	8/19/1987	4/2/2009	8/19/1987
Toquerville	6/25/1976	2/19/1986	4/2/2009	2/19/1986
Virgin	6/25/1976	8/5/1986	4/2/2009(M)	8/5/1986
Washington County	2/7/1978	3/18/1986	4/2/2009	3/18/1986
Washington City	8/2/1974	7/1/1987	4/2/2009	7/1/1987
FIRM - Flood Insurance Rate Map FHBM - Flood Hazard Boundary Map			(M) - No Elevation Determined Zones A,C,X NSFHA - No Special Flood Hazard Area, Zone C	
Source: FEMA National Flood Insurance Program Community Status Book Feb/2016				

All of the communities in Washington County are participating in the National Flood Insurance Program with the exception of Hildale, which is not participating.

(Claims) FEMA Loss Statistics from Jan 1/1978 through Nov/30/2015 - Washington County

Community Name	Total Losses	Closed Losses	Open Losses	CWOP Losses	Total Payments
Hurricane, City of	1	0	0	1	$0.00
Ivins, City of	4	2	0	2	$19,409.19
Leeds, Town of	1	0	1	0	$0.00
New Harmony, Town of	1	1	0	0	$10,291.78
Santa Clara, Town of	2	1	0	1	$1,194.30
St. George, City of	18	9	0	9	$170,295.53
Washington County	12	7	0	5	$182,407.87
Washington City	3	1	0	2	$6,377.08
Total	**42**	**21**	**1**	**20**	**$389,975.75**

Total Losses - All losses submitted regardless of the status.
Closed Losses - Losses that have been paid.
Open Losses - Losses that have not been paid.
CWOP Losses - Losses that have been closed without payment.
Total Payment - Total amount paid on losses.

Source: FEMA Policy and Claim Statistics for Flood Insurance

A total of 42 FEMA flood claims have been tallied in the county, totaling $389,975, with St. George City contributing to nearly half of these claims.



SUMMARY

Two Hundred and six flooding events have occurred and/or have been recorded in Washington County over the last half century. The recorded data indicates that there has been 27 deaths, 31 injuries, and well over $300 million dollars in property and crop damage. FEMA's 100 year flood areas are mapped along waterways in and near most of the towns and recreation areas in Washington County. Other flood ways include dam inundation zones which run also are in the majority of populated communities in the county. There are currently 9,124 structures valued at more than $2 billion in the 100 year flood plains.

There are no FEMA flood claims in the county and all of the incorporated municipalities and the county are participating in the National Flood Insurance Program except for Hildale. Since 1978 There have been 42 FEMA flood claims valued at $389,975.

MITIGATION STRATEGY

Washington County addresses flood hazards through implementation of its comprehensive flood control Code. The purpose of this section is to minimize public and private losses due to flood conditions in specific areas. This is accomplished by requiring all new construction and substantial improvements to minimize flood damage. Plans for the Virgin River, Santa Clara River, and Fort Pearce Wash have been written to help mitigate flood and erosion problems in Washington County. The link for these plans is at http://www.wcwcd.org/about-us/reports-plans-studies-and-agreements/ In concert with this purpose, the following mitigation strategy is provided.

Apple Valley Flood Mitigation Strategy #1	
Objective:	(Apple Valley Storm Management Project) Prevent flooding in homes and private property.
Action:	Implement projects from the Storm Water Management Plan such as install curb and gutter, storm drain boxes, diverting water into Gould Wash, collect easements, install culverts and ditches to descharge water into the wash.
Timeline:	5 Years
Estimated Cost:	Unknown
Possible Funding:	Apple Valley, CIB, CDBG, FEMA
Responsible Agencies:	Apple Valley
Plan Goals Addressed:	Prevention, Property Protection, Environmental Protection
Priority:	High

Enterprise Flood Mitigation Strategy #1	
Objective:	Minimize structural damage from floods.
Action:	Provide flood protective features along Spring Creek to prevent flooding on residences in downtown Enterprise City.
Timeline:	Unknown

Estimated Cost:	Unknown
Possible Funding:	Local government operating budget; State and Federal flood grant programs
Responsible Agencies:	Enterprise
Plan Goals Addressed:	Environmental Protection, Partnership/Coordination, Prevention, Property Protection
Priority:	Medium

Hildale Flood Mitigation Strategy #1	
Objective:	To reduce flooding risk at the community level.
Action:	Clear debris and other material from all waterways.
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	Related public/private property owners.
Responsible Agencies:	Private property owners, irrigation companies, local jurisdictions.
Plan Goals Addressed:	Environmental Protection, Prevention, Property Protection
Priority:	High

Hurricane Flood Mitigation Strategy #1	
Objective:	Minimize structural damage from floods.
Action:	Construct a retention basin on Goulds Wash above Hurricane City to prevent flooding in Hurricane City.
Timeline:	Unknown
Estimated Cost:	Unknown
Possible Funding:	Local government operating budget; State and Federal flood grant programs
Responsible Agencies:	Hurricane City
Plan Goals Addressed:	Emergency Services, Environmental Protection, Partnership/ Coordination, Prevention, Property Protection
Priority:	High

LaVerkin Flood Mitigation Strategy #1	
Objective:	Prevent rainwater and snowmelt that causes flooding and erosion in developed areas.
Action:	Prepare and adopt an updated community-wide stormwater management master plan.
Timeline:	1 Year
Estimated Cost:	Unknown
Possible Funding:	Town Operating Budget

Responsible Agencies:	LaVerkin
Plan Goals Addressed:	Prevention, Property Protection, Environmental Protection
Priority:	High

Leeds Flood Mitigation Strategy #1	
Objective:	(Main Street Storm Drain Improvements) Reduce community and residential flooding through storm drainage improvements.
Action:	Replace ditch on north side of Main Street with curb and gutter. Storm drain catch basins along Main Street at intersections. Storm drain outlet to discharge into Harrisburg Wash.
Timeline:	5 Years
Estimated Cost:	$985,000.00
Possible Funding:	Leeds, CIB, CDBG, FEMA
Responsible Agencies:	Leeds
Plan Goals Addressed:	Prevention, Property Protection, Environmental Protection
Priority:	High

Leeds Flood Mitigation Strategy #2	
Objective:	(Silver Reef Area Storm Drain Improvements) Reduce community and residential flooding through storm drainage improvements.
Action:	Re-grade swales. Clear debris from washes and waterways. Place rip rap along points of erosion (turns, steep slopes, and culvert inlets and outlets)
Timeline:	5 Years
Estimated Cost:	$98,000.00
Possible Funding:	Leeds, CIB, CDBG, FEMA
Responsible Agencies:	Leeds
Plan Goals Addressed:	Prevention, Property Protection, Environmental Protection
Priority:	Medium

Leeds Flood Mitigation Strategy #3	
Objective:	(Silver Meadows and Mesa View Storm Drain Improvements) Reduce community and residential flooding through storm drainage improvements.
Action:	Re-grade swales. Clear debris from washes and waterways. Place rip rap along points of erosion (turns, steep slopes, and culvert inlets and outlets). Install underground storm drain pipe.
Timeline:	5 Years
Estimated Cost:	$55,500.00

Possible Funding:	Leeds, CIB, CDBG, FEMA
Responsible Agencies:	Leeds
Plan Goals Addressed:	Prevention, Property Protection, Environmental Protection
Priority:	Medium

Leeds Flood Mitigation Strategy #4	
Objective:	(Leeds Valley Road Storm Drain Improvements) Reduce community and residential flooding through storm drainage improvements.
Action:	Construct concrete swales with catch basins and underground piping. Direct underground piping to convey water to discharge into Harrisburg Wash.
Timeline:	5 Years
Estimated Cost:	$1,211,000.00
Possible Funding:	Leeds, CIB, CDBG, FEMA
Responsible Agencies:	Leeds
Plan Goals Addressed:	Prevention, Property Protection, Environmental Protection
Priority:	Low

Leeds Flood Mitigation Strategy #5	
Objective:	Town Storm Water Maintenance Program) Reduce community and residential flooding through storm drainage improvements.
Action:	Develop a Storm Water Maintenance and Management Plan to manage sediment build up and removal. Plan will outline costs for such maintenance and planning for future improvements. GIS mapping of project with portable management device.
Timeline:	5 Years
Estimated Cost:	$20,000.00
Possible Funding:	Leeds, CIB, CDBG, FEMA
Responsible Agencies:	Leeds
Plan Goals Addressed:	Prevention, Property Protection, Environmental Protection
Priority:	Low

New Harmony Flood Mitigation Strategy #1	
Objective:	Minimize structural damage from floods.
Action:	A structural alternative would be to construct a levee along Pace Draw creek through town, a levee distance of about 5,000 feet.
Timeline:	Unknown
Estimated Cost:	312,000

Possible Funding:	Local government operating budget; State and Federal flood grant programs
Responsible Agencies:	New Harmony
Plan Goals Addressed:	Partnership/Coordination, Prevention, Property Protection
Priority:	Medium

New Harmony Flood Mitigation Strategy #2	
Objective:	Provide Flood protective features along Ash Creek in and near New Harmony.
Action:	Provide flood protective features along Ash Creek to prevent flooding to residences in area subdivisions.
Timeline:	Unknown
Estimated Cost:	Unknown
Possible Funding:	Local government operating budget; State and Federal flood grant programs
Responsible Agencies:	New Harmony
Plan Goals Addressed:	Environmental Protection, Partnership/Coordination, Prevention, Property Protection
Priority:	High

Rockville Flood Mitigation Strategy #1	
Objective:	(Wash east of Cos Rd. and North of Hwy 9 Storm Drain Improvements) Storm water management projects to prevent residential flooding and prevent flood waters from washing out roadways and drainage ditches, and prolong the life of roadways through erosion management.
Action:	Obtain easements for new wash route. Wash redesign and new construction for wash north of Highway 9. Install rip rap along areas of erosion.
Timeline:	5 Years
Estimated Cost:	Unknown
Possible Funding:	Rockville, CIB, CDBG, FEMA
Responsible Agencies:	Rockville
Plan Goals Addressed:	Prevention, Property Protection, Environmental Protection
Priority:	High

Rockville Flood Mitigation Strategy #2	
Objective:	(Dennett Lane Storm Drain Improvements) Storm water management projects to prevent residential flooding and prevent flood waters from washing out roadways and drainage ditches, and prolong the life of roadways through erosion management.
Action:	Re-grade and widen wash. Install culverts to ensure adequate flow. Place rip rap along points of erosion (Turns, steep slopes, and culvert inlets and outlets). Clear Debris from wash and culverts along Dennett Lane.
Timeline:	5 Years
Estimated Cost:	Unknown
Possible Funding:	Rockville, CIB, CDBG, FEMA
Responsible Agencies:	Rockville
Plan Goals Addressed:	Prevention, Property Protection, Environmental Protection
Priority:	High

Rockville Flood Mitigation Strategy #3	
Objective:	(De Mille Rd. Storm Drain Improvements) Storm water management projects to prevent residential flooding and prevent flood waters from washing out roadways and drainage ditches, and prolong the life of roadways through erosion management.
Action:	Re-grade swale to collect and divert water to drainage washes. Install soil erosion mechanisms along lower part of mesa to minimize amount of sediment during storm events. Install culvert under road ways to route water to natural drainage channels.
Timeline:	5 Years
Estimated Cost:	Unknown
Possible Funding:	Rockville, CIB, CDBG, FEMA
Responsible Agencies:	Rockville
Plan Goals Addressed:	Prevention, Property Protection, Environmental Protection
Priority:	High

Rockville Flood Mitigation Strategy #4	
Objective:	(Town Storm Water Drainage Plan) Storm water management projects to prevent residential flooding and prevent flood waters from washing out roadways and drainage ditches, and prolong the life of roadways through erosion management.
Action:	Develop a storm water drainage and management plan. Plan will outline costs for such maintenance and planning for future improvements. GIS Mapping of Projects with portable management device.

Timeline:	5 Years
Estimated Cost:	$30,000
Possible Funding:	Rockville, CIB, CDBG, FEMA
Responsible Agencies:	Rockville
Plan Goals Addressed:	Prevention, Property Protection, Environmental Protection
Priority:	High

St. George Flood Mitigation Strategy #1	
Objective:	Provide for erosion protection for Millcreek Power Generation station in St. George.
Action:	Provide for erosion protection for Millcreek Power Generation station in St. George.
Timeline:	Unknown
Estimated Cost:	Unknown
Possible Funding:	Local government operating budget; State and Federal flood grant programs
Responsible Agencies:	St. George
Plan Goals Addressed:	Environmental Protection, Partnership/Coordination, Prevention, Property Protection
Priority:	Medium

Santa Clara Flood Mitigation Strategy #1	
Objective:	Stabilize Santa Clara River for future flood events.
Action:	Provide grade stabilization to limit scouring near Dixie Drive Bridge and through Santa Clara City.
Timeline:	Unknown
Estimated Cost:	Unknown
Possible Funding:	Local government operating budget; State and Federal flood grant programs
Responsible Agencies:	Santa Clara
Plan Goals Addressed:	Environmental Protection, Partnership/Coordination, Prevention, Property Protection
Priority:	High

Santa Clara Flood Mitigation Strategy #2	
Objective:	Stabilize the Santa Clara River against future flooding events.

Action:	Stabilize river banks and hardened bank structure and infrastructure along the Santa Clara River. Limit development within the flood plain and relocate existing structures threatened by flooding. Clear debris and limit vegetation growth to reduce flood impacts. Provide early warning.
Timeline:	This is a long term strategy with undetermined times lines.
Estimated Cost:	Unknown
Possible Funding:	Local funding, state and federal grant funds as available.
Responsible Agencies:	Washington County, Washington County Water Conservancy District, Local water users, NRCS, Army Corp of Engineers, other Local Governments.
Plan Goals Addressed:	Emergency Management, Prevention, Property Protection, Environmental Protection, Partnership/Coordination
Priority:	High

Springdale Flood Mitigation Strategy #1	
Objective:	Minimize structural damage from floods.
Action:	Construct flood mitigation measures at Flannigan Diversion Structure (Springdale's Diversion) in Zion National Park. Measures may include increasing the height of the headwall, armoring above intake pipe to reduce scour effects, constructing new walls or changing weir roof material from aluminum to a heavier gauge steel.
Timeline:	Unknown
Estimated Cost:	Unknown
Possible Funding:	Local government operating budget; State and Federal flood grant programs
Responsible Agencies:	Springdale
Plan Goals Addressed:	Environmental Protection, Partnership/Coordination, Prevention, Property Protection
Priority:	Medium

Springdale Flood Mitigation Strategy #2	
Objective:	Minimize structural damage from floods
Action:	Construct an erosion control/rip rap wall to protect the Canyon Springs Estates subdivision emergency access and Town water line from further erosion and damage.
Timeline:	Unknown
Estimated Cost:	Unknown

Possible Funding:	Local government operating budget; State and Federal flood grant programs
Responsible Agencies:	Springdale
Plan Goals Addressed:	Emergency Services, Environmental Protection, Partnership/ Coordination, Prevention, Property Protection
Priority:	Medium

Springdale Flood Mitigation Strategy #3	
Objective:	Minimize structural damage from floods.
Action:	Construct an erosion control/rip rap wall at the South end of Springdale on the Dickman property to protect the Town sewer line and Rockville Canal irrigation pipe from further erosion and damage. Project currently under Corps of Engineers Section 14 review.
Timeline:	Unknown
Estimated Cost:	Unknown
Possible Funding:	Local government operating budget; State and Federal flood grant programs
Responsible Agencies:	Springdale
Plan Goals Addressed:	Emergency Services, Environmental Protection, Partnership/ Coordination, Prevention, Property Protection
Priority:	Medium

Springdale Flood Mitigation Strategy #4	
Objective:	Minimize structural damage from floods.
Action:	Investigate erosion potential on bend of river near SR-9 south of Springdale Chevron and north of River Park.
Timeline:	Unknown
Estimated Cost:	Unknown
Possible Funding:	Local government operating budget; State and Federal flood grant programs
Responsible Agencies:	Springdale
Plan Goals Addressed:	Emergency Services, Environmental Protection, Partnership/ Coordination, Prevention, Property Protection
Priority:	Medium

Toquerville Flood/Drought Mitigation Strategy #1	
Objective:	Prevent flood waters from subverting bridge structures. Maintaining dam water levels.
Action:	Clear willows and other debris from Ash Creek.

Timeline:	Semi-Annual
Estimated Cost:	Unknown
Possible Funding:	Toquerville Operating budget (water Budget) Partnered with the Water District, Laverkin, and Hurricane
Responsible Agencies:	The Water District, Laverkin, and Hurricane
Plan Goals Addressed:	Partnership/Coordination, Prevention, Property Protection
Priority:	High

Virgin Flood Mitigation Strategy #1	
Objective:	(Sierra Bella Subdivision Storm Drain Improvements) Storm water management projects to prevent residential flooding and prevent flood waters from washing out roadways and drainage ditches.
Action:	Clean and rehabilitate Cornelius Wash that directs water to the Virgin River. Clean and rehabilitate wash to the west of the above mentioned was. Install new culvert with rip rap at inlet and outlet of culvert to prevent erosion. Redesign culvert outlet on the more west wash.
Timeline:	5 Years
Estimated Cost:	Unknown
Possible Funding:	Virgin, CIB, CDBG, FEMA
Responsible Agencies:	Virgin
Plan Goals Addressed:	Prevention, Property Protection, Environmental Protection
Priority:	High

Virgin Flood Mitigation Strategy #2	
Objective:	(Sierra Bella Subdivision Storm Drain Improvements) Storm water management projects to prevent residential flooding and prevent flood waters from washing out roadways and drainage ditches.
Action:	Re-grade waterways and construct swales to direct flow of water on and along the north end of Sierra Bella Subdivision. Clear Debris from wash and through bridge from the north end of subdivision to Kolob Terrace Road. Place rip rap along points of erosion (turns, steep slopes, and culvert inlets and outlets). Coordination and a project is underway with NRCS and Virgin Town for improvements of small area west of Pocketville Road and north of Hwy 9.
Timeline:	5 Years
Estimated Cost:	Unknown
Possible Funding:	Virgin, CIB, CDBG, FEMA
Responsible Agencies:	Virgin
Plan Goals Addressed:	Prevention, Property Protection, Environmental Protection

Priority:	High

Virgin Flood Mitigation Strategy #3	
Objective:	(Mill Street to North Street City Block Storm Drain Improvements) Storm water management projects to prevent residential flooding and prevent flood waters from washing out roadways and drainage ditches.
Action:	Re-grade wash. Clear trees and debris from wash. Place rip rap along points of erosion and outlet to the Virgin River (turns, steep slopes, and culvert inlets and outlets)
Timeline:	5 Years
Estimated Cost:	Unknown
Possible Funding:	Virgin, CIB, CDBG, FEMA
Responsible Agencies:	Virgin
Plan Goals Addressed:	Prevention, Property Protection, Environmental Protection
Priority:	High

Virgin Flood Mitigation Strategy #4	
Objective:	100 North Street and 150 South Street Storm Drain Improvements) Storm water management projects to prevent residential flooding and prevent flood waters from washing out roadways and drainage ditches.
Action:	Construct concrete swales and waterways to direct storm water to the Virgin River. Direct underground piping to convey water discharge into Virgin River Washes.
Timeline:	5 Years
Estimated Cost:	Unknown
Possible Funding:	Virgin, CIB, CDBG, FEMA
Responsible Agencies:	Virgin
Plan Goals Addressed:	Prevention, Property Protection, Environmental Protection
Priority:	High

Virgin Flood Mitigation Strategy #5	
Objective:	(Town Storm Water Drainage Plan) Storm water management projects to prevent residential flooding and prevent flood waters from washing out roadways and drainage ditches.
Action:	Develop a storm water drainage and management plan for planning and maintenance planning. Plan outline costs for such maintenance and planning for future improvements. GIS mapping of project with portable management device.

Timeline:	5 Years
Estimated Cost:	$30,000
Possible Funding:	Virgin, CIB, CDBG, FEMA
Responsible Agencies:	Virgin
Plan Goals Addressed:	Prevention, Property Protection, Environmental Protection
Priority:	High

Washington County Flood Mitigation Strategy #1	
Objective:	Minimize future flood damage in the unincorporated County.
Action:	Implement zoning to prevent development of structures near all rivers, creeks, lakes and dry washes
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	Local government operating budget; State and Federal flood and planning grant programs
Responsible Agencies:	Local government
Plan Goals Addressed:	Emergency Services, Partnership/Coordination, Property Protection
Priority:	High

Washington County Flood Mitigation Strategy #2	
Objective:	To reduce flooding risk as it relates to the built environment.
Action:	Address flood control at the building/construction level by requiring all subdivision proposals to have a storm water drainage system.
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	Private funds/ developer.
Responsible Agencies:	Local (especially Springdale Town, Rockville Town, Town of Virgin, LaVerkin City, City of Toquerville, Hurricane City, Town of Leeds Washington City, St. George City, Santa Clara City), jurisdictional level.
Plan Goals Addressed:	Environmental Protection, Prevention, Property Protection
Priority:	High

Washington County Flood Mitigation Strategy #3	
Objective:	To reduce flooding risk at the community level.
Action:	Clear debris and other material from all waterways.
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	Related public/private property owners.

Responsible Agencies:	Private property owners, irrigation companies, local jurisdictions.
Plan Goals Addressed:	Environmental Protection, Prevention, Property Protection
Priority:	High

Washington County Flood Mitigation Strategy #4	
Objective:	Minimize future flood damage in Dammeron Valley area of Washington County.
Action:	Provide flood channel modification to redirect flooding along State Road 18 to historic washes away from residences (Dammeron Valley area of Unincorporated County.
Timeline:	Unknown
Estimated Cost:	Unknown
Possible Funding:	Local government operating budget; State and Federal flood grant programs
Responsible Agencies:	Local government
Plan Goals Addressed:	Environmental Protection, Partnership/Coordination, Prevention, Property Protection
Priority:	High

Washington County Flood Mitigation Strategy #5	
Objective:	Minimize future flood damage in Diamond Valley area of unincorporated Washington County.
Action:	Remove debris and provide flood protective features along Rock Hollow Wash to prevent residential flooding.
Timeline:	Unknown
Estimated Cost:	Unknown
Possible Funding:	Local government operating budget; State and Federal flood grant programs
Responsible Agencies:	Local government
Plan Goals Addressed:	Environmental Protection, Partnership/Coordination, Prevention, Property Protection
Priority:	High

Washington County Flood Mitigation Strategy #6	
Objective:	Minimize future flood damage in Manganese area of Unincorporated Washington County.
Action:	Purchase isolated property to reserve as open space to resolve access problems during flood events. (Manganese area of Unincorporated Washington County)
Timeline:	Unknown

Estimated Cost:	Unknown
Possible Funding:	Local government operating budget; State and Federal flood grant programs
Responsible Agencies:	Local government
Plan Goals Addressed:	Emergency Services, Environmental Protection, Prevention
Priority:	High

Washington County Flood Mitigation Strategy #7	
Objective:	Minimize future flood damage in Dixie Deer area of Unincorporated Washington County.
Action:	Modify flood channel away from residences to prevent flooding. (Dixie Deer area of Unincorporated Washington County).
Timeline:	Unknown
Estimated Cost:	Unknown
Possible Funding:	Local government operating budget; State and Federal flood grant programs
Responsible Agencies:	Local government
Plan Goals Addressed:	Environmental Protection, Partnership/Coordination, Prevention, Property Protection
Priority:	High

Santa Clara/St. George/ Washington County Flood Mitigation Strategy #8	
Objective:	Stabilize Santa Clara River for future flood events.
Action:	Provide grade stabilization to limit scouring near Dixie Drive Bridge and through Santa Clara City. (Washington County, St. George and Santa Clara City).
Timeline:	Unknown
Estimated Cost:	Unknown
Possible Funding:	Local government operating budget; State and Federal flood grant programs
Responsible Agencies:	Local government
Plan Goals Addressed:	Environmental Protection, Partnership/Coordination, Prevention, Property Protection
Priority:	High

Washington County Flood Mitigation Strategy #9	
Objective:	Stabilize grade of Santa Clara River to limit scouring.
Action:	Provide grade stabilization to limit scouring of the Santa Clara River near the Lower Gunlock Bridge. (Gunlock area of Unincorporated Washington County)



Timeline:	Unknown
Estimated Cost:	Unknown
Possible Funding:	Local government operating budget; State and Federal flood grant programs
Responsible Agencies:	Local government
Plan Goals Addressed:	Environmental Protection, Partnership/Coordination, Prevention, Property Protection
Priority:	High

Washington County Flood Mitigation Strategy #10	
Objective:	Provide Flood protective features along Slaughter Creek in the Motoqua area of Unincorporated Washington County).
Action:	Provide Flood protective features along Slaughter Creek in the Motoqua area of Unincorporated Washington County).
Timeline:	Unknown
Estimated Cost:	Unknown
Possible Funding:	Local government operating budget; State and Federal flood grant programs
Responsible Agencies:	Local government
Plan Goals Addressed:	Environmental Protection, Partnership/Coordination, Prevention, Property Protection
Priority:	High

Santa Clara/St. George/ Washington County Flood Mitigation Strategy # 11	
Objective:	Stabilize the Santa Clara River against future flooding events.
Action:	Stabilize river banks and hardened bank structure and infrastructure along the Santa Clara River. Limit development within the flood plain and relocate existing structures threatened by flooding. Clear debris and limit vegetation growth to reduce flood impacts. Provide early warning.
Timeline:	This is a long term strategy with undetermined times lines.
Estimated Cost:	Unknown
Possible Funding:	Local funding, state and federal grant funds as available.
Responsible Agencies:	Washington County, Washington County Water Conservancy District, Local water users, NRCS, Arny Corp of Engineers, other Local Governments.
Plan Goals Addressed:	Emergency Management, Prevention, Property Protection, Environmental Protection, Partnership/Coordination
Priority:	High

Washington County Flood Mitigation Strategy # 12	
Objective:	Stabilize the Slaughter Creek and Beaver Dam Wash against future flooding events.
Action:	Stabilize river banks and hardened bank structure and infrastructure along Slaughter Creek and Beaver Dam Wash. Limit development within the flood plain and relocate existing structures threatened by flooding. Clear debris and limit vegetation growth to reduce flood impacts.
Timeline:	This is a long term strategy with undetermined time lines.
Estimated Cost:	Unknown
Possible Funding:	Local funding, state and federal grant funds as available.
Responsible Agencies:	Washington County, Bureau of Lnad Management, NRCS, Army Corp of Engineers.
Plan Goals Addressed:	Emergency Services, Prevention, Property Protection, Environmental Protection, Partnership/Coordination
Priority:	High

Washington County Flood Mitigation Strategy # 13	
Objective:	Stabilize the Shoal Creek against future flooding events.
Action:	Stabilize river banks and hardened bank structure and infrastructure along Shoal Creek. Limit development within the flood plain and relocate existing structures threatened by flooding. Clear debris and limit vegetation growth to reduce flood impacts. Provide early warning.
Timeline:	This is a long term strategy with undetermined time lines.
Estimated Cost:	Unknown
Possible Funding:	Local Funding, state and federal grant funds as available.
Responsible Agencies:	Washington County, Washington County Water Conservancy District, Local water users, NRCS, Army Corp of Engineers, Enterprise City and other Local Governments.
Plan Goals Addressed:	Emergency Services, Prevention, Property Protection, Environmental Protection, Partnership/Coordination
Priority:	High

Washington County Flood Mitigation Strategy # 14	
Objective:	Provide early warning of structure failure on the South Creek Dam to down stream residents on Rockville, Virgin, La Verkin, Hurricane, Washington, and St. George.
Action:	Develop and provide and early warning system for the South Creek Dam, located above Rockville, Utah

Timeline:	This is a long term strategy with undetermined time lines.
Estimated Cost:	Unknown
Possible Funding:	Local private and government funding, state and federal grant funds as available.
Responsible Agencies:	Washington County, Washington County Water Conservancy District, Springdale Fruit Company, NRCS, Army Corp of Engineers, other Local Governments.
Plan Goals Addressed:	Emergency Services, Prevention, Property Protection, Environmental Protection, Partnership/Coordination.
Priority:	High

Washington County Flood Mitigation Strategy #15	
Objective:	Improve flood plain management activities by exceeding the minimum Nation Flood Insurance Program standards. Decrease flood insurance Rates.
Action:	Each community will voluntarily participate in the FEMA Community Rating system which will help to keep communities more safe, reduce flood insurance rates, and improve flood plain management activities.
Timeline:	Ongoing
Estimated Cost:	Variable
Possible Funding:	Local, State, and Federal Funding Sources
Responsible Agencies:	Local Government
Plan Goals Addressed:	Environmental Protection, Partnership/Coordination, Prevention, Property Protection
Priority:	High

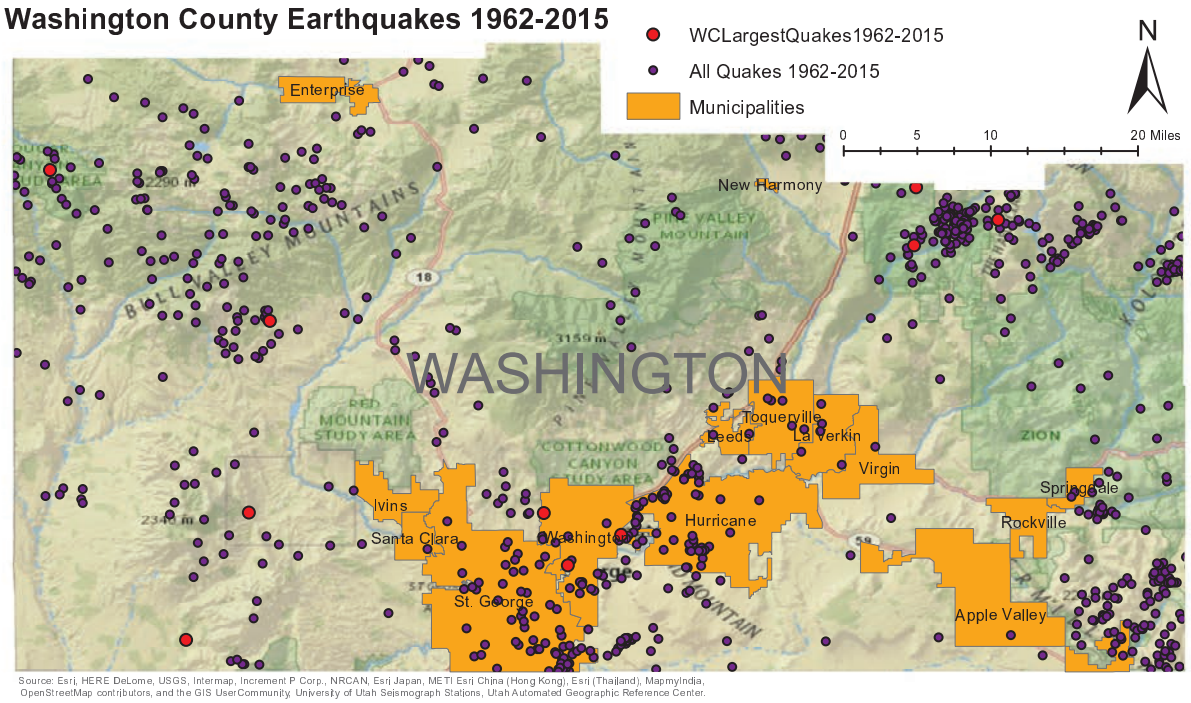


Earthquake

HAZARD RISK ASSESSMENT

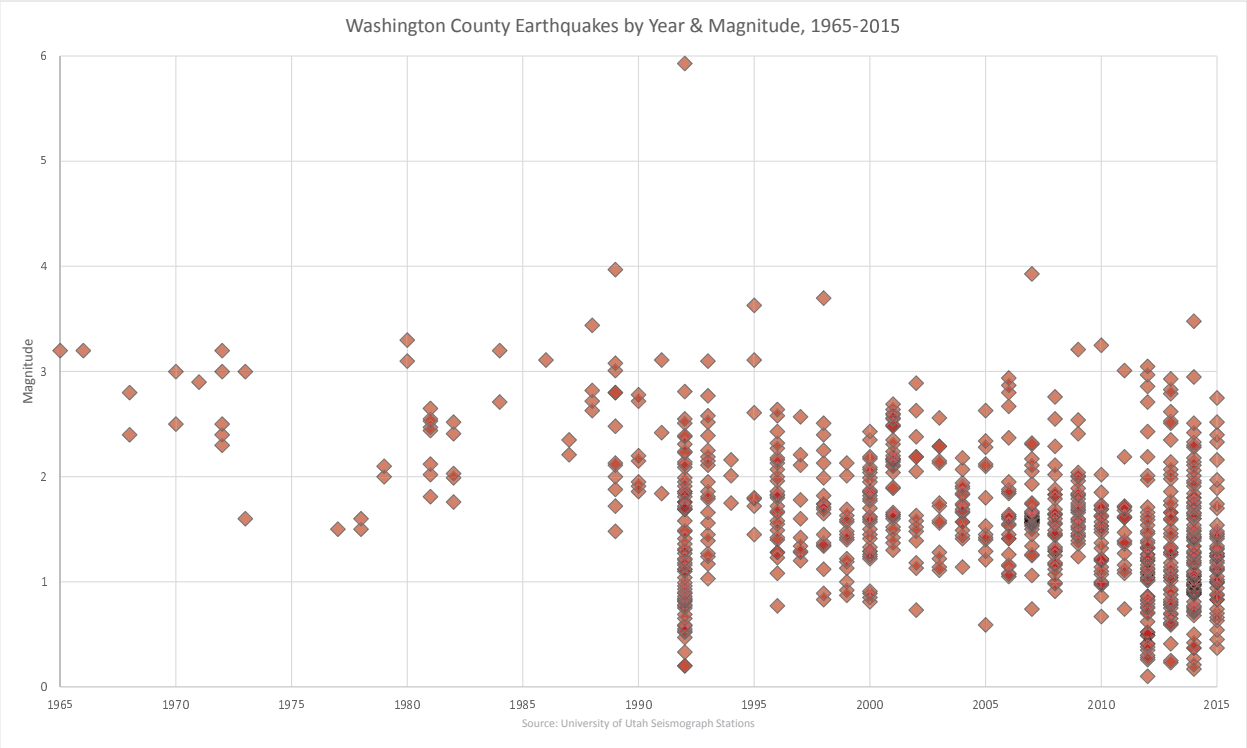
An Earthquake releases built up energy when blocks of earth slip past each other. Earthquakes are a frequent occurrence in Washington County but are rarely large enough to be felt. Between the years of 1962-2015 more than 700 earthquakes have transpired in the County. Along with several of those earthquakes large enough to cause disturbance, a 5.9 quake in 1992 near Washington City triggered a landslide, destroying three homes and blocked a state highway. Even though there has not been a large number of significant events in recent years, there is still potential for

more disastrous quakes.



Counties Greatest Earthquakes 1962-2015 - Washington County		
Date	**Magnitude**	**Location**
9/2/1992	5.93	In Washington
5/1/1989	3.97	5.8 mi. West of Ivins
6/11/2007	3.93	13.2 mi. West-Southwest of Enterprise
7/16/1998	3.7	In Washington
6/8/1995	3.63	7.5 mi. East of New Harmony
4/4/2014	3.48	10.5 mi. Northwest of Ivins
8/21/1988	3.44	13.3 mi. West of St. George
12/21/1980	3.3	12 mi. East of New Harmony
7/8/2010	3.25	In Washington
3/23/2009	3.21	8.2 mi. East-Southeast of New Harmony
Source: Utah Seismograph Stations/University of Utah, Earthquakes measured using Local Magnitude (ML)		

Earthquakes occurrences in the county mainly cluster in the St. George-Hurrican Metro Area, near Hildale, west of SR-18, and between Timber Top Mountain and Kolob Peak. The majority of these quakes are quite small with a median magnitude of 1.58. There have been about 27 earthquakes large enough to be felt since 1960, but with exception of just a few of these quakes very few have been reported.



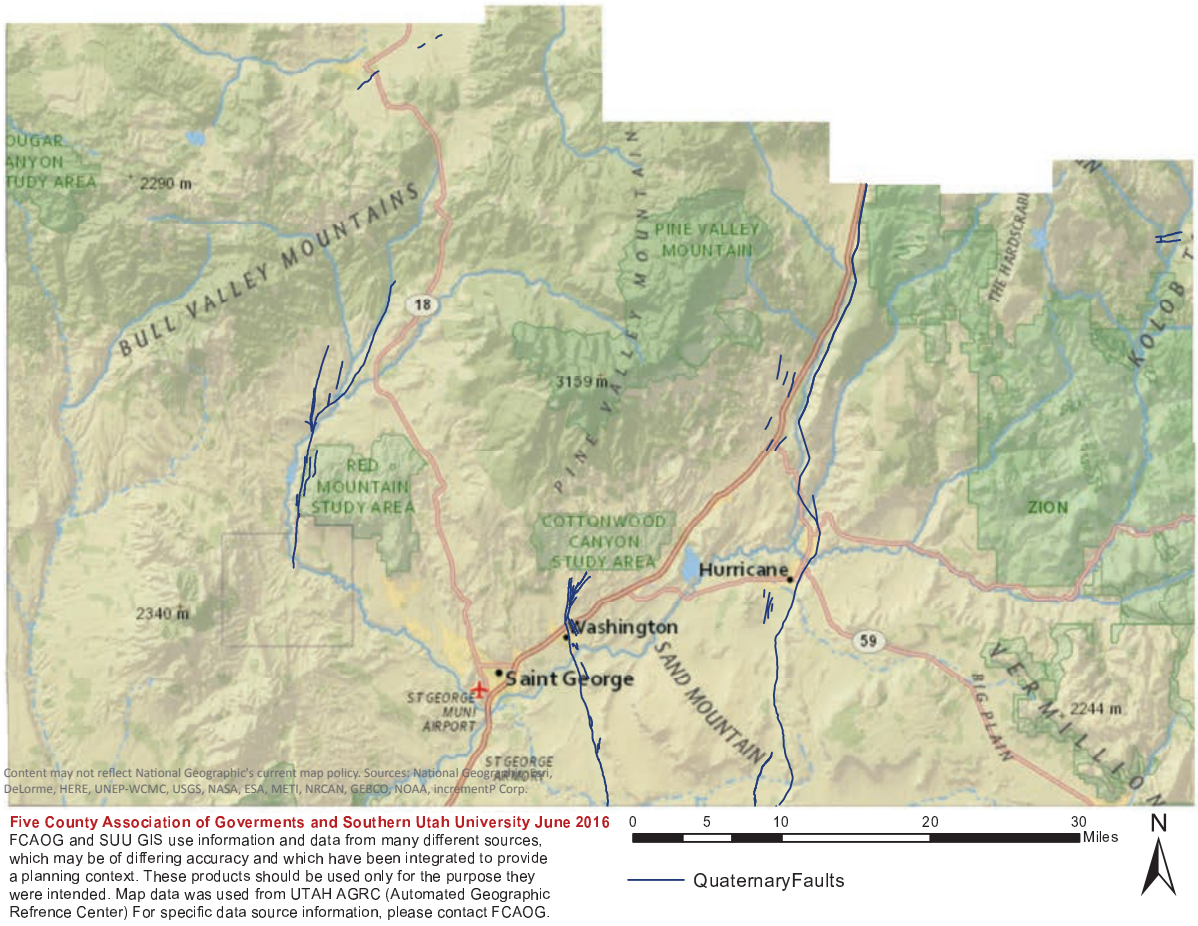
*The increasing number of earthquakes by year is likely contributed to more seismograph stations and equipment advances.

Earthquakes are not a predictable hazard. However, Geologic study of the recent geologic past can help reveal what can be expected for the future. The Charts provided depicting recent historical quakes are not intended to indicate the cycle of regional earthquakes and what to expect, but rather, to display that earthquakes are and will continue to be real threat.



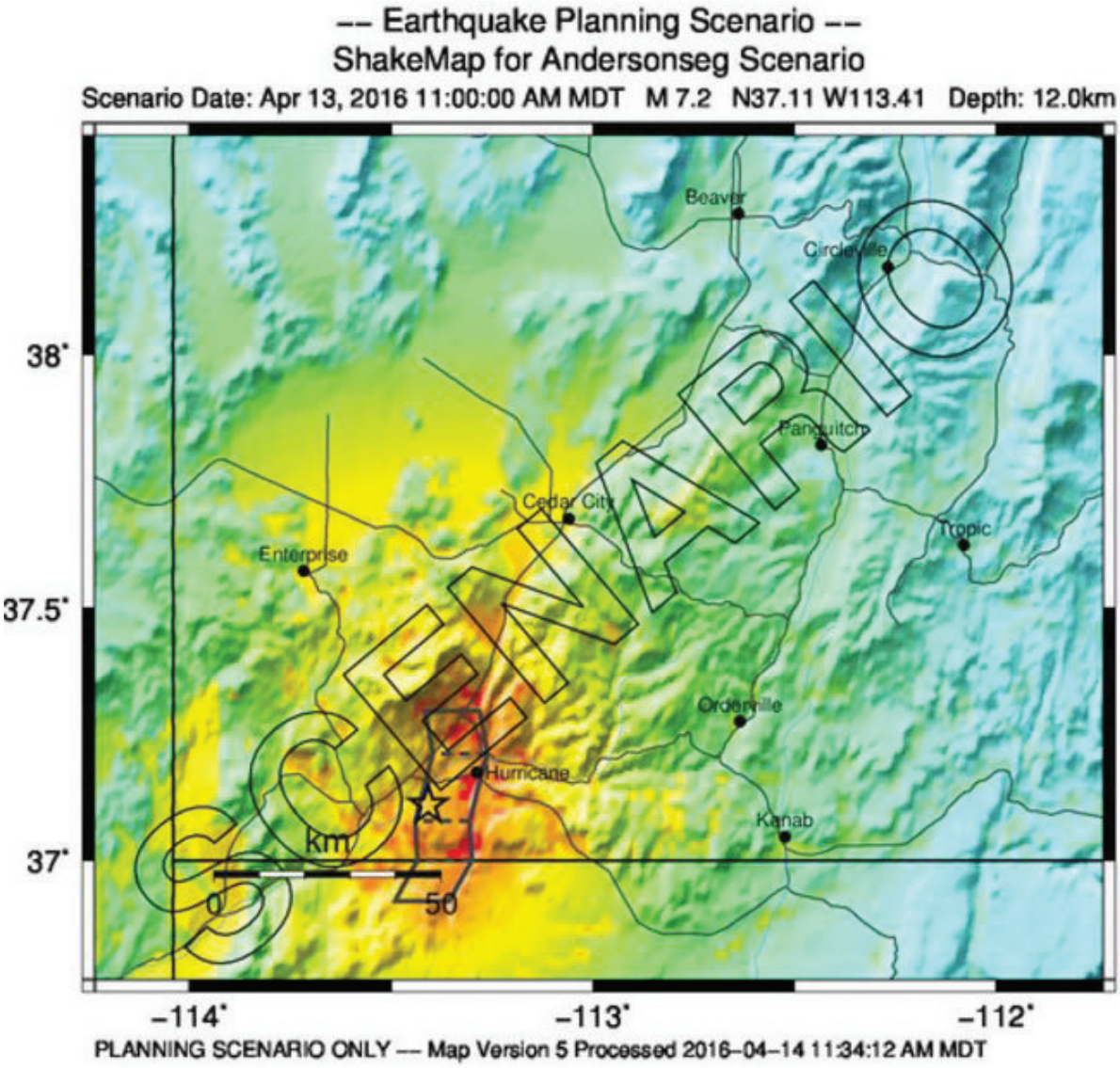
Image-Portion of the Hurricane Fault

Washington County Faults



The previous mitigation plan included an analysis for all structures within 1,000 feet of a fault. The problem with this type of analysis is that it only accounts for structures within this boundary. ShakeMap scenarios account for ground movement providing a more realistic scenario and analysis of structural damage resulting from an earthquake.

Due to time and resource constraints only one ShakeMap was produced. Because of these limitations the scenario with the fault segment able to produce the largest earthquake near the largest population was selected. In this scenario it is the Anderson Segment of the Hurricane Fault.



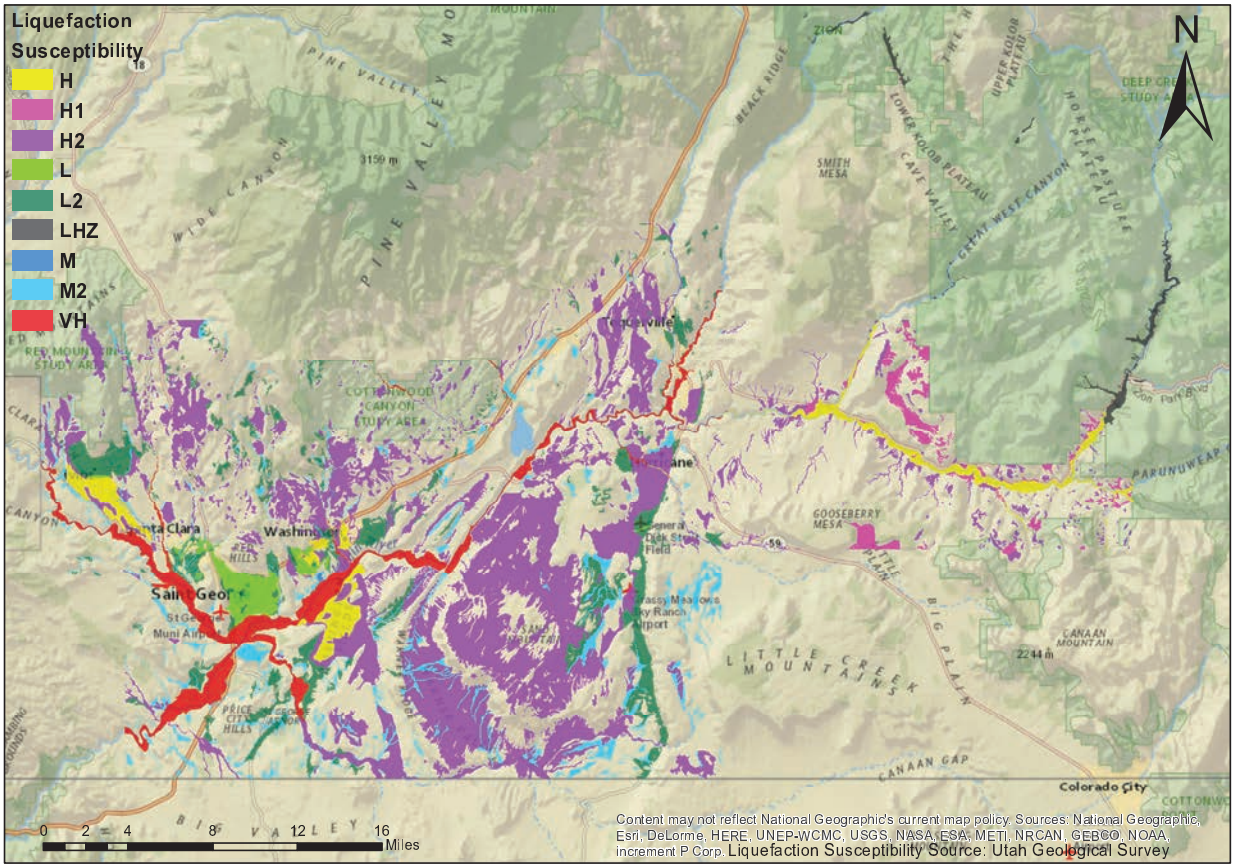
PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	*<0.1*	*0.5*	*2.4*	*6.7*	*13*	24	44	83	>156
PEAK VEL.(cm/s)	<0.07	0.4	1.9	5.8	*11*	*22*	*43*	*83*	*>160*
INSTRUMENTAL INTENSITY	I	II–III	IV	V	VI	VII	VIII	IX	X+

Scale based upon Wald, et al.; 1999

Liquefaction occurs during an earthquake of magnitude five or greater, throughout an earthquake soil can lose its strength and ability to resist the weight of overlaying structures. Developed and developing areas of Washington County that are known or are suspected to have high to very high liquefaction are Little Valley, Washington Fields, Portions of Bloomington, St. George, Santa Clara, and Ivins. It is advisable to consult a geologist to gain a better understanding of liquefaction risks on the parcel level. The following liquefaction map was created using liquefaction data from the Utah Geological Survey for several area of the county. The original maps can be found at http://

geology.utah.gov/map-pub/maps/geologic-hazard-maps/#toggle-id-27 .

Liquefaction Susceptibility Map for the St. George-Hurricane Metropolitan Area, The SR-9 Corridor, and Zion National Park



Liquefaction Key Explanation		
H	High	Geologic units that consist of well-sorted sands, silty sands, and gravels where depth to ground water is <50 feet. None of these units are known to have liquefied during the 1992 St. George earthquake.
H1	High1	Geologic units with textural characteristics of the high susceptibility category, but geotechnical data on groundwater conditions are lacking. However, these units are mapped by the NRCS as poorly drained soils (low–moderate permeability) that may develop shallow groundwater locally when rates of water application exceed the soil's drainage capacity.
H2	High2	Geologic units with textural characteristics of the High category, but ground-water information is lacking.
L	Low	Geologic units that consist of moderately to poorly sorted sands and gravels where depth to ground water is <50 feet. Liquefaction hazard is considered low in these units because of their textural characteristics and/or degree of cementation.
L2	Low2	Geologic units with textural characteristics of the Low category, but ground-water information is lacking.

LHZ	Liquefaction Hazard Susceptibility Zone	Areas where potentially liquefiable unconsolidated geologic units may also be saturated. Determining if a liquefaction hazard exists at a particular location requires acquiring site-specific information about soil texture and density, ground-water conditions, and the frequency and intensity of anticipated ground shaking.
M	Moderate	Geologic units that consist of moderately sorted sands, silty sands, and gravels where depth to ground water is <50 feet.
M2	Moderate2	Geologic units with textural characteristics of the Moderate category, but ground-water information is lacking.
VH	Very High	Geologic units that liquefied during the 1992 St. George, Utah, M 5.8 earthquake, and consist of well-sorted sands, silty sands, and gravels along modern stream drainages and young alluvial terraces where depth to ground water is <10 feet.

SUMMARY

Washington County is geologically active with over 700 earthquakes occurring since 1962. Only a handful of these quakes have been large enough to be felt. The current ShakeMap scenario displays moderate to heavy damage across the most populated portions of the county, occurring from heavy shaking. Additionally, Liquefaction will be a problem for developments east of St. George, In Hurricane and near rivers.

MITIGATION STRATEGY

Earthquake mitigation strategies include general mitigation actions that agencies are capable of implementing during the next five years, given their existing resources and authorities. In addition to the earthquake mitigation strategies provided herewith, this Natural Hazard Mitigation Plan endorses any seismic mitigation proffered by the Utah Seismic Safety Commission. In particular, numerous and varied earthquake mitigation strategies are provided in *A Strategic Plan for Earthquake Safety in Utah (January, 1995)* completed by the Utah Seismic Safety Commission. It is highly recommended that jurisdictions whom desire to provide more specific earthquake mitigation strategies consult the aforementioned plan, which can be accessed at: http://ussc.utah.gov/.

Washington County Earthquake Mitigation Strategy #1	
Objective:	Promote building safety through non-structural improvements.
Action:	Increase public education related to earthquake hazards by distributing Utah Seismic Safety Commission informational brochures to County and City emergency management agencies.
Timeline:	Ongoing
Estimated Cost:	Very Minimal: request Utah Seismic Safety Commission to deliver brochures; and/or download brochures directly from: http://ussc.utah.gov/

Possible Funding:	County and City operating budget; Utah Seismic Safety Commission operating budget.
Responsible Agencies:	Local, jurisdictional level.
Plan Goals Addressed:	Education/Outreach, Partnership/Coordination
Priority:	Medium

Washington County Earthquake Mitigation Strategy #2	
Objective:	To reduce earthquake risk as it relates to the built environment.
Action:	Continued dedication/vigilance in enforcing the seismic standards established in the International Building Code (IBC).
Timeline:	Ongoing
Estimated Cost:	Minimal
Possible Funding:	County or City government operating budget (where applicable).
Responsible Agencies:	County or City government (where applicable).
Plan Goals Addressed:	Prevention, Property Protection
Priority:	High

Washington County Earthquake Mitigation Strategy #3	
Objective:	To reduce earthquake losses by mapping and identifying earthquake hazard areas.
Action:	**Action 1**-Utilize the Earthquake Risk Map provided in this plan as a tool to assess earthquake risks as it relates to any building/ subdivision proposals. If deemed necessary, jurisdiction should require the builder/developer to conduct a site-specific earthquake hazard identification/mapping study. **Action 2**-At the County level, contract with Utah Geological Survey (UGS) to formally study/map earthquake hazard areas.
Timeline:	**Action 1**-Ongoing **Action 2**-3 to 5 years
Estimated Cost:	**Action 1**-$1,000 to $5,000 **Action 2**-$7,109 to $14,218 per jurisdiction (1995 cost as reflected in *A Strategic Plan for Earthquake Safety in Utah* adjusted for inflation)
Possible Funding:	**Action 1**-Private funds/ developer. **Action 2**-Local government operating budget; Utah Geologic Survey operating budget.
Responsible Agencies:	Local, jurisdictional level; Private property owner; Utah Geological Survey
Plan Goals Addressed:	**Action 1**-Prevention, Property Protection **Action 2**-Partnership/Coordination, Prevention, Property Protection
Priority:	Medium

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APPENDIX B - REFERENCES, WORKS CITED, & LINKS USED IN THE DOCUMENT

Executive Summary:

- Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended, and Related Authorities FEMA 592, (June 2007)

- FEMA Disaster Mitigation Act of 2000 (Public Law 106-390-OCT. 30, 2000)

Problem Soil References:

- Five County Hazard Mitigation Plan (2011)
    - Problem Soils

- Association of environmental & Engineering Geologists
    - Expansive and Collapsible Soil

- Encyclopaedia Britannica
    - Karst

- Geology.com
    - Expansive Soils and Expansive Clay

Landslide References:

- United States Geological Survey,
    - The Utah Geological Survey collected newspaper articles regarding historic landslides from 1850-1978 as part of a landslide inventory pilot project. In regards to the Five County region the reference articles are:
        1. Butler and Marsell 1940-1967
        2. Kane Co. Standard Feb. 12 1932, March 20 1942
        3. Parowan Times Nov. 24 1915, May 16 1941
        4. Piute Co. Papers May 28 1943
        5. Richfield Reaper March 20 1930, Feb. 181932
        6. Southern Utonian March3 1891, Jan. 4 1924
        7. Toole County Chronicle Dec. 5 1947
        8. Washington Co. News May 6 1915
        9. Woolley 1920-1936

    - Landslide Hazards-A National Threat (2005)

- The Geological Society
    - Landslide types
    - Landslide Classification

    - Homeowner's Guide to Recognizing and Reducing Landslide Damage on their Property.
- Utah Geological Survey
    - Homeowner's Guide to Recognizing and Reducing Landslide Damage on Their Property

Wildfire References:

- United State Geological Survey
    - Federal Fire Occurrence Map Viewer (2014)

- Bureau of Land Management
    - Geographic Datasets-2015 Fire History Geodatabase

- Southwest Utah Regional Wildfire Protection Plan (2007)
    - Color Country Fuels Committee's Communities at Risk (2005)

Flood References:

- National Oceanic and Atmospheric Administration
    - The National Severe Storms Laboratory-Severe Weather 101-Floods
    - National Centers for Environmental Information-Storm Events Database
    - National Weather Service-Flooding in Utah

- FEMA National Flood Insurance Program Community Status Book (2016)

- Hazards & Vulnerability Research Institute (2015). The Spatial Hazard Events and Losses Database for the United States, Version 14.0 [Online Database]. Columbia, SC: University of South Carolina. Available from http://www.sheldus.org

- News Articles
    - Deseret New-Bulldog Fire Surpasses 33,000 Acres (Joseph Dougherty & Laura Hancock, 7/17/2003)
    - Fox 13 Salt Lake City-Scarred land recovering 5 Years After Milford Flat Wildfire (Todd Tanner Updated 7/25/2012
    - Salt Lake Tribune-Milford Flat Fire one of biggest in Utah History (Nathan C. Gonzalez, 2007)
    - Iron County Today-Baboon Fire Burns Near Minersville (Author not listed, 7/18/2012)
    - Deseret News-Big Wash Fire has Residents Fleeing (Joe Bauman 6/10/2002)
    - Salt Lake Tribune-Winds Beat Back Utah Firefighters (Mark Havnes 6/25/2005)

Earthquake References:

- United States Geological Survey
    - Measuring Earthquakes FAQs
    - Glossary
    - Magnitude/Intensity Comparison

- University of Utah Seismograph Stations
    - Earthquake Catalogs (7/1/1962 - 12/31/2015)

- Utah Geological Survey
    - I am Thinking of Buying a House at X Address... Is it Near a Fault? (Sandy Eldredge)
    - Earthquakes & Utah (Series 48; 1997)
    - Homebuyer's Guide to Earthquake Hazards in Utah (Series 38; 1996)
    - Guidelines for Evaluating Surface-Fault-Rupture Hazards in Utah (Christensen, Batatian, Nelson; 2003)

- The St. George Earthquake of September 2, 1992 (Philip A. Pearthree Arizona-Geological Survey, Terry C. Wallace-University of Arizona)

Severe Weather References:

- National Oceanic and Atmospheric Administration
    - National Centers for Environmental Information-Storm Events Database
    - The National Severe Storms Laboratory-Severe Weather 101-Winds, Thunderstorms, Tornadoes, Lighting, Hail, Winter Weather

Drought References:

- Drought in Utah, Learning from the Past-Preparing for the Future; Utah State Water Plan (The Utah Division of Water Resources, 2007)

- National Oceanic and Atmospheric Administration - National Centers for Environmental Information
    - North American Drought Monitor
    - Palmer Drought Severity Index (1895-2015)
    - Drought Termination and Amelioration
    - Earth System Research Laboratory
    - ClimDiv Temperature-Precititation-Drought (June 2014)

- National Drought Mitigation Center
    - What is Drought
    - Types of Drought

- A Historical Perspective of U.S. Climate Divisions (Nathaniel b. Guttman and Rovert G. Quale

National Climatic Data Center, Asheville, North Carolina; 1996)

- United Stated Geological Survey
    - Climate Geodatabase (Climate Divisions)

- Utah Hazard Mitigation Plan (2014)
    - Drought 2014

- Oregon Department of Forestry
    - As part of a West Wide Wildfire Assessment that covers seventeen Western States the Utah Department of Natural Resources (Utah DNR) has partnered with many other western states organizations to prepare thorough wildfire assessments throughout the Western U.S. In addition the proper citation from documents provided by the Utah DNR Wildfire Risk Assessment Portal is "The Oregon Department of Forestry"

Radon References:

- Utah Environmental Public Health Tracking
    - Percent of Radon Test Results with Levels Over 4pCi/L by County
    - Average Radon Levels From Home Radon Tests by County and Year
    - Number of Home Radon Tests by County and Year
    - Percent of Homes that Have Been Tested for Radon Gas

- Utah Hazard Mitigation Plan (2014)
    - Other Hazards 2014

- Utah's Health: An Annual Review 2011, Volume 16 (University of Utah)

- Utah Department of Environmental Quality
    - Radon Program

- United States Environmental Protection Agency
    - A Citizen's Guide to Radon (EPA 402/K-12/002; 2012)
    - Basic Radon Facts (EPA 402/F-12/005; 2013)
    - How Often Should I Test/Retest My Home for Radon? (EPA Frequently Asked Questions)

Demographic & Housing References:

- U.S. Census Bureau
    - Utah History Encyclopedia
    - Decennial Census 1900-1990 Compiled by Richard L. Forstall
    - 2014 American Community Survey 5 Year

- 2010 Decennial Census

- Governor's Office of Management & Budget (2015)

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General
- http://dem.utah.gov/hazards-and-mitigation/
- http://www.arcgis.com/home/item.html?id=831bc77130f14125a5b9ebefed72a3f1
- http://gardner.utah.edu/utah-demographics/

Drought
- http://www.ncdc.noaa.gov/temp-and-precip/drought/historical-palmers/
- http://drought.unl.edu/DroughtBasics/WhatisDrought.aspx
- ftp://ftp.ncdc.noaa.gov/pub/data/cirs/drd/divisional.README
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- http://nws.weather.gov/lcat/resources/ref_docs/GuttmanQuayle_1996.pdf
- http://droughtmonitor.unl.edu/SupplementalInfo/HistoricalWeatherData.aspx

Radon
- http://www.deq.utah.gov/ProgramsServices/programs/radiation/radon/radonstudies.htm
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- https://www.epa.gov/sites/production/files/2016-02/documents/2012_a_citizens_guide_to_radon.pdf
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- http://www.health.utah.gov/enviroepi/healthyhomes/epht/Radon_in_Utah.pdf

Severe Weather
- http://www.nssl.noaa.gov/education/svrwx101/wind/
- http://www.ncdc.noaa.gov/stormevents/
- http://www.esrl.noaa.gov/psd/data/usclimdivs/data/map.html
- http://hvri.geog.sc.edu/SHELDUS/

Problem Soils
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- http://www.aegweb.org/?page=ExpansiveSoil
- http://geology.com/articles/expansive-soil.shtml
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Landslides
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- http://hvri.geog.sc.edu/SHELDUS/

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Wildfire

- http://www.blm.gov/ut/st/en/prog/more/geographic_information/gis_data_and_maps.html
- http://www.fs.usda.gov/rds/archive/Product/RDS-2015-0047/
- http://utahdnr.maps.arcgis.com/home/item.html?id=1e12d023e99d43cc81eb6b1bbba73a77
- http://wildfire.cr.usgs.gov/firehistory/viewer/viewer.htm
- http://forestry.utah.gov/index.php/fire/resources-for-homeowners/communities-at-risk
- https://utahwildfireriskstaging.timmons.com/

Flood

- http://www.ncdc.noaa.gov/stormevents/
- http://www.nssl.noaa.gov/education/svrwx101/floods/types/
- http://www.floodsafety.noaa.gov/states/ut-flood.shtml
- http://fema.maps.arcgis.com/home/item.html?id=cbe088e7c8704464aa0fc34eb99e7f30
- http://www.waterrights.utah.gov/cgi-bin/damview.exe?Startup
- http://www.rules.utah.gov/publicat/code/r655/r655-010.htm#T5
- http://www.waterrights.utah.gov/gisinfo/wrcover.asp
- http://hvri.geog.sc.edu/SHELDUS/
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- https://www.fema.gov/media-library-data/1458756801023-311019d76271533f6b21ce505df7bd3c/20_crs_508_apr2016.pdf

Earthquake

- https://www2.usgs.gov/faq/categories/9828/3357
- http://earthquake.usgs.gov/earthquakes/search/
- http://geology.utah.gov/map-pub/survey-notes/glad-you-asked/is-my-house-near-a-fault/
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- http://files.geology.utah.gov/online/pdf/pi-38.pdf
- http://files.geology.utah.gov/online/pdf/pi-48.pdf
- http://quake.utah.edu/
- http://quake.utah.edu/Shakemap_archive/ANDERSONseg_se/genex/web/shake/ANDERSONseg_se/products.html

APPENDIX C - GIS SOURCES

Data	Sources
Agriculture	
Water Related Land Uses	Utah Automated Geographic Reference Center (AGRC)
Boundaries	
Parcels	Utah Automated Geographic Reference Center (AGRC)
City, County, and State Boundaries	Utah Automated Geographic Reference Center (AGRC)
Climate & Weather	
Climate Division	United States Geological Survey (USGS)
Forecast Zones	Utah Automated Geographic Reference Center (AGRC)
Earthquake	
Earthquakes	Utah Seismograph Stations
ShakeMap	Utah Seismograph Stations
Liquefaction	Utah Geological Survey (UGS)
Flood	
100 Year Flood Plains	Federal Emergency Management Agency (FEMA)
Bodies of Water	Utah Automated Geographic Reference Center (AGRC)
Dam Break Inundation Zones	Utah Automated Geographic Reference Center (AGRC)
Infrastructure	
Health Care Facilities	Utah Automated Geographic Reference Center (AGRC)
State Facilities	Utah Automated Geographic Reference Center (AGRC)
Rail	Utah Automated Geographic Reference Center (AGRC)
Transmission Lines	Utah Automated Geographic Reference Center (AGRC)
Emergency Medical Services	Utah Automated Geographic Reference Center (AGRC)
Roads	Utah Automated Geographic Reference Center (AGRC)
School & Libraries	Utah Automated Geographic Reference Center (AGRC)
Residential Structures	County Assessor's Data
Agriculture Structures	County Assessor's Data
Commercial Structures	County Assessor's Data
Landslide	
Landslides	Utah Geological Survey (UGS)
Landslide Susceptibility	Utah Geological Survey (UGS)
Rockfall	Utah Geological Survey (UGS)
Problem Soils	
Problem Soils (Engineering Problems)	Utah Automated Geographic Reference Center (AGRC)
Radon	
Radon Potential	FCAOG (2011 Hazard Mitigation Plan)
Wildfire	
Wildfire Risk	Utah Department of Natural Resources (Utah DNR)
Wildfire Threat	Utah Department of Natural Resources (Utah DNR)
Wildfires	Bureau of Land Management (BLM)

APPENDIX D - MYTHS AND FACTS ABOUT THE NATIONAL FLOOD INSURANCE PROGRAM (FEMA)

Who needs flood insurance? Everyone!



And almost everyone in a participating community of the National Flood Insurance Program (NFIP) can buy flood insurance. Nationwide, more than 20,000 communities have joined the Program. In some instances, people have been told that they cannot buy flood insurance because of where they live. To clear up this and other misconceptions about National Flood Insurance, the NFIP has compiled a list of common myths about the Program, and the real facts behind them, to give you the full story about this valuable protection

MYTH: You can't buy flood insurance if you are located in a high-flood risk area.

FACT: You can buy National Flood Insurance no matter where you live if your community participates in the NFIP, except in Coastal Barrier Resources System (CBRS) or other protected areas. The Program was created in 1968 to make federally backed flood insurance available to property owners who live in eligible communities. Flood insurance was then virtually unavailable from the private insurance industry. The Flood Disaster Protection Act of 1973, as amended, requires federally regulated lending institutions to make sure that mortgage loans secured by buildings in high-flood risk areas are protected by flood insurance.

Lenders should notify borrowers, prior to closing, that their property is located in a high-flood risk area and that National Flood Insurance is required.

MYTH: You can't buy flood insurance immediately before or during a flood.

FACT: You can purchase National Flood Insurance at any time. There is usually a 30-day waiting period after premium payment before the policy is effective, with the following exceptions:

1. If the initial purchase of flood insurance is in connection with the making, increasing, extending, or renewing of a loan, there is no waiting period. Coverage becomes effective at the time of the loan, provided application and payment of premium is made at or prior to loan closing.

2. If the initial purchase of flood insurance is made during the 13-month period following the effective date of a revised flood map for a community, there is a 1-day waiting period. This applies only where the Flood Insurance Rate Map (FIRM) is revised to show the building to be in a Special Flood Hazard Area (SFHA) when it had not been in an SFHA.

The policy does not cover a "loss in progress," defined by the NFIP as a loss occurring as of 12:01 a.m. on the first day of the policy term. In addition, you cannot increase the amount of insurance

coverage you have during a loss in progress.

MYTH: Homeowners insurance policies cover flooding.

FACT: Unfortunately, many home and business owners do not find out until it is too late that their homeowners and business multiperil policies do not cover flooding. The NFIP offers a separate policy that protects the single most important financial asset, which for most people is their home or business.

Homeowners can include contents coverage in their NFIP policy. Residential and commercial renters can purchase contents coverage. Business owners can purchase flood insurance coverage for their buildings and contents/inventory and, by doing so, protect their livelihood.

MYTH: Flood insurance is only available for homeowners.

FACT: Most people who live in NFIP participating communities, including renters and condo unit owners, are eligible to purchase federally backed flood insurance. A maximum of $250,000 of building coverage is available for single-family residential buildings; $250,000 per unit for residential condominiums. The limit for contents coverage on all residential buildings is $100,000, which is also available to renters.

Commercial structures can be insured to a limit of $500,000 for the building and $500,000 for the contents. The maximum insurance limit may not exceed the insurable value of the property.

MYTH: You can't buy flood insurance if your property has been flooded.

FACT: You are still eligible to purchase flood insurance after your home, apartment, or business has been flooded, provided that your community is participating in the NFIP.

MYTH: Only residents of high-flood risk areas need to insure their property.

FACT: All areas are susceptible to flooding, although to varying degrees. If you live in a low-to-moderate flood risk area, it is advisable to have flood insurance. Nearly 25 percent of the NFIP's claims come from outside high-flood risk areas. Residential and commercial property owners located in low-to-moderate risk areas should ask their agents if they are eligible for the Preferred Risk Policy, which provides inexpensive flood insurance protection.

MYTH: National Flood Insurance can only be purchased through the NFIP directly.

FACT: NFIP flood insurance is sold through private insurance companies and agents, and is backed by the federal government.

MYTH: The NFIP does not offer any type of basement coverage.

FACT: Yes it does. The NFIP defines a basement as any area of a building with a floor that is below ground level on all sides. While flood insurance does not cover basement improvements (such as finished walls, floors, or ceilings), or personal belongings kept in a basement (such as furniture and other contents), it does cover structural elements and essential equipment.

The following items are covered under building coverage, as long as they are connected to a power source, if required, and installed in their functioning location:

- Sump pumps
- Well water tanks and pumps, cisterns, and the water in them
- Oil tanks and the oil in them, natural gas tanks and the gas in them
- Pumps and/or tanks used in conjunction with solar energy
- Furnaces, water heaters, air conditioners, and heat pumps
- Electrical junction and circuit breaker boxes and required utility connections
- Foundation elements
- Stairways, staircases, elevators, and dumbwaiters
- Unpainted drywall walls and ceilings, including nonflammable insulation
- Cleanup

The following items are covered under contents coverage:
- Clothes washers and dryers
- Food freezers and the food in them

The NFIP recommends both building and contents coverage for the broadest protection.

MYTH: The NFIP encourages coastal development.

FACT: One of the NFIP's primary objectives is to guide development away from high-flood risk areas. NFIP regulations minimize the impact of structures that are built in SFHAs by requiring them not to cause obstructions to the natural flow of floodwaters. Also, as a condition of community participation in the NFIP, those structures built within SFHAs must adhere to strict floodplain management regulations enforced by the community.

In addition, the Coastal Barrier Resources Act (CBRA) of 1982 relies on the NFIP to discourage building in fragile coastal areas by prohibiting the sale of flood insurance in designated CBRA areas. While the NFIP does not prohibit property owners from building in these areas, any Federal financial assistance, including federally backed flood insurance, is prohibited. However, the CBRA does not prohibit privately financed development or insurance.

MYTH: Federal disaster assistance will pay for flood damage.

FACT: Before a community is eligible for disaster assistance, it must be declared a federal disaster area. Federal disaster assistance declarations are issued in less than 50 percent of flooding events.

The premium for an NFIP policy, averaging a little over $500 a year, can be less expensive than the monthly payments on a federal disaster loan.

Furthermore, if you are uninsured and receive federal disaster assistance after a flood, you must purchase flood insurance to remain eligible for future disaster relief.

MYTH: The NFIP does not cover flooding resulting from hurricanes or the overflow of rivers or tidal waters.

FACT: The NFIP defines covered flooding as a general and temporary condition during which the surface of normally dry land is partially or completely inundated. Two properties in the area or two or more acres must be affected. Flooding can be caused by:

• Overflow of inland or tidal waters, or
• Unusual and rapid accumulation or runoff of surface waters from any source, such as heavy rainfall, or
• Mudflow, i.e., a river of liquid and flowing mud on the surfaces of normally dry land areas, or
• Collapse or subsidence of land along the shore of a lake or other body of water, resulting from erosion or the effect of waves, or water currents exceeding normal, cyclical levels.

For more information about the NFIP and flood insurance, call
1-800-427-4661
or contact your insurance company or agent.
For an agent referral, call 1-888-435-6637
TDD 1-800-427-5593
http://www.fema.gov/business/nfip
http://www.floodsmart.gov
F-002 FEMA B-690 / Catalog No. 08094-3 (2/10)

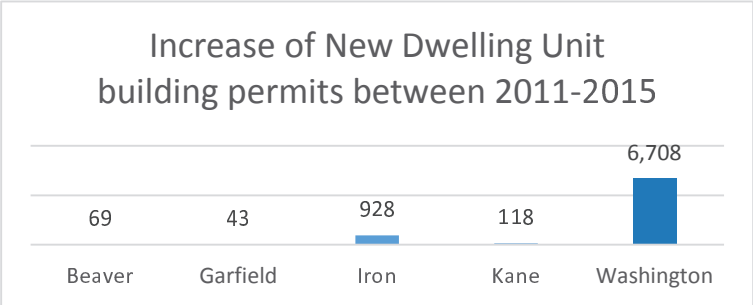
APPENDIX E - NATIONAL FLOOD INSURANCE PROGRAM WORKSHEET

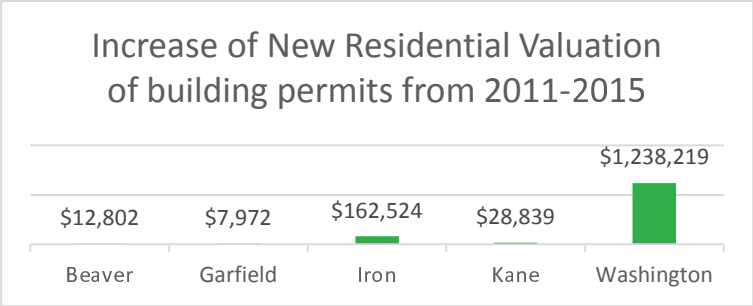
National Flood Insurance Program (NFIP) Worksheet - Five County		
NFIP Topic	**Source of Information**	**Comments**
Insurance Summary		
How many NFIP policies are in the community? What is the total premium and coverage?	FEMA Loss Statistics 11/30/2015	See Appendix J
How many claims have been paid in the community? What is the total amount of paid claims? How many of the claims were for substantial damage?	FEMA Loss Statistics 11/30/2015	Total Losses-63 Closed Losses-38 CWOP Losses24 Total Payments-$481,570.09 Substantial damage not given in this report. Addition information in Appendix J
How many structures are exposed to flood risk within the community?	2016 NHMP	12,544 structures within the FEMA 100-year flood plain
Describe any areas of flood risk with limited NFIP policy coverage		See Appendix J
Staff Resources		
Is the Community FPA or NFIP Coordinator certified?	Five County AOG	St. George City is, the other jurisdictions are undetermined.
Is floodplain management an auxiliary function?	Five County AOG	St. George City is, the other jurisdictions are undetermined.
Provide an explanation of NFIP administration services (e.g., permit review, GIS education or outreach, inspections, engineering capability)	Five County AOG	Each of the 38 cities/towns and the five counties provide their own administrative services or hire out.
What are the barriers to running an effective NFIP program in the community, if any?	Five County AOG	Lack of personnel and funding.
Compliance History		
Is the community in good standing with the NFIP?		waiting for Barb to get back to me
Are there any outstanding compliance issues (i.e., current violations)?		waiting for Barb to get back to me
When was the most recent Community Assistance Visit (CAV) or Community Assistance Contact (CAC)?		See Appendix J
Is a CAV or CAC scheduled or needed?		See Appendix J
Regulation		
When did the community enter the NFIP?	FEMA Community Status Book Report	Please see the flood portion of each County Section.
Are the FIRMs digital or paper	FEMA Community Status Book Report	Please see the flood portion of each County Section.
Do floodplain development regulations meet or exceed FEMA or State minimum requirements? If so, in what ways?		waiting for Barb to get back to me
Provide an explanation of the permitting process	Five County AOG	Permitting processes vary depending upon Jurisdiction.
Community Rating System (CRS)		

Does the community participate in CRS?	FEMA Community Rating System Eligible Communities 5/1/2016 https://www.fema.gov/media-library/assets/documents/27808	3 of 38 cities/towns participate in the CRS, they are Cedar City, Santa Clara, & St. George
What is the community's CRS Class Ranking?	FEMA Community Rating System Eligible Communities 5/1/2016 https://www.fema.gov/media-library/assets/documents/27808	Cedar City-10 Santa Clara-9, St. George, 6
What categories and activities provide CRS points and how can the class be improved?	FEMA NFIP Community Rating System: A local Official's Guide to Saving Lives Preventing Property Damage Reducing the Cost of Flood Insurance http://www.fema.gov/media-library-data/1444398921661-5a1b30f0f-8b60a79fb40cefcaf2bc290/2015_NFIP_Small_Brochure.pdf	The communities in the Five County Region need to participate in some or all of the 19 public information and floodplain management activities. NFIP Coordinators Manual for details. The majority of these communities need to apply for the CRS, participate in two activities and Activity 310.
Does the plan include CRS planning requirements?	http://www.fema.gov/media-library/assets/documents/8768?id=2434	For CRS planning requirements please see FEMA Coordinator's Manual. http://www.fema.gov/media-library/assets/documents/8768?id=2434

APPENDIX F - REFLECTING CHANGES IN DEVELOPMENT

In assessing the changes in developments that have occurred since the last plan was approved, the planning team decided to analyze these changes through the number of new building permits issued for dwelling units, comparing the number of structures in hazard risk areas, and review the population change.





The increase of new residential building permits in Iron and Washington Counties indicates that people are building homes in areas that have not been previously developed, which also stipulates that growth is likely reaching further into areas that are prone to natural hazards. On the other hand, very few new permits have been issued in Beaver, Garfield, and Kane Counties, indicating that very little growth is extending into vulnerable areas.

The comparison of structures in hazard susceptible areas is far more complex than just comparing the numbers from the 2011 report to the 2016 report. However, the table below is the direct comparison of structures in vulnerable areas, the variables and changes in analysis from the 2011 report to the 2016 report to keep in mind while comparing the numbers are: The 2016 report includes agriculture structures while the 2011 report did not, there may be changes in data sources and updates in the data sources that can have effects on the analysis. Even with the changes between the two assessments there is ample evidence that development is encroaching into hazard susceptible areas.

Between the escalation of new residential building permits and the increase of structures in hazard prone areas from the old assessment to the new one, it is evident that human development is infringing on lands that are more susceptible to natural hazards, especially in Iron and Washington Counties.

Hazard	Old Number of Structures in Susceptible Areas	New Number of Structures in Susceptible Areas
Beaver County		
Severe Weather	6	New assessment is incomparable
Problem Soils	2	0
Landslide	285	195

Wildfire	553	1,526
Flood	0	0
Earthquake	72	New assessment is incomparable
Garfield County		
Severe Weather	27	New assessment is incomparable
Problem Soils	238	366
Landslide	182	270
Wildfire	290	689
Flood	309	556
Earthquake	24	New assessment is incomparable
Iron County		
Severe Weather	840	New assessment is incomparable
Problem Soils	5,177	7,331
Landslide	881	1,906
Wildfire	2,322	5,948
Flood	2,263	2,490
Earthquake	1,621	New assessment is incomparable
Kane County		
Severe Weather	166	New assessment is incomparable
Problem Soils	142	201
Landslide	881	1,479
Wildfire	1,777	1,334
Flood	422	374
Earthquake	496	New assessment is incomparable
Washington County		
Severe Weather	94	New assessment is incomparable
Problem Soils	5,428	7,962
Landslide	2,823	7,300
Wildfire	3,250	24,507
Flood	3,276	9,124
Earthquake	2,402	New assessment is incomparable

The reason for evaluating population is to better understand some of the dynamics of a communities changing development. For example if a communities population is not growing, but there has been significant growth in new residential building permits, there might be a chance that people are building secondary homes in that community. There are many factors involved with a communities change in development, but the goal here is to address several factors of growth to help local decision makers objectively assess whether people are moving into hazard prone areas or not, then make the proper decisions to discourage further development in susceptible areas.

Counties	2010	2015	Population Change	Percent Change
Beaver	6,629	6,354	-275	-4.1%
Garfield	5,172	5,009	-163	-3.2%

Iron	46,163	48,368	2,205	4.8%
Kane	7,125	7,131	6	0.1%
Washington	138,115	155,602	17,487	12.7%

Since the 2011 Hazard Mitigation Plan, Beaver, Garfield, and Kane Counties had little to no population growth while all three of these counties had a small increase of new residential building permits and additional structures within hazard susceptible areas. Iron and Washington Counties experiences an increase in population growth, new residential building permits, and structures within hazard susceptible areas. Based on these numbers and past population trends, Iron and Washington Counties are the more likely to have populations and structures move into hazard prone areas in the near future.

APPENDIX G - REFLECT PROGRESS IN LOCAL MITIGATION

The step to understand the progress of local mitigation efforts was conducted through conversations, interviews, emails, and meetings with key individuals within the planning area. This step identified what mitigations and goals are already established and adopted for the planning areas, and whether or not they promote or deter mitigation activities.

No statement was made whether the communities had integrated the natural hazard mitigations into other planning mechanisms. However, it was evident that many of the communities had incorporated wild fire mitigations as well as others mitigations into planning mechanisms as some of the communities mentioned projects that are underway or have been worked on.

The communities in the Five County Region intend to incorporate the mitigation strategies outlined in this Plan into existing planning mechanisms such as: County Wild Fire Plans for each of the five counties in the region. These plans will be completed by Five County Association of Governments, who is under contract with the state department of Forestry Fire and State Lands. Additional, it is intended that each county will incorporate hazard mitigation efforts into comprehensive land use plans, capital improvement plans, and building codes, but incorporating the mitigations will be left up to their discretion.

What Mitigations have or have not been completed?

Beaver County:

- Clear Debris and other material from all waterways: This is being done annually before the spring runoff. It has been helped to reduce flooding throughout the communities in Beaver County.
- Distributing printed information regarding the risks of living in the Wildland-Urban Interface. This is being done every two to three years. This also addresses the Wildland-Urban Interface Code. This has helped some people living in the Wildland-Urban Interface to take the proper fire safety measures.

Iron County:

- Address flood control at the building/construction level by requiring all subdivision proposals to have a storm water drainage system. This is an on going mitigation that the county has implemented, and will continue to implement. The communities did not say whether this mitigation produced the intended results.
- Clear debris and other material from all waterways. This is occurring on a regular basis, and helps reduce flooding downstream.
- Construct Berms, Levees, and other channel improvements that will contain the 100-year flood within the channel along Coal Creek. Phases one and two are complete and phase three will begin soon. Determining the intended results will be determined when the entire project is finished and a 100-year flood occurs.

Kane County:

- Promote public awareness campaign for property owners living in Wildland-Urban Interface areas. People are being better educated on how to keep their homes safe. Intended results are undermined at this time, but Kane County wants to increase their efforts of awareness.

- Wildfire-Ameliorate access concerns.. Increase ingress/egress into private property/ subdivisions. Coordinate the roadwork being done by private land owners with the work being done by the National Park Service and the Bureau of Land Management. These actions are being worked on, but there was no comment whether this mitigation is producing the intended result.

Washington County:

- Promote public awareness campaign for property owners living in Wildland-Urban Interface areas. People are being better educated on how to keep their homes safe. Intended results are undermined at this time, but Washington County wants to increase their efforts of awareness.
- Fuels reduction. Continue interagency fuel treatments that are adjacent to and within communities at risk. Develop cheatgrass focus areas, to include fire tolerant vegetation and strategic fuel break to protect communities at risk. Encourage landowner mitigation and defensible space work. At least a portion has been done. It is an ongoing mitigation and seems to have the intended results.
- Develop a community fire plan for the Kolob Terrace and Blue Springs area. This mitigation has been complete, and there was no comment whether this mitigation produced the intended results.
- Stabilize the Truman Landslide in Santa Clara. This project is underway, intended results can not be determined until completion of the project.

Every Mayor, City/Town Manager, County Commissioner, and County Emergency Manager was asked to assess the hazard mitigations for their jurisdictions. However, there was an insufficient number of responses from these authorities to know if the mitigations not listed as complete or underway have not been commenced. It is assumed that any mitigation strategy that has not been started or completed is due to time restraints, budget restraints, lack of personnel, or did not get completed due to other higher priorities.

APPENDIX H - PLAN PARTICIPATION LETTERS AND PLAN ADOPTION RESOLUTIONS

The pages following this contain letters documenting Plan Development Participation by every county, city and town in the Five County Association of Governments region of southwest Utah with the exception of Alton, Glendale, and Orderville.

As soon as FEMA determines that this Plan is "*Approvable*" a formal "Adoption Resolution" from each jurisdiction that adopts this plan will be incorporated into this Appendix immediately following the Participation Letters.

This section contains a table with the point of contact, date contacted, and type of contact for each jurisdiction in the region, this section also includes letters of participation from each jurisdiction.

		Type of Contact		
Jurisdiction	**Local Point of Contact**	**Email**	**Phone**	**In Person**
Beaver County Community Mitigation Strategies				
Beaver County	Kyle Blackner	June, July, 2016		July, 2016
Beaver County	Tammy Pearson	June, July, Aug, 2016		July, 2016
Beaver County	Scott Alvord	June, Aug, 2016		
Beaver County	Les Whitney	June, Aug, 2016		
Beaver County	Scott Albrecht	June, 2016		
Beaver County	Michelle Barton	June, July, 2016		
Beaver City	Jason Brown	June, July, Aug, 2016		July, 2016
Beaver City	Craig Wright	Aug, 2016		
Beaver City	Anona Yardley	Sept, 2016	Sept, 2016	
Milford	Nolan Davis	June, July, Aug, 2016		
Milford	Makayla Bealer	Sept, 2016	Sept, 2016	
Minersville	Ward Dotson	Aug, 2016		
Minersville	Cherie	Sept, 2016	Sept, 2016	
Garfield County Community Mitigation Strategies				
Garfield County	Justin Fischer	April, June, July, Aug, Sept, 2016		July, 2016
	John Singer	June, 2016		
Garfield County	Brian Bremner	June, July, 2016		July, 2016
Garfield County	Denise Dastrup	June, July, Aug, 2016		July, 2016
Garfield County	David Tebbs	June, July, 2016		
Garfield County	Chris Hatch	June, July, 2016		
Garfield County	Rob Wolfsey	June, July, 2016		
Antimony	Shannon Allen	Aug, 2016, Dec, 2016, Jan 2017	Sept, 2016, Jan, 2017	
Boulder	Bill Muse	Aug, 2016, Dec 2016, Jan 2017		
Boulder	Judi Davis	Dec, 2016, Jan 2017	Jan, 2017	
Bryce Canyon City	Ron Harris	June, July, Sept, 2016	Sept, 2016	
Bryce Canyon City	Shiloh Syrett	Aug, 2016		
Bryce Canyon City	Jean Seiler	Aug, 2016		
Cannonville	Jeff Stock	Aug, 2016, Dec 2016		

		Type of Contact		
		Email	Phone	In Person
Escalante	Jerry Taylor	Aug, 2016		
Escalante	Stephanie Steed		Sept, 2016	
Escalante	Richard White	Sept, 2016		
Hatch	Ron Riggs	Aug, 2016		
Hatch	Jacie Torgersen	Sept, 2016, Dec 2016, Jan 2017	Sept, 2016	
Hatch	Duane Barnhurst	Dec, 2016, Jan 2017	Dec, 2016 Jan, 2017	
Henrieville	Robert Davis	Aug, 2016		
Panguitch	Eric Houston	Aug, 2016		
Panguitch	Lori Talbot	Aug, 2016	Sept, 2016	
Tropic	Ron Harris	July, 2016	Sept, 2016	
Tropic	Waylon Brinkerhoff	Aug, 2016		
Tropic	Marie	Sept, 2016		
Iron County Community Mitigation Strategies				
Iron County	Steve Platt	June, July, 2016		July, 2016
Iron County	Mike Worthen	June, July, 2016		July, 2016
Iron County	Reed Erickson	June, July, 2016		July, 2016
Iron County	John Higley	June, July, Aug, 2016		July, 2016
Iron County	Kelly Stones	June, July, 2016		
Brian Head	Tom Stratton	June, July, 2016		
Brian Head	H.C. Deutchlander	Aug, 2016		
Brian Head	Bret Howser	Aug, 2016		
Brian Head	Shane Williamson	Sept, 2016	Sept, 2016	
Cedar City	Kit Wareham	July, Sept, 2016		
Cedar City	Maile Wilson	Aug, 2016		
Cedar City	Rick Holman	Aug, 2016		
Cedar City	Paul Bittmenn		Sept, 2016	
Enoch	Rob Dotson	June, July, Aug, 2016	Sept, 2016	
Enoch	Geoffrey Chestnut	Aug, 2016		
Kanarraville	Galen Allred	Aug, 2016		
Kanarraville	David Ence	Sept, 2016	Sept, 2016	
Paragonah	Constance Robinson	Aug, 2016		
Parowan	Donald Landes	Aug, 2016		
Parowan	Shayne Scott	Aug, 2016		
Parowan	Josh Jones	Sept, 2016		
Kane County Community Mitigation Strategies				
Kane County	Shannon McBride	June, July, 2016		July, 2016
Kane County	Tracy Glover	June, July, 2016		July, 2016
Kane County	Lou Pratt	June, July, 2016		July, 2016
Kane County	Jim Matson	June, July, Sept, 2016		July, 2016
Kane County	Dave Owens	Feb, March, June, July, 2016		July, 2016
Kane County	Bert Harris	June, July, Aug, Sept 2016		
Kane County	Alan Alldredge	June, July, Aug, 2016		
Alton	Not Participating			
Big Water	David Schmuker	Aug, 2016		
Big Water	Liz Coates	Sept, 2016	Sept, 2016	
Glendale	Not Participating			
Kanab	Joe Decker	June, July, Aug, Sept2016		July, 2016

		Type of Contact		
		Email	Phone	In Person
Kanab	Robert Houston	Aug, 2016		
Kanab	Barbara Hansen	June, July, 2016		
Orderville	Not Participating			
Washington County Community Mitigation Strategies				
Washington County	Peter Kuhlmann	June, July, Aug, 2016		July, 2016
Washington County	Ron Whitehead			July, 2016
Washington County	Scott Messel	June, July, 2016		July, 2016
Washington County	John Max	June, July, Aug, 2016		
Washington County	Todd Edwards	June, July, 2016		
Washington County	Zac Renstrom	June, July, 2016		
Washington County	Wayne Rogers	June, July, 2017		
Washington County	Dave Black	June, July, 2018		
Washington County	Dean Cox	June, July, 2019		
Apple Valley	Rick Moser	Aug, 2016		
Apple Valley	Rod Mills		Sept, 2016	Sept, 2017
Enterprise	Lee Bracken	Aug, 2016		
Enterprise	Adam Browler	Aug, 2016		
Enterprise	Brendon	Oct, 2016	Oct, 2016	
Hildale	Kevin Barlow	Sept, 2016	Oct, 2016	Oct, 2016
Hurricane	John Bramall	Aug, 2016		
Hurricane	Clark Fawcett	Aug, 2016		
Ivins	Chris Hart	Aug, 2016		
Ivins	Dale Coulan	Aug, 2016		
Ivins	Chuck Gillette	Sept, 2016	Sept, 2016	
LaVerkin	Kerry Gubler	Aug, 2016		
LaVerkin	Kyle Gubler	Aug, Sept, 2016, Dec 2016, Jan 2017	Sept, 2016, Dec, 2016, Jan, 2017	
Leeds	Wayne Peterson	Aug, 2016		
Leeds	Bob Goldsberry	Aug, 2016		
Leeds	Rod Mills		Sept, 2016	Sept, 2017
New Harmony	Joel Webster	Aug, 2016		
Rockville	Pam Leach	Aug, 2016		
Rockville	Rod Mills		Sept, 2016	Sept, 2017
St. George	Wes Jenkins	June, July, 2016		
St. George	Jay Sandberg	June, July, 2016		
St. George	Jon Pike	Aug, 2016		
St. George	Gary Esplin	Aug, 2016		
Santa Clara	Rick Rosenberg	June, July, Aug 2016		July, 2016
Santa Clara	Edward Dickie	Aug, 2016		
Springdale	Stanley Smith	Aug, 2016		
Springdale	Rick Wixom	Aug, 2016		
Toquerville	Darrin LeFevre	Aug, 2016		
Virgin	Bruce Densley	Aug, 2016		
Virgin	Rod Mills		Sept, 2016	Sept, 2017
Washington City	Kenneth Neilson	Aug, 2016		
Washington City	Roger Carter	Aug, 2016		
Washington City	Jim Keith	Aug, 2016		

BEAVER COUNTY COMMISSION

105 East Center
P.O. Box 789
Beaver, UT 84713
P: (435)438-6490
F: (435)438-6481

Michael F. Dalton, *Chairman*
Mark S. Whitney, *Commissioner*
William L. Dalton, *Commissioner*
Scott Albrecht, *Administrative Assistant*

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, Beaver County is submitting this letter of commitment to confirm that Beaver County has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; Beaver County agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Beaver County understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Chairman of the Beaver County Commission, commit Beaver County to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 11th day of November, 2014

Chairman



Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, Beaver City is submitting this letter of commitment to confirm that Beaver City has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; Beaver City agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Beaver City understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit Beaver City to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 18 day of NOVEMBER, 2014

Mayor

30 WEST 300 NORTH • P.O. BOX 271 • BEAVER, UTAH 84713-0271
TELEPHONE (435) 438-2451 or 438-5568 • FAX (435) 438-5826 • www.beaverutah.net

CITY OF MILFORD
PO Box 69
Milford, Utah 84751
Tel: 435 387-2711
Fax: 435 387-2748

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, Milford City is submitting this letter of commitment to confirm that Milford City has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; Milford City agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Milford City understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit Milford City to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 10th day of November, 2014

Mayor

Minersville City
60 West Main St.
P.O. Box 159
Minersville, Utah 84752
(435) 386-2242

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, The Minersville Town is submitting this letter of commitment to confirm that Minersville Town has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; Minersville Town agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Minersville Town understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

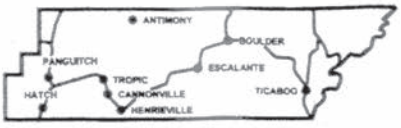
- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor of Minersville Town, commit Minersville Town to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 19 day of November, 2014

Paul Dalton
Mayor

GARFIELD COUNTY



55 South Main Street, P.O. Box 77 • Panguitch, Utah 84759
Phone (435) 676-8826 • Fax (435) 676-8239

County Commissioners
Clare M. Ramsay
H. Dell LeFevre
Leland F. Pollock
Camille A. Moore,
Auditor/Clerk

Joe Thompson, Assessor
Jeannie Henrie, Treasurer
James D. Perkins, Sheriff
Barry L. Huntington, Attorney
A. Les Barker, Recorder
Russell Bulkley,
Justice Court Judge

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, Garfield County is submitting this letter of commitment to confirm that Garfield County has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; Garfield County agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Garfield County understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

> Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
> The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
> The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
> Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
> Documentation of an effective process to maintain and implement the plan: and,
> Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Chairman of the Garfield County Commission, commit Garfield County to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 10th day of November, 2014

Clare M. Ramsay
Chairman

ANTIMONY TOWN
P.O. Box 120046
Antimony UT 84712
435-624-3300 & FAX

November 15,2014

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, The Antimony Town is submitting this letter of commitment to confirm that the town of Antimony has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; the town of Antimony agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

The town of Antimony understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any

planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and

- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit the town of Antimony to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 18 day of November, 2014

Shannon D Allen

Mayor

BOULDER TOWN

P. O. Box 1329
Boulder, Utah 84716
Phone (435) 335-7300 • FAX (435) 335-7300

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, Boulder Town is submitting this letter of commitment to confirm that Boulder Town has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning, Boulder Town agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Boulder Town understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, data, or other information, commenting on drafts of the plan, etc.);
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit Boulder Town to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 10 day of NOV., 2014

Bill Muse
Mayor

BRYCE CANYON
EST CITY 2007
Your Gateway to
Bryce Canyon National Park

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, The Bryce Canyon City is submitting this letter of commitment to confirm that Bryce Canyon City has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; Bryce Canyon City agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Bryce Canyon City understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit Bryce Canyon City to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 19 day of November, 2014

Mayor

P.O. Box 640028 • 165 South Main St., Suite A • Bryce Canyon City, UT 84764 • 435-834-5711 • BryceCanyonCityUT.gov

Cannonville Town
50 South Redrock Drive
PO Box 180075
Cannonville, Utah 84718-0075

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, The Cannonville Town is submitting this letter of commitment to confirm that the town of Cannonville has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; the town of Cannonville agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

The town of Cannonville understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit the town of Cannonville to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 18th day of November, 2014

Mayor W. Jeff Stock

ESCALANTE CITY
P.O. BOX 189
56 NORTH 100 WEST
ESCALANTE, UT 84726
(435) 826-4644
FAX: (435) 826-4642

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, Escalante City is submitting this letter of commitment to confirm that Escalante City has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; Escalante City agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Escalante City understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of ricks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit Escalante City to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 14 day of November, 2014

Mayor

The Town of Hatch

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, The town of Hatch is submitting this letter of commitment to confirm that the town of Hatch has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; the town of Hatch agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

The town of Hatch understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit the town of Hatch to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 7th day of November, 2014

Mayor Amanda Josie



Mayor
Dave Roberts

Council Members

Cliff Mathews, Community Development
Dale Pollock, Water
Norm Davis, Roads

Clerk
Marie Jaggar

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazar

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolve more comprehensively by coordinating at the county, regional, or watershed level, The town of Henrievill commitment to confirm that the town of Henrieville has agreed to participate in the Five County Associati jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; the town of Henrieville agrees to meet t mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timel AOG to complete the plan in conformance with FEMA requirements.

The town of Henrieville understands that it must engage in the following planning process, as more fully d Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general plan
- The formulation of mitigation goals responsive to public input and development of mitigation actions compl range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning proc stakeholders (examples of participation include relevant involvement in any planning process, attending me date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (eacl

PANGUITCH CITY

25 South 200 East
PO Box 75
Panguitch UT 84759
Tel: (435)676-8585
Fax: (435) 676-2758

Mayor: J. Arthur Cooper
City Manager: Allen K. Henrie
City Recorder: Cindy Johnson
City Treasurer: Carla Farnsworth
Public works director: Dave Owens
Council Members:
Eric Houston
John Orion
Nick Reynolds
Tim Smith
Lori Talbot

Mr. Kenneth Sizemore
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Sizemore,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44 CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, the **City of Panguitch** is submitting this letter of commitment to confirm that the **City of Panguitch** has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; the **City of Panguitch** agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

The **City of Panguitch** understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of ricks, where they differ from the general planning area:
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I, **Mayor Arthur Cooper** commit the **City of Panguitch** to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Executed this 2ND **day of** DECEMBER, 2009

Mayor Arthur Cooper

Tropic Town

20 North Main
PO Box 130
Tropic UT 84776

Telephone: 435-679-8713
Fax: 435-679-8505
Email: tropic@color-country.net
townoftropicut.gov

November 11, 2014

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot:

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, The town of Tropic is submitting this letter of commitment to confirm that the town of Tropic has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; the town of Tropic agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

The town of Tropic understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

~Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
~The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
~The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
~Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
~Documentation of an effective process to maintain and implement the plan: and,
~Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit the town of Tropic to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 11th Day of November, 2014

Mayor

Commissioners
Alma L. Adams
Daniel L. Webster
Dale M. Brinkerhoff
Clerk • David I. Yardley
Treasurer • Geraldine S. Norwood
Recorder • Deborah B. Johnson
Assessor • Cindy W. Bulloch
Auditor • H. Eugene Adams
Attorney • Scott F. Garrett
Sheriff • Mark O. Gower

IRON COUNTY

68 South 100 East • Parowan, Utah 84761 • Phone (435) 477-8300 • Fax (435) 477-8847

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, Iron County is submitting this letter of commitment to confirm that Iron County has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; Iron County agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Iron County understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Chairman of the Iron County Commission, commit Iron County to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 10th day of November, 2014.

Chairman

P.O. Box 190068
56 North Hwy. 143
Brian Head, UT 84719
435-677-2029 – Phone
435-677-3661 - Fax
www.brianheadtown.utah.gov

Mayor — H.C. Deutschlander
Town Council — Jim Ortler
Larry Freeberg
Clayton Calloway
Reece Wilson

Town Manager — Bret Howser
Town Clerk — Nancy Leigh
Town Treasurer — Cecilia Johnson
Public Works Director — Tom Stratton
Public Safety Director — Dan Benson

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, Brian Head Town is submitting this letter of commitment to confirm that Brian Head Town has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; Brian Head Town agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Brian Head Town understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit Brian Head Town to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 4 day of December, 2014

Mayor

Cedar City

10 North Main Street • Cedar City, UT 84720
435-586-2950 • FAX 435-586-4362
www.cedarcity.org

Mayor
Maile L. Wilson

Council Members
Ronald R. Adams
John Black
Paul Cozzens
Don Marchant
Fred C Rowley

City Manager
Rick Holman

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, Cedar City is submitting this letter of commitment to confirm that Cedar City has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; Cedar City agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Cedar City understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit Cedar City to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 10th day of November, 2014

Maile L. Wilson

Mayor Maile L. Wilson

Administration	Building and Zoning	Economic Development	City Engineer	Leisure Services	Public Works
586-2953	865-5117	586-2770	586-2963	865-9223	586-2912

City Council Members
Destry Griffiths
Steve Johnson
J. Kirk Lovell
Michael Olenslager
Gary Wilcken

ENOCH CITY

Robert A. Rasmussen - Mayor
Rob Dotson - City Manager
Jackson Ames - Chief of Police
Julie Watson - City Recorder
Dan Jessen - City Treasurer

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, Enoch City is submitting this letter of commitment to confirm that Enoch City has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; Enoch City agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Enoch City understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit Enoch City to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 12 day of November, 2014

Robert A. Rasmussen

Mayor

900 East Midvalley Road, Enoch, Utah 84721 | Phone 435.586.1119 | Fax 435.586.8171

KANARRAVILLE TOWN CORPORATION

HCR 65 BOX 148
Kanarraville, Utah 84742
Ph. 435-867-1852 Fax 435-867-5592
Email: david@kanarraville.org

January 27, 2015

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, Kanarraville Town is submitting this letter of commitment to confirm that Kanarraville Town has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; Kanarraville Town agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Kanarraville Town understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit Kanarraville Town to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 28th day of January, 2015

Mayor

Paragonah Town

P.O. Box 600247 • Paragonah, Utah 84760 • Phone: (435) 477-8979 • Fax: (435) 477-8508

Mr. Bryan Thiriot, Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, Paragonah Town is submitting this letter of commitment to confirm that Paragonah Town has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; Paragonah Town agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Paragonah Town understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

>Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
> The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
> The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
> Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and;
> Documentation of an effective process to maintain and implement the plan: and,
>Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit Paragonah Town to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 10 day of Nov., 2014

Constance Robinson
Mayor

5 S. Main Street | P.O. Box 576 | Parowan, UT 84761
Phone: (435) 477-3331 | Fax: (435) 477-8092 | www.parowan.org

PAROWAN
MOTHER TOWN OF SOUTHERN UTAH

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
P0 Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, Parowan City is submitting this letter of commitment to confirm that Parowan City has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; Parowan City agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Parowan City understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit Parowan City to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 10 day of November, 2014

Mayor

KANE COUNTY COMMISSION
76 North Main Street
Kanab, Utah 84741

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, Kane County is submitting this letter of commitment to confirm that Kane County has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; Kane County agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Kane County understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, data, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan; and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I, as Chairman of the Kane County Commission, commit Kane County to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 20 day of November, 2014

Douglas K Heaton
Chairman

Drawer 410127, 60 Aaron Burr, Big Water, UT 84741-2127
Office (435) 675-3760 Fax (435) 675-3736 Fire Department (435) 675-9160 Sheriff 1-877-677-2349

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, the town of Big Water is submitting this letter of commitment to confirm that the town of Big Water has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; the town of Big Water agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

The town of Big Water Valley understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit the town of Big Water to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 10 day of Nov. 10 —, 2014

Mayor

Mayor
Robert D. Houston
City Manager
Joseph M. Decker
Treasurer
RaeLene Johnson

KANAB
UTAH

City Council
Brent Chamberlain
Cheryl Brown
Kirt Carpenter
Joe B. Wright
Kent Burggraaf

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, Kanab City is submitting this letter of commitment to confirm that Kanab City has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; Kanab City agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Kanab City understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit Kanab City to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 18 day of NOV, 2014

Robert D. Houston
Mayor

WASHINGTON COUNTY

197 East Tabernacle ♦ St. George, Utah 84770
Telephone: (435) 634-5700 ♦ Fax: (435) 634-5753

Employer of Choice

COMMISSION

JAMES EARDLEY, Chairman
jim.eardley@washco.utah.gov

ALAN GARDNER
alan.gardner@washco.utah.gov

VICTOR IVERSON
victor.iverson@washco.utah.gov

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, Washington County is submitting this letter of commitment to confirm that Washington County has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; Washington County agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Washington County understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, data, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Chairman of the Washington County Commission, commit Washington County to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 10 day of NOV, 2014

James Eardley
Chairman

Town of Apple Valley
UTAH
Mayor Richard Moser, Council Members: Roger Ashmore, Trevor Black, Judith Davis, and Kevin Sair
1777 North Meadowlark Drive, Apple Valley, Utah 84737
Phone: 435-877-1190 Fax: 435-877-1192
www.applevalleyut.gov

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, the town of Apple Valley is submitting this letter of commitment to confirm that the town of Apple Valley has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; the town of Apple Valley agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

The town of Apple Valley understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit the town of Apple Valley to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 12th day of November, 2014

Richard S Moser

Mayor Richard Moser

CITY OF ENTERPRISE

P.O. Box 340
Enterprise, Utah 84725
(435) 878-2221 • Fax: (435) 878-2311

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, Enterprise City is submitting this letter of commitment to confirm that Enterprise City has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; Enterprise City agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Enterprise City understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit Enterprise City to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 10th day of November, 2014

S. Lee Bracken, Mayor

HILDALE CITY Established 1963
P.O. BOX 840490 320 E. NEWEL AVE. HILDALE, UTAH 84784 PHONE: 435-874-2323 FAX: 435-874-2603

November 18, 2014

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, Hildale City is submitting this letter of commitment to confirm that Hildale City has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; Hildale City agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Hildale City understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit Hildale City to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 18th day of November, 2014

Mayor

Mayor
John W. Bramall

Darin Larson Kevin Tervort
Pam Humphries Darin Thomas
Ethelyn Humphries

City of Hurricane

City Council

November 10, 2014

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, Hurricane City is submitting this letter of commitment to confirm that Hurricane City has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; Hurricane City agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Hurricane City understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, data, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

147 North 870 West • Hurricane, UT • 84737
Phone: (435) 635-2811 • Fax: (435) 635-4284
WEB: www.cityofhurricane.com

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit Hurricane City to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 12 day of November, 2014

John W. Bramall

Mayor

Ivins City
55 N. Main Street
Ivins, UT 84738
(435) 628-0606
www.ivins.com
An Equal Opportunity Employer

Mayor Chris Hart
City Council Members:
Ron Densley
George E. Elwell, Jr.
Cheyne McDonald
Lesley Mendenhall
Steven Roberts

City Manager/Attorney:
Dale Coulam

November 10, 2014

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, Ivins City is submitting this letter of commitment to confirm that Ivins City has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; Ivins City agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Ivins City understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

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

- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit Ivins City to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 10TH day of NOVEMBER, 2014

Chris Hart, Ivins City Mayor

City of La Verkin

435 North Main Street
La Verkin, Utah 84745
(435) 635-2581 (435) 635-2104 Fa

Kyle Gubler
City Administrator

Kerry Gubler
Mayor

Chantelle Browning
Richard Hirschi
Ken Hooten
Randy Reeve
Brandon Stephenson
Council Members

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, La Verkin City is submitting this letter of commitment to confirm that La Verkin City has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; La Verkin City agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

La Verkin City understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, data, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor of La Verkin City, commit La Verkin City to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 13TH day of NOVEMBER, 2014

Mayor

Town of Leeds
218 North Main Street
PO Box 460879
Leeds, UT 84746-0879
Phone: 435-879-2447
Fax: 435-879-6905

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot:

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, The Town of Leeds is submitting this letter of commitment to confirm that the Town of Leeds has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; the Town of Leeds agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

The Town of Leeds understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit the Town of Leeds to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 13th day of November, 2014

Wayne Peterson
Mayor

TOWN OF NEW HARMONY
PO Box 620 • 133 E. Center St.
New Harmony, Utah 84757
Phone: 435.865.7522 • Fax: 435.586.2378



Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, The town of New Harmony is submitting this letter of commitment to confirm that the town of New Harmony has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; the town of New Harmony agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

The town of New Harmony understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit the town of New Harmony to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 18th day of November, 2014

Joel D. Webster
Mayor

Agenda item # 8 regarding the authorization of the Mayor to sign the Letter of Commitment was tabled at their November 13, 2013 meeting (see agenda below). The Town Council will take up this item at its December 10, 2014 meeting.

Town Council Agendas
Rockville Town Council
November 13, 2014
Rockville Community Center

The Rockville Town Council will hold their regular meeting on Thursday the 13th day of November, 2014 at 6:00 p.m. in the Rockville Community Center, 43 E. Main, Rockville, Utah.

When you are recognized to be heard during any Town of Rockville public meeting, please come to the podium to speak to enable an accurate recording of your remarks.

If you wish to speak during Public Comment and Questions, please sign in with the Town Clerk by 5:45 p.m. If more than one person desires to speak on the same topic, a time limit may be imposed.

The agenda will be as follows:

1. Call to order – Roll call.
2. Pledge of Allegiance.
3. Declaration of conflict of interest with an agenda item.
4. Public Comments and Questions.
5. Report on Rockville/Springdale Fire Protection District – Luci Francis
6. Report and action, if necessary, on recommendations of the Planning Commission – Planning Commission Chair Sharon Hatfield.
7. Resolution for appointments to the Rockville Tree Board – Robin Smith.
8. Discussion and possible action to approve "Letter of Commitment as Participating Jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning".
9. Approval of Meeting Schedule for 2015
10. Approval of expenditures for the month of October 2014 – Town Clerk.
11. Approval of the minutes of the October 15, 2014 Town Council regular meeting.
12. Mayor and Council Member reports and comments.
    - Mayor Dutson
    - V. Terry Bell
    - Bernie Harris
    - Megan Honer-Orton
    - Pam Leach
13. Staff Report as needed.
14. Adjourn.

Elaine M. Harris
Town Clerk

Mayor
Rick Rosenberg

City Manager
Edward O. Dickie III

Founded 1854
Santa Clara
Utah

City Council
Jerry Amundsen
Herb Basso
Mary Jo Hafen
Kenneth Sizemore
David Whitehead

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, Santa Clara City is submitting this letter of commitment to confirm that Santa Clara City has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; Santa Clara City agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Santa Clara City understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit Santa Clara City to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 12th day of November, 2014

CITY OF SANTA CLARA
STATE OF UTAH

Mayor

2603 Santa Clara Drive, Santa Clara, Utah 84765
Phone (435) 673-6712 Fax (435) 628-7338

TOWN OF SPRINGDALE

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, The town of Springdale is submitting this letter of commitment to confirm that the town of Springdale has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; the town of Springdale agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

The town of Springdale understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit the town of Springdale to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 12th day of November, 2014

Mayor

P.O. BOX 187 Springdale, Utah 84767-0187 (435) 772-3434

CITY OF ST. GEORGE
175 East 200 North
St. George, Utah 84770

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, St. George City is submitting this letter of commitment to confirm that St. George City has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; St. George City agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

St. George City understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit St. George City to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 17th day of November, 2014

Jonathan T. Pike
Mayor

CITY OF ST. GEORGE
175 East 200 North, St. George, Utah 84770
Phone: (435) 627-4000
www.sgcity.org

MAYOR
Jonathan T. Pike

CITY MANAGER
Gary S. Esplin

CITY COUNCIL
Gil Almquist
Jimmie Hughes, Michele Randall
Joe Bowcutt, Bette Arial

City of Toquerville
212 N Toquerville Boulevard,
Box 27
Toquerville, UT 84774

Ph: (435) 635-1094,
Fx: (435) 635-5761
www.toquerville.org

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, Toquerville City is submitting this letter of commitment to confirm that Toquerville City has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; Toquerville City agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Toquerville City understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit Toquerville City to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 17 day of November, 2014

M. [illegible]
Mayor

VIRGIN TOWN
Gateway to Kolob

114 S. Mill Street
P.O. Box 790008
Virgin, UT 84779
T 435-635-4695 F 435-635-0265
E clerk@virgin.utah.gov

TOWN COUNCIL:
J. Bruce Densley, Mayor
Danyale Blackmore
Jean M. Krause
Jay Lee
Bill Adams

November 10, 2014

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, The town of Virgin is submitting this letter of commitment to confirm that the town of Virgin has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; the town of Virgin agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

The town of Virgin understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

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

VIRGIN TOWN
Gateway to Kolob

- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit the town of Virgin to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 13 day of November, 2014

J. Bruce Dansie
Mayor

Washington City
Where Dixie Begins

Mr. Bryan Thiriot
Executive Director
Five County Association of Governments
PO Box 1550
St. George, UT 84771

Re: Letter of commitment as participating jurisdiction in Five County Association Multi-jurisdictional Hazard Mitigation Planning

Dear Mr. Thiriot,

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, Washington City is submitting this letter of commitment to confirm that Washington City has agreed to participate in the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning.

Further, as a condition to participating in the mitigation planning; Washington City agrees to meet the requirements of mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Five County AOG to complete the plan in conformance with FEMA requirements.

Washington City understands that it must engage in the following planning process, as more fully described in FEMA's Local Multi-hazard Mitigation Planning Guidance dated July 1, 2008, as amended, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, date, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan: and,
- Formal adoption of the Multi-jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the obligations incurred by participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I as Mayor, commit Washington City to the Five County Association of Governments Multi-jurisdictional Hazard Mitigation Planning effort.

Signed this 10th day of November, 2014

Kenneth F. Neilson, Mayor

111 North 100 East • Washington City • Utah • 84780 Ph: (435) 656-6300 Fax: (435) 656-6370 washingtoncity.org

Mayor: Kenneth F. Neilson **City Manager**: Roger Carter
Council Members: Garth E. Nisson • Thad D. Seegmiller • Kress Staheli • Ronald W. Truman • Jeff Turek

APPENDIX I - HAZARD MITIGATION AMENDMENTS

APPENDIX J - ADDITIONAL NFIP INFORMATION

NFIP Policy and Claims Report					
County	**Number Policies**	**Total coverage**	**Total Premium**	**Total Claims Since 1978**	**Total Paid Since 1978**
BEAVER COUNTY	0	$0	$0	2	$7,119
GARFIELD COUNTY	15	$ 3.439,400	$12,995	1	$3,627
IRON COUNTY	113	$27,407,600	$61,301	14	$60,262
KANE COUNTY	39	$8,965,900	$27,412	4	$20,588
WASHINGTON COUNTY	514	$154,561,900	$258,924	43	$403,565

NFIP Insurance Report							
Community Name	**Total Premium**	**V-Zone**	**A-Zone**	**No. Policies**	**Total Coverage**	**Total Claims Since 1978**	**Total Paid Since 1978**
Beaver county							
BEAVER COUNTY•	$0	0	0	0	$0	$0	$3,672
MILFORD, CITY OF	$0	0	0	0	$0	$0	$3,447
Garfield County							
ESCALANTE, TOWN OF	$370	0	0	1	$350,000	0	$0
GARFIELD COUNTY •	$6,495	0	3	8	$2,220,900	1	$3,627
PANGUITCH, CITY OF	$4,116	0	3	5	$616,500	0	$0
TROPIC, TOWN OF	$2,014	0	1	1	$252,000	0	$0
Iron County							
CEDAR CITY	$35,373	0	22	58	$14,153,300	5	$31,958
IRON COUNTY •	$23,610	0	8	49	$11,545,400	8	$22,319
PARAGONAH, TOWN OF	$1,121	0	1	3	$658,900	0	$0
PAROWAN, CITY OF	$1,197	0	0	3	$1,050,000	1	$5,985
Kane County							
GLENDALE, TOWN OF	$5,046	0	4	6	$742,100	0	$0
KANAB. CITY OF	$5.12	0	2	14	$2,871,300	0	$0
KANE COUNTY •	$16,831	0	4	18	$5,002,500	4	$20,588
ORDERVILLE, TOWN OF	$415	0	0	1	$350,000	0	$0
Washington County							
APPLE VALLEY, TOWN OF	$2,662	0	2	2	$199,000	0	$0
ENTERPRISE, CITY OF	$3,298	0	2	6	$1,464,200	0	$0
HURRICANE, CITY OF	$13,720	0	13	35	$8,817,300		$0
IVINS, CITY OF	$15,032	0	1	43	$13,291,000	4	$19,409
LAVERKIN, CITY OF	$1,915	0	1	5	$1,130,100	0	$0
LEEDS, TOWN OF	$1,676	0	0	4	$1,400,000		$13,591
NEW HARMONY, TOWN OF	$6,045	0	3	4	$1,073,500	1	$10,292
ROCKVILLE, TOWN OF	$4,561	0	2	4	$992,000	0	$0
SANTA CLARA, CITY OF	$6,413	0	3	16	$5,400,000	2	$1,194
SPRINGDALE, TOWN OF	$19,054	0	4	10	$4,120,000	0	$0

ST. GEORGE, CITY OF	$121,746	0	29	261	$78,551,900	18	$170,294
TOQUERVILLE, TOWN OF	$1,485	0	0	4	$1,155,000	0	$0
VIRGIN, TOWN OF	$2,319	0	3	5	$854,100	0	$0
WASHINGTON COUNTY •	$35,756	0	6	57	$18,048,100	13	$182,408
WASHINGTON,CITY OF	$23,242	0	11	58	$18,065,700	3	$6,377

Federal Emergency Management Agency Repetitive Losses/ BCX Claims

Community Name	County	No. of Variances	Losses	CAC Date	CAV Date	No Of BCX Claims	Total Area Population	LOMCS	No. of Policies	FIRM Date	CRS
BEAVER COUNTY•	BEAVER COUNTY	0	0		11/04/2015	0	1,450		0	09/18/1987	
BEAVER	BEAVER COUNTY	0	0	11/04/2015		0	1,453	2	0	04/01/1977	
MILFORD	BEAVER COUNTY	0	0		09/22/2008	0	1,451	0	0		
MINERSVILLE	BEAVER COUNTY	0	0			0	448	0	0		
ANTIMONY	GARFIELD COUNTY	0	0			0	113	0	0	04/0211976	
ESCALANTE	GARFIELD COUNTY	0	0			0	950	0		08/28/1979	
GARFIELD COUNTY •	GARFIELD COUNTY	0	0			0	738	43	8	08/05/1986	
HATCH	GARFIELD COUNTY	0	0			0	128		0	07/24/1979	
HENRIEVILLE	GARFIELD COUNTY	0	0			0	177	0	0	09/28/1979	
PANGUITCH	GARFIELD COUNTY	0	0	*0610212008*		0	1,450	5	5	08/28/1979	
TROPIC	GARFIELD COUNTY	0	0		06/30/1993	0	568	0		12104/1979	
CEDAR CITY	IRON COUNTY	0	0	03/14/2016	07/14/2015	0	27,786	24	58	10/16/1984	YES
IRON COUNTY •	IRON COUNTY	0	2	03/14/2016	04/13/2011	2	6,985	12	49	07/17/1986	
KANARRAVILLE	IRON COUNTY	0	0			0	350		0		
PARAGONAH	IRON COUNTY	0	0			0	530	2	3	06/0212005	
PAROWAN	IRON COUNTY	0	0	03/14/2016		0	3,000	2	3	03/18/1986	
ALTON	KANE COUNTY	0	0		03/04/2005	0	148	0	0		
GLENDALE	KANE COUNTY	0	0		03/04/2005	0	348	2	6	05/01/1986	
KANAB	KANE COUNTY	0	0		02123/2005	0	5,000	10	14	08/19/1985	
KANE COUNTY •	KANE COUNTY	0	0	03/08/2005	05/08/2008	0	6,523	5	18	07/01/1986	
ORDERVILLE	KANE COUNTY	0	0		03/04/2005	0	499	0			
ENTERPRISE	WASHINGTON COUNTY	0	0		03/15/2011	0	1,600	7	6	04/02/2009	
HILDALE	WASHINGTON COUNTY	0	0	12/02/2015	11/07/2015	0	480		0	04/02/2009	

HURRICANE	WASHINGTON COUNTY	0	0	02/21/2005	03/07/2011	0	13,400	8	35	04/02/2009	
IVINS	WASHINGTON COUNTY	0	0		11/06/2015	0	8,200	8	43	04/02/2009	
LAVERKIN	WASHINGTON COUNTY	0	0	03/08/2005	02/28/2009	0	5,100	5	5	04/02/2009	
LEEDS	WASHINGTON COUNTY	0	0		01/28/2009	0	864	2	4	04/02/2009	
SANTA CLARA	WASHINGTON COUNTY	0	0	08/23/2012	02/05/2013	0	6,750	18	16	04/02/2009	YES
SPRINGDALE	WASHINGTON COUNTY	0	0	04/11/2011	11/06/2015	0	550	10	10	04/02/2009	
ST. GEORGE	WASHINGTON COUNTY	0	0		11/06/2015	0	83,745	94	261	04/02/2009	YES
TOQUERVILLE	WASHINGTON COUNTY	0	0		03/08/2011	0	1,200	18	4	04/02/2009	
VIRGIN	WASHINGTON COUNTY	0	0		*0212212005*	0	550	2	5	04/02/2009	
WASHINGTON COUNTY •	WASHINGTON COUNTY	0	2	11/23/2015	04/07/2011	2	7,080	26	57	04/02/2009	
WASHINGTON	WASHINGTON COUNTY	0	0		03/01/2011	0	20,221	57	58	04/02/2009	

APPENDIX K - MITIGATION STRATEGIES

Beaver County Community Mitigation Strategies									
Jurisdiction:	**Hazard:**	**Goals Addressed:**	**Objective:**	**Action:**	**Timeline:**	**Estimated Cost:**	**Potential Funding**	**Responsible Agencies:**	**Priority:**
Beaver City	Flooding & Water Availability	Property Protection, Environmental Protection, Secondary Water Availability, Hydro Electric Generation	Prevent damage to private and public property, continue to generate power, and continue to provide secondary water to citizens.	Replace the Pressurized Irrigation and Hydro Power Plant Diversion.	Bonding: Sept. & Oct. 2016. Construction: Oct. 2016 Project Finished Nov. 2016	$442,000-$520,000	Utah Division of Water Resources, Water Fund for City Portion.	Beaver City	High
Milford	Flood	Property Protection, Prevention	Allow the water to move freely and eliminate water from backing up into private properties.	Install a culvert with a box in our main drainage ditch (300S 100 E) The culvert will be extended 15' past the 100 East. This will allow the water to move more efficiently and freely. The culvert will end in the main drainage canal, which is located on Railroad Property, east of 100 East. The City crew will be cleaning out the drainage ditch, which is on the Railroad Property to ensure the water moves freely out of city limits.	1 year	$10,500	Milford operating budget.	Milford	High
Minersville	Flooding	Property Protection and Environmental protection, Prevention	Prevent high intensity rains from flooding property in Minersville	Construct proper drainage as addressed in a storm water and drainage master plan to prevent flood damage to property. Will be putting in sidewalk curb and gutter where necessary.	Phased out over approximately 10 years	$800.000 - $1 million Minersville Town budgeted 35,000 in2016	Minersville Town operating budget, CIB, CDBG, FEMA, UDOT	Minersville Town	High
Beaver County	Wildfire	Action 1-Education/Outreach, Partnership/Coordination, Prevention, Property ProtectionAction 2-Education/Outreach, Emergency Services, Partnership/Coordination, Prevention, Property ProtectionAction 3-Prevention, Property Protection	Promote public awareness campaign for property owners living in Wildland-Urban interface areas and to encourage local governments to require property owners and developers to utilize defensible space tactics.	Action 1-Provide printed Information, Public Service Announcements; Encourage new homes and communities in the Wildland-Urban interface to follow the WUI code and be Firewise compliant. Complete WUI assessment.Action 2-Voluntary site visits (to CARs) by fire crews to consult with landowners about specific ways to reduce risk to their property.Action 3-Develop local code enhancements that require utilization of defensible space tactics.	Every 2-3 years/ongoing	Unknown	State and Federal wildfire grant programs, Local government operating budget; Special Service District operating budget	State and Federal government, Community & local government entities	High
Garfield County Community Mitigation Strategies									
Jurisdiction:	**Hazard:**	**Goals Addressed:**	**Objective:**	**Action:**	**Timeline:**	**Estimated Cost:**	**Possible Funding Sources:**	**Responsible Agencies:**	**Priority:**
Antimony	Flood	Prevention, Property Protection, Environmental Protection	Prevent snow melt and high intensity precipitation events from flooding property, and roads, and to protect nearby water lines.	Routinely clearing debris and sediment build-up from washes and creeks	Annual	Unknown	Town Operating Budget	Antimony	High
Boulder	Landslide	Prevention, Property Protection, Environmental Protection	Prevent damage to property and environment from landslides through zoning and development standards.	Adopt a zoning ordinance that prohibits development sloped exceeding 30% average grade or on sensitive lands. Including the prevention of excavating or grading in areas of sensitive lands, hillside, and Mesa Tops Overlay District prior to final approval by the proper officer or body. Information will be required for development in areas of slope exceeding 15% average grade.	1 Year/ Ongoing	Unknown	Town Operating Budget	Boulder	High
Boulder	Wildfire	Education/Outreach, Partnership/Coordination, Property Protection	Educate property owners and citizens about actions that they can take to reduce risk to property, and the risks of wildfire.	Organize the local Fire Academy to inform residents of wildfire danger, and educate citizens about fire mitigation systems, defensible spaces, etc. Hand out fire safety materials. The town will also keep hydrants clear of weeks and debris.	Ongoing/ Annual	Unknown	Town Operating Budget	Boulder	High
Bryce Canyon City	Wildfire	Property Protection, Prevention, Resident's and guest's protection	The potential spread of wildfire in to Bryce Canyon City.	Mechanical thinning and cleanup of fuels on wildland interface areas along boundaries of City	Ongoing mitigation each year	$1 – $1.5 million	United States Forest Service	Bryce Canyon City / Bryce Canyon City Fire Department	High

Bryce Canyon City	Severe Weather	Prevention, Life Protection, Property Protection, Education/Outreach, Partnership Coordination	Protect life and property from severe weather events (E.g. Severe winter storms and severe heat), and provide back up electricity in the event of a long-term power outage.	Encourage all businesses and critical facilities to have enough back up generators to efficiently provide for life sustaining essentials until the power is restored. E.g. Power for an oxygen concentrator for those in need. Encourage businesses and tourism departments to provide emergency preparedness material to visitors.	1 Year/Ongoing	$500-$10,000	Operating budgets of Businesses and Bryce Canyon City	Bryce canyon City and Local Businesses	Medium
Cannonville	Severe Weather	Partnership/Coordination, Education/Outreach, Life Protection	Protect vulnerable populations from the impacts of severe winter storms.	Identify specific at-risk populations that may be exceptionally vulnerable in the event of long-term power outages. Organize outreach to vulnerable populations, including establishing and promoting accessible heating centers in the community.	1 Year	Unknown	Town Operating Budget	Cannonville	High
Escalante	Flood	Property Protection, Environmental Protection, Prevention	Prevent high intensity precipitation events from flooding property in town.	Construct proper drainage as addressed in the Storm Water Master plan to prevent flood damage to property.	Phased out over 10 years.	$800,000-$1 million	Local Government Operating budget, CIB, CDBG, FEMA	Escalante	High
Hatch	Flood	Prevention, Property Protection, Environmental Protection	Prevent snow melt and high intensity precipitation events from flooding property, and roads.	Perform regular drainage system maintenance, such as sediment and debris clearance from culverts.	Annual	Unknown	Town Operating Budget	Hatch	High
Hatch	Flood	Prevention, Property Protection, Environmental Protection	Prevent flooding and property damage to homes and businesses in Hatch during high precipitation events.	Construct flood control measures that are addressed in the town drainage study. Specifically curb and gutter to prevent flooding during high precipitation events.	5 Years	$408,000	Hatch,FEMA,CIB,CDBG	Hatch	High
Henrieville	Severe Weather	Property Protection	Protect buildings and infrastructure from the impacts of winter storms.	Ensure the development and enforcement of building codes for roof snow loads.	1 Year/ Ongoing	Minimal	Town Operating Budget	Henrieville	High
Panguitch	Flood	Property Protection, Prevention	Reduce flood damage to homes and property at the community level.	Reduce flood risk by clearing debris and other material form all waterways	Annually	Minimal	Municipality operating budget	Panguitch City	High
Tropic	Flood	Property Protection, Environmental Protection, Prevention	Prevent flooding problems throughout Tropic during high intensity storms.	Construct proper drainage as addressed in the Storm Water Master plan to prevent flood damage to property.	Phased out as funding becomes available	$335,307	DWQ, RDA, CIB, CDBG, HMGP	Town of Tropic	High
Garfield County	Flood	Environmental Protection, Prevention, Property Protection	To reduce flooding risk at the community level.	Clear debris and other material from all waterways.	Ongoing	Minimal	Related public/private property owners.	Private property owners, irrigation companies, local jurisdictions.	High
Iron County Community Mitigation Strategies									
Jurisdiction:	**Hazard:**	**Goals Addressed:**	**Objective:**	**Action:**	**Timeline:**	**Estimated Cost:**	**Possible Funding Sources:**	**Responsible Agencies:**	**Priority:**
Brian Head	Wildfire	Property Protection, Fire Breaks, a Reduction in natural fuels from deadfall.	Reduce the fuel contribution to potential wildfires. Increase safety from falling trees on streets and trails.	Clearing deadfall from street and trail rights-of-way.	September 2016-May 2017.	$10,000 - $15,000	Wildland Fire revenue, general fund, State fire grants, FEMA funding.	Brain Head Public Safety, State Forestry and Fire, National Forest Service	High
Brian Head	Flood	Control storm flows and run-off, protect property, ensure town access.	The objective resolves managing storm drains and flood plans by increasing infrastructure.	Construct a comprehensive storm drain master plan.	Septemeber 2016 - September 2017	$40,000 - $55,000	General Fund, CIB Grant, other state or federal grant opportuntiies.	Brian Head Public Works	High
Cedar City	Flood	Environmental Protection, Prevention, Property Protection	Prevent Fiddlers Canyon flood waters from damaging homes and agricultural land.	Construct a channel from the west side of I-15 to the north route of the Coal Creek flood channel	And, ongoing	$2 million	Local government operating budget, state and federal flood programs	Local government	High

Cedar City	Flood	Prevention, Property Protection	Protect homes, businesses, and city infrastructure that is adjacent to Coal Creek	Construct berms, levees, and other channel improvements that will contain the 100-year flood within the channel. (Phase 3)	3-5 years	$2.8 million	Cedar City operating budget, federal grant program	Cedar City Engineering Staff; Federal Agency and Contractor.	High
Enoch	Flood	Prevention, Property Protection, Emergency Services, Environmental Protection, Partnership/Coordination	Protect property from spring runoff and thundershowers	Design sediment debris basins east of I-15 to delay and meter flow of severe runoff. Obtain easements from private land owners and the BLM. Construct basins	10 Years	$4.5 million	NRCS, Enoch City Storm Drainage Fund	Local, State, and Federal Governments	High
Kanarraville	Wildfire	Emergency Services, Environmental Protection, Prevention, Property Protection, Education/Outreach, Partnership/Coordination	Fuels reduction and defensible space tactics.	Action 1-Continue to place strategic fuel breaks throughout the focus area. Action 2-Encourage landowner mitigation and defensible space work.	Ongoing	Unknown	Local government operating budget; Special Service District operating budget	Kanarraville	High
Paragonah	Flood	Partnership/Coordination, Prevention, Property Protection	Protect homes from Red Creek Flood Waters	Expand the existing Red Creek flood way from the mouth of the canyon to west of I-15. Iron County is responsible from the mouth of the canyon to the town boundary and again after it leaves the town boundary to west of I-15. Paragonah is responsible within the town boundary.	5 years	$2 million	Utah Army National Guard 115th Engineer Battalion, 348 East Main Street, Lehi, UT 84043 will contribute equipment and personnel but no cash outlay; Iron County and Paragonah town will purchase necessary materials. Federal loans and grants as available.	Paragonah, Utah Army National Guard.	High
Parowan	Wildfire	Emergency Services, Environmental Protection, Prevention, Property Protection, Education/Outreach, Partnership/Coordination	Fuels reduction and defensible space tactics.	Action 1-Continue to place strategic fuel breaks throughout the focus area. Action 2-Encourage landowner mitigation and defensible space work.	Ongoing	Unknown	Local government operating budget; Special Service District operating budget	Parowan	High
Iron County	Flood	Environmental Protection, Prevention, Property Protection	To reduce flooding risk at the community level.	Clear debris and other material from all waterways.	Ongoing	Minimal	Related public/private property owners.	Private property owners, irrigation companies, local jurisdictions.	High
Kane County Community Mitigation Strategies									
Jurisdiction:	**Hazard:**	**Goals Addressed:**	**Objective:**	**Action:**	**Timeline:**	**Estimated Cost:**	**Possible Funding Sources:**	**Responsible Agencies:**	**Priority:**
Big Water	Problem Soils	Reducing Public Health Hazards	Minimize ground water contamination.	Site specific geological soil studies to prevent sewer leech field failures.	Ongoing	$500-$1,500	Home owners/Developers	Big Water	High
Kanab	Flood	Prevention, Property Protection	Minimize flood damage in Kanab and the surrounding development.	Construct a levee along the creek through the north and east part of town, a distance of about 8,000 ft.	contingent on funding	$610,000	Local government operating budget, state and federal flood programs	Local government	High
Kanab	Flood	Prevention, Property Protection	Minimize flood damage in Kanab and the surrounding development.	Install adequate storm drainage for excess flows	contingent on funding	$1.5 million	Local government operating budget, state and federal flood programs	Local government	High
Kanab	Flood	Prevention, Property Protection	Minimize future flooding along Stout Canyon Road, House Rock Road, Barracks Road, and Spring Drive	Build and implement flood control measures, and infrastructure.	Unknown	Unknown	Local, State, and Federal Funding as available	Local government	Medium
Kanab	Flood	Prevention, Property Protection	City Wide Flood Control	Build and implement flood control measures, and infrastructure.	Unknown	Unknown	Local, State, and Federal Funding as available	Local government	Medium
Kanab	Flood	Prevention, Property Protection	Flood Control in Pugh Canyon near the Kanab Golf Course.	Build and implement flood control measures, and infrastructure.	5 years	$1.9 million	Local, State, and Federal Funding as available	Local government	High
Kanab	Flood	Prevention, Property Protection	Flood Control in the Ranchos Subdivision area	Build and implement flood control measures, and infrastructure.	5 years	$3.6 million	Local, State, and Federal Funding as available	Local government	High
Kane County	Flood	Environmental Protection, Prevention, Property Protection	To reduce flooding risk at the community level.	Clear debris and other material from all waterways.	Ongoing	Minimal	Related public/private property owners.	Private property owners, irrigation companies, local jurisdictions.	High

Washington County Community Mitigation Strategies									
Jurisdiction:	**Hazard:**	**Goals Addressed:**	**Objective:**	**Action:**	**Timeline:**	**Estimated Cost:**	**Possible Funding Sources:**	**Responsible Agencies:**	**Priority:**
Apple Valley	Flood	Prevention, Property Protection, Environmental Protection	(Apple Valley Storm Management Project) Prevent flooding in homes and private property.	Implement projects from the Storm Water Management Plan such as install curb and gutter, storm drain boxes, diverting water into Gould Wash, collect easements, install culverts and ditches to descharge water into the wash.	5 Years	Unknown	Apple Valley, CIB, CDBG, FEMA	Apple Valley	High
Enterprise	Flood	Environmental Protection, Partnership/Coordination, Prevention, Property Protection	Minimize structural damage from floods.	Provide flood protective features along Spring Creek to prevent flooding on residences in downtown Enterprise City.	Unknown	Unknown	Local government operating budget; State and Federal flood grant programs	Enterprise	Medium
Hildale	Flood	Life Safety, Property Protection, Environmental Protection	Prevent high intensity precipitation events from flooding roads and damaging utilities and private property.	Construct retention basin above Utah Avenue at the Willow Street draining channel to capture excess storm water and allow for controlled release.	1 Year	$400,000	CIB, NRCS, Local Government Operating Budget	Hildale City, NRCS, Washington County, Public Works	High
Hildale	Flood	Life Safety, Property Protection, Environmental Protection	Prevent high intensity precipitation events from flooding roads and damaging utilities and private property.	Re-construct retention basin and overflow system above Utah Avenue at Central Street to capture excess storm water and allow for controlled release.	1 Year	$200,000	CIB, NRCS, Local Government Operating Budget	Hildale City, NRCS	High
Hildale	Flood	Life Safety, Property Protection, Environmental Protection	Prevent high intensity precipitation events from flooding roads and damaging utilities and private property.	Construct drainage channel above the "Cove" on North Canyon Street to channel flood waters around structures and into existing channels.	1 Year	$100,000	CIB, NRCS, Local Government Operating Budget	Hildale City, NRCS	High
Hildale	Drought	Life Safety, Economic Viability	Provide for secure culinary water sources for existing needs.	Secure land, engineer and permit, drill and establish a deep well to access ground water suitable for culinary grade water.	2 Years	$500,000	Local Government Utility Funds, CDBG	Hildale City	Medium
Hildale	Severe Weather	Life Safety, Property Protection	Strengthen public safety facilities and communications systems again severe wind and storm events.	Install backup generators with auto changeover for fire stations and EOC (Town Hall), and strengthen antennas to withstand high winds	2 Years	$100,000	Local Government Operating Funds, Emergency Management Funds	Hildale city	Medium
Hurricane	Flood	Emergency Services, Environmental Protection, Partnership/Coordination, Prevention, Property Protection	Minimize structural damage from floods.	Construct a retention basin on Goulds Wash above Hurricane City to prevent flooding in Hurricane City.	Unknown	Unknown	Local government operating budget; State and Federal flood grant programs	Hurricane City	High
Ivins	Flood	Property protection	Mitigate property damage from high intensity storms.	Construct various storm drain projects as identified as priority 1 in the 2016 Ivins Storm Drain Master Plan.	Phased over 10 years	$5.6 M	Ivins is bonding for $1.5M. Bond will be paid back with impact fees and user rates. A grant from NRCS has delivered another $1M from the Emergency Watershed Protection program.	Ivins City	High
Ivins	Flood	Property protection	Mitigate property damage from high intensity storms.	Construct various storm drain projects as identified as priority 2 in the 2016 Ivins Storm Drain Master Plan.	Phased over 10 to 20 years	$2.7M	Impact fees and user rates will provide revenue.	Ivins City	Medium
LaVerkin	Flood	Prevention, Property Protection, Environmental Protection	Prevent rainwater and snowmelt that causes flooding and erosion in developed areas.	Prepare and adopt an updated community-wide stormwater management master plan.	1 Year	Unknown	Town operating budgets	LaVerkin	High
Leeds	Flood	Prevention, Property Protection, Environmental Protection	(Main Street Storm Drain Improvements) Reduce community and residential flooding through storm drainage improvements.	Replace ditch on north side of Main Street with curb and gutter. Storm drain catch basins along Main Street at intersections. Storm drain outlet to discharge into Harrisburg Wash.	5 Years	$985,000.00	Leeds, CIB, CDBG, FEMA	Leeds	High

Leeds	Flood	Prevention, Property Protection, Environmental Protection	(Silver Reef Area Storm Drain Improvements) Reduce community and residential flooding through storm drainage improvements.	Re-grade swales. Clear debris from washes and waterways. Place rip rap along points of erosion (turns, steep slopes, and culvert inlets and outlets)	5 Years	$98,000.00	Leeds, CIB, CDBG, FEMA	Leeds	Medium
Leeds	Flood	Prevention, Property Protection, Environmental Protection	(Silver Meadows and Mesa View Storm Drain Improvements) Reduce community and residential flooding through storm drainage improvements.	Re-grade swales. Clear debris from washes and waterways. Place rip rap along points of erosion (turns, steep slopes, and culvert inlets and outlets). Install underground storm drain pipe.	5 Years	$55,500.00	Leeds, CIB, CDBG, FEMA	Leeds	Medium
Leeds	Flood	Prevention, Property Protection, Environmental Protection	(Leeds Valley Road Storm Drain Improvements) Reduce community and residential flooding through storm drainage improvements.	Construct concrete swales with catch basins and underground piping. Direct underground piping to convey water to discharge into Harrisburg Wash.	5 Years	$1,211,000.00	Leeds, CIB, CDBG, FEMA	Leeds	Low
Leeds	Flood	Prevention, Property Protection, Environmental Protection	Town Storm Water Maintenance Program) Reduce community and residential flooding through storm drainage improvements.	Develop a Storm Water Maintenance and Management Plan to manage sediment build up and removal. Plan will outline costs for such maintenance and planning for future improvements. GIS mapping of project with portable management device.	5 Years	$20,000.00	Leeds, CIB, CDBG, FEMA	Leeds	Low
New Harmony	Flood	Partnership/Coordination, Prevention, Property Protection	Minimize structural damage from floods.	A structural alternative would be to construct a levee along Pace Draw creek through town, a levee distance of about 5,000 feet.	Unknown	312,000	Local government operating budget; State and Federal flood grant programs	Local government	Medium
New Harmony	Flood	Environmental Protection, Partnership/Coordination, Prevention, Property Protection	Provide Flood protective features along Ash Creek in and near New Harmony.	Provide flood protective features along Ash Creek to prevent flooding to residences in area subdivisions.	Unknown	Unknown	Local government operating budget; State and Federal flood grant programs	New Harmony	High
Rockville	Landslide	Emergency Services, Prevention, Property Protection, Partnership/Coordination.	Stabilize or limit the potential for damage from rock fall	Protect or relocate structures located in the high rick fall hazard area north of SR-9 in Rockville, Utah	This is a long term strategy with undetermined time lines.	Unknown	Local funding, state and federal grant funds as available.	Town of Rockville, Washington County, Bureau of Land Management, other Local Governments.	High
Rockville	Food	Prevention, Property Protection, Environmental Protection	(Wash east of Cos Rd. and North of Hwy 9 Storm Drain Improvements) Storm water management projects to prevent residential flooding and prevent flood waters from washing out roadways and drainage ditches, and prolong the life of roadways through erosion management.	obtain easements for new wash route. Wash redesign and new construction for wash north of Highway 9. Install rip rap along areas of erosion.	5 Years	Unknown	Rockville, CIB, CDBG, FEMA	Rockville	High
Rockville	Food	Prevention, Property Protection, Environmental Protection	(Dennett Lane Storm Drain Improvements) Storm water management projects to prevent residential flooding and prevent flood waters from washing out roadways and drainage ditches, and prolong the life of roadways through erosion management.	Re-grade and widen wash. Install culverts to ensure adequate flow. Place rip rap along points of erosion (Turns, steep slopes, and culvert inlets and outlets). Clear Debris from wash and culverts along Dennett Lane.	5 Years	Unknown	Rockville, CIB, CDBG, FEMA	Rockville	High
Rockville	Food	Prevention, Property Protection, Environmental Protection	(De Mille Rd. Storm Drain Improvements) Storm water management projects to prevent residential flooding and prevent flood waters from washing out roadways and drainage ditches, and prolong the life of roadways through erosion management.	Re-grade swale to collect and divert water to drainage washes. Install soil erosion mechanisms along lower part of mesa to minimize amount of sediment during storm events. Install culvert under road ways to route water to natural drainage channels.	5 Years	Unknown	Rockville, CIB, CDBG, FEMA	Rockville	High

Rockville	Food	Prevention, Property Protection, Environmental Protection	(Town Storm Water Drainage Plan) Storm water management projects to prevent residential flooding and prevent flood waters from washing out roadways and drainage ditches, and prolong the life of roadways through erosion management.	Develop a storm water drainage and management plan. Plan will outline costs for such maintenance and planning for future improvements. GIS Mapping of Projects with portable management device.	5 Years	$30,000	Rockville, CIB, CDBG, FEMA	Rockville	High
St. George	Flood	Environmental Protection, Partnership/Coordination, Prevention, Property Protection	Provide for erosion protection for Millcreek Power Generation station in St. George.	Provide for erosion protection for Millcreek Power Generation station in St. George.	Unknown	Unknown	Local government operating budget; State and Federal flood grant programs	St. George	Medium
Santa Clara	Flood	Environmental Protection, Partnership/Coordination, Prevention, Property Protection	Stabilize Santa Clara River for future flood events.	Provide grade stabilization to limit scouring near Dixie Drive Bridge and through Santa Clara City.	Unknown	Unknown	Local government operating budget; State and Federal flood grant programs	Santa Clara	High
Santa Clara	Flood	Emergency Management, Prevention, Property Protection, Environmental Protection, Partnership/Coordination	Stabilize the Santa Clara River against future flooding events.	Stabilize river banks and hardened bank structure and infrastructure along the Santa Clara River. Limit development within the flood plain and relocate existing structures threatened by flooding. Clear debris and limit vegetation growth to reduce flood impacts. Provide early warning.	This is a long term strategy with undetermined times lines.	Unknown	Local funding, state and federal grant funds as available.	Washington County, Washington County Water Conservancy District, Local water users, NRCS, Army Corp of Engineers, other Local Governments.	High
Springdale	Landslide	Property Protection, Prevention, Partnership Coordination	To reduce landslide risk as it relates to the built environment in Town of Springdale.	Adopt zoning regulations to prevent development of structures in identified rock fall or geologically unstable areas to minimize losses in the unincorporated areas of Washington County.	5 years	Minimal	Private funds/ developer; Local government operating budget; Utah Geologic Survey operating budget.	Local, jurisdictional level; Utah Geological Survey	High
Springdale	Flood	Environmental Protection, Partnership/Coordination, Prevention, Property Protection	Minimize structural damage from floods.	Construct flood mitigation measures at Flannigan Diversion Structure (Springdale's Diversion) in Zion National Park. Measures may include increasing the height of the headwall, armoring above intake pipe to reduce scour effects, constructing new walls or changing weir roof material from aluminum to a heavier gauge steel.	Unknown	Unknown	Local government operating budget; State and Federal flood grant programs	Springdale	Medium
Springdale	Flood	Emergency Services, Environmental Protection, Partnership/Coordination, Prevention, Property Protection	Minimize structural damage from floods.	Construct an erosion control/rip rap wall to protect the Canyon Springs Estates subdivision emergency access and Town water line from further erosion and damage.	Unknown	Unknown	Local government operating budget; State and Federal flood grant programs	Springdale	Medium
Springdale	Flood	Emergency Services, Environmental Protection, Partnership/Coordination, Prevention, Property Protection	Minimize structural damage from floods.	Construct an erosion control/rip rap wall at the South end of Springdale on the Dickman property to protect the Town sewer line and Rockville Canal irrigation pipe from further erosion and damage. Project currently under Corps of Engineers Section 14 review.	Unknown	Unknown	Local government operating budget; State and Federal flood grant programs	Springdale	Medium
Springdale	Flood	Emergency Services, Environmental Protection, Partnership/Coordination, Prevention, Property Protection	Minimize structural damage from floods.	Investigate erosion potential on bend of river near SR-9 south of Springdale Chevron and north of River Park.	Unknown	Unknown	Local government operating budget; State and Federal flood grant programs	Springdale	Medium
Toquerville	Flood/Drought	Partnership/Coordination, Prevention, Property Protection	Prevent flood waters from subverting bridge structures. Maintaining dam water levels.	Clear willows and other debris from Ash Creek.	Semi-Annual	Unknown	Toquerville Operating budget (water Budget) Partnered with the Water District, Laverkin, and Hurricane	The Water District, Laverkin, and Hurricane	High

Virgin	Flood	Prevention, Property Protection, Environmental Protection	(Rio de Sion Storm Drain Improvements) Storm water management projects to prevent residential flooding and prevent flood waters from washing out roadways and drainage ditches.	Clean and rehabilitate Cornelius Wash that directs water to the Virgin River. Clean and rehabilitate wash to the west of the above mentioned was. Install new culvert with rip rap at inlet and outlet of culvert to prevent erosion. Redesign culvert outlet on the more west wash.	5 Years	Unknown	Virgin, CIB, CDBG, FEMA	Virgin	High
Virgin	Flood	Prevention, Property Protection, Environmental Protection	(Sierra Bella Subdivision Storm Drain Improvements) Storm water management projects to prevent residential flooding and prevent flood waters from washing out roadways and drainage ditches.	Re-grade waterways and construct swales to direct flow of water on and along the north end of Sierra Bella Subdivision. Clear Debris from wash and through bridge from the north end of subdivision to Kolob Terrace Road. Place rip rap along points of erosion (turns, steep slopes, and culvert inlets and outlets). Coordination and a project is underway with NRCS and Virgin Town for improvements of small area west of Pocketville Road and north of Hwy 9.	5 Years	Unknown	Virgin, CIB, CDBG, FEMA	Virgin	High
Virgin	Flood	Prevention, Property Protection, Environmental Protection	(Mill Street to North Street City Block Storm Drain Improvements) Storm water management projects to prevent residential flooding and prevent flood waters from washing out roadways and drainage ditches.	Re-grade wash. Clear trees and debris from wash. Place rip rap along points of erosion and outlet to the Virgin River (turns, steep slopes, and culvert inlets and outlets)	5 Years	Unknown	Virgin, CIB, CDBG, FEMA	Virgin	High
Virgin	Flood	Prevention, Property Protection, Environmental Protection	100 North Street and 150 South Street Storm Drain Improvements) Storm water management projects to prevent residential flooding and prevent flood waters from washing out roadways and drainage ditches.	Construct concrete swales and waterways to direct storm water to the Virgin River. Direct underground piping to convey water discharge into Virgin River Washes.	5 Years	Unknown	Virgin, CIB, CDBG, FEMA	Virgin	High
Virgin	Flood	Prevention, Property Protection, Environmental Protection	(Town Storm Water Drainage Plan) Storm water management projects to prevent residential flooding and prevent flood waters from washing out roadways and drainage ditches.	Develop a storm water drainage and management plan for planning and maintenance planning. Plan outline costs for such maintenance and planning for future improvements. GIS mapping of project with portable management device.	5 Years	$30,000	Virgin, CIB, CDBG, FEMA	Virgin	High
Washington City	Landslide	Prevention, Property Protection, Environmental Protection	Stabilize the landslide on Telegraph Road, and repair the road to a safe operating condition.	Stabilize the road to stop future movement, and repair the road surface to a level and safe condition.	Repair needs to be immediately to prevent loss of life and property.	$2,000,000	City Funds, Possible grant/ loan	Local government, Any Other Agency that can Provide Assistance.	High
Washington County	Landslide	Education/Outreach, Environmental Protection, Partnership Coordination, Property Protection, Prevention	Prevent damage to structures from rock fall in unincorporated areas of Washington County.	Adopt zoning regulations to prevent development of structures in identified rock fall or geologically unstable areas to minimize losses in the unincorporated areas of Washington County.	Ongoing	Minimal	Private funds/ developer; Local government operating budget; Utah Geologic Survey operating budget.	Local, jurisdictional level; Utah Geological Survey	High

Appendix L - Community Capabilities

Introduction

Mitigating natural hazards is most effectively accomplished when a community efficiently strings together the necessary funding, plans, staff and implementations. This can be accomplished by knowing what types of capabilities a community has, or has access to. The primary types of capabilities for reducing natural hazards are Planning and Regulatory, Administrative, Financial, and Education and Outreach.

Planning and Regulatory

The majority of the incorporated cities and towns in the Five County Region have at one time adopted a General Plan. However, due to the lack of resources and staff many of the General Plans have not been updated in many years, and do not include valuable natural hazard mitigation measures that are applicable today. Communities in the Five County Region are advised to address natural hazards in their respective General Plan when it is updated.

A large number of the communities and all five of the counties have zoning ordinances, enforce building codes, and have subdivision ordinances. Many of the smaller towns in this region have such ordinances enforced by county building officials under interlocal agreements.

Administration and Technical

Very few of the cities and towns in the region have enough resources to provide a full time staff such as engineers, GIS Technicians, and Grant Writers. Some of the cities and towns have but one or two full time staff and the smallest towns may only have one part time staff member. In many cases, these staff often perform many duties (e.g. a city manager might be the planner, GIS Tech., Financial Officer, etc.) When communities need administrative and technical assistance they will often contract out with engineering firms and counties.

Education and Outreach

There are several communities in the region that address education and outreach annually, biannually, and regularly through community newsletters, community calendars, County Fairs, and Utility Bills. In addition to these forms of community outreach, local/regional fire and police departments voluntarily reach out to children at schools and libraries to teach about wildfire and other dangers.

The following tables are intended to be a living document and should be updated and/or amended as the communities grow and adapt.

Question 1	Does the plan address hazards?															
Question 2	Does the plan identify projects to include in the mitigation strategy?															
Question 3	Can the plan be used to implement mitigation actions?															
Jurisdiction:	**Compre/Master/ General Plan**	Question 1	Question 2	Question 3	**Capital Improvements Program**	Question 1	Question 2	Question 3	**Stormwater Manage-ment Plan**	Question 1	Question 2	Question 3	**Wildfire Protection Plan**	Question 1	Question 2	Question 3
Beaver County																
Beaver County	**Y**	*	*	*	**Y**	Y	Y	Y	*	*	*	*	**R**	Y	Y	Y
Beaver City	**Y**	Y	N	N	**Y**	Y	Y	Y	**Y**	N	N	N	**R**	Y	Y	Y
Milford	**Y**	*	*	*	**Y**	Y	Y	Y	*	*	*	*	**R**	Y	Y	Y
Minersville	**Y**	*	*	*	**Y**	Y	Y	Y	**Y**	Y	Y	Y	**R**	Y	Y	Y
Garfield County																
Garfield County	**Y**	*	*	*	**Y**	Y	Y	Y	*	*	*	*	**R**	Y	Y	Y
Antimony	*	*	*	*	**Y**	Y	Y	Y	*	*	*	*	**R**	Y	Y	Y
Boulder	**Y**	Y	N	Y	**Y**	Y	Y	Y	*	*	*	*	**R**	Y	Y	Y
Bryce Canyon City	*	*	*	*	**Y**	Y	Y	Y	*	*	*	*	**R**	Y	Y	Y
Cannonville	*	*	*	*	*	*	*	*	*	*	*	*	**R**	Y	Y	Y
Escalante	*	*	*	*	**Y**	Y	Y	Y	**Y**	Y	Y	Y	**R**	Y	Y	Y
Hatch	*	*	*	*	**Y**	Y	Y	Y	*	*	*	*	**R**	Y	Y	Y
Henrieville	*	*	*	*	**Y**	Y	Y	Y	*	*	*	*	**R**	Y	Y	Y
Panguitch	*	*	*	*	**Y**	Y	Y	Y	*	*	*	*	**R**	Y	Y	Y
Tropic	*	*	*	*	**Y**	Y	Y	Y	**Y**	Y	Y	Y	**R**	Y	Y	Y
Iron County																
Iron County	**Y**	Y	Y	Y	**Y**	Y	Y	Y	*	*	*	*	**R**	Y	Y	Y
Brian Head	**Y**	*	*	*	**Y**	Y	Y	Y	**N**	*	*	*	**R**	Y	Y	Y
Cedar City	**Y**	*	*	*	**Y**	Y	Y	Y	**Y**	*	*	*	**R**	Y	Y	Y
Enoch	**Y**	Y	N	Y	**Y**	Y	Y	Y	*	*	*	*	**R**	Y	Y	Y
Kanarraville	*	*	*	*	*	*	*	*	*	*	*	*	**R**	Y	Y	Y
Paragonah	*	*	*	*	**Y**	Y	Y	Y	*	*	*	*	**R**	Y	Y	Y
Parowan	*	*	*	*	**Y**	Y	Y	Y	*	*	*	*	**R**	Y	Y	Y
Kane County																
Kane County	**Y**	Y	Y	Y	**Y**	Y	Y	Y	*	*	*	*	**R**	Y	Y	Y
Alton	Not Participating															
Big Water	**Y**	*	*	*	**Y**	Y	Y	Y	*	*	*	*	**R**	Y	Y	Y
Glendale	Not Participating															
Kanab	**Y**	*	*	*	**Y**	Y	Y	Y	**Y**	*	*	*	**R**	Y	Y	Y
Orderville	Not Participating															
Washington County																
Washington County	**Y**	Y	Y	Y	**Y**	Y	Y	Y	*	*	*	*	**R**	Y	Y	Y
Apple Valley	*	*	*	*	**Y**	Y	Y	Y	**Y**	Y	Y	Y	**R**	Y	Y	Y
Enterprise	*	*	*	*	**Y**	Y	Y	Y	*	*	*	*	**R**	Y	Y	Y
Hildale	*	*	*	*	**Y**	Y	Y	Y	*	*	*	*	**R**	Y	Y	Y

Hurricane	Y	Y	Y	Y	Y	Y	Y	Y	*	*	*	*	R	Y	Y	Y
Ivins	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	R	Y	Y	Y
LaVerkin	Y	Y	Y	Y	Y	Y	Y	Y	*	*	*	*	R	Y	Y	Y
Leeds	Y	N	N	N	Y	Y	Y	Y	N	*	*	*	R	Y	Y	Y
New Harmony	Y	Y	N	N	*	*	*	*	*	*	*	*	R	Y	Y	Y
Rockville	Y	Y	N	N	Y	Y	Y	Y	N	*	*	*	R	Y	Y	Y
Santa Clara	*	*	*	*	Y	Y	Y	Y	*	*	*	*	R	Y	Y	Y
Springdale	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	R	Y	Y	Y
St. George	Y	Y	N	Y	Y	Y	Y	Y	*	*	*	*	R	Y	Y	Y
Toquerville	Y	Y	N	N	Y	Y	Y	Y	*	*	*	*	R	Y	Y	Y
Virgin	Y	Y	N	Y	*	*	*	*	N	*	*	*	R	Y	Y	Y
Washington City	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	R	Y	Y	Y

Y - Yes
N - No
C - Contracted
R - Regionally Adopted
* Not Available/Unknown

Jurisdiction:	Chief Building Official	Floodplain Administrator	Emergency Manager	Community Planner	Engineer	GIS Coordinator	City Manager/ County Administrator	Planning Commission	Warning systems/ services	Grant writing	Hazus analysis	Zoning ordinance	Subdivision ordinance	Flood insurance rate maps	Fire department ISO rating	Building Codes
Beaver County																
Beaver County	Y	N	Y	N	N	N	N	Y	N	*	N	Y	Y	N	Y	Y
Beaver City	C	N	C	N	N	N	Y	Y	N	*	N	*	*	Y	Y	Y
Milford	C	N	C	N	N	N	Y	Y	N	*	N	Y	*	N	Y	Y
Minersville	C	N	C	N	N	N	N	Y	N	*	N	*	Y	N	Y	Y
Garfield County																
Garfield County	Y	N	Y	Y	Y	N	N	Y	N	*	N	Y	Y	Y	Y	Y
Antimony	C	N	C	N	C	N	N	Y	N	*	N	N	N	Y	Y	Y
Boulder	C	N	C	N	C	N	N	Y	N	*	N	Y	Y	N	Y	Y
Bryce Canyon City	C	N	C	N	C	N	Y	Y	N	*	N	N	N	Y	Y	Y
Cannonville	C	N	C	N	C	N	N	Y	N	*	N	N	N	N	Y	Y
Escalante	C	N	C	N	C	N	N	Y	N	*	N	Y	N	Y	Y	Y
Hatch	C	N	C	N	C	N	N	Y	N	*	N	Y	N	N	Y	Y
Henrieville	C	N	C	N	C	N	N	Y	N	*	N	N	N	Y	Y	Y
Panguitch	C	N	C	N	C	N	Y	Y	N	*	N	Y	N	Y	Y	Y
Tropic	C	N	C	N	C	N	N	Y	N	*	N	Y	N	Y	Y	Y
Iron County																
Iron County	Y	Y	Y	Y	Y	Y	N	Y	N	*	N	Y	Y	Y	Y	Y
Brian Head	Y	N	C	N	C	N	Y	Y	N	*	N	Y	*	N	Y	Y
Cedar City	Y	Y	N	N	Y	Y	Y	Y	N	Y	N	Y	*	Y	Y	Y
Enoch	Y	N	N	N	N	N	Y	Y	N	*	N	Y	Y	N	Y	Y
Kanarraville	C	N	N	N	N	N	N	Y	N	*	N	Y	Y	N	Y	Y
Paragonah	C	N	N	N	N	N	N	Y	N	*	N	Y	Y	Y	Y	Y
Parowan	C	N	N	N	N	N	Y	Y	N	*	N	Y	*	Y	Y	Y
Kane County																
Kane County	Y	N	Y	Y	Y	Y	N	Y	Y	*	N	Y	Y	Y	Y	Y
Alton	Not Participating															
Big Water	C	N	N	N	C	N	N	Y	N	*	N	*	*	N	Y	Y
Glendale	Not Participating															
Kanab	C	N	N	C	Y	N	Y	Y	N	*	N	Y	*	Y	Y	Y
Orderville	Not Participating															
Washington County																
Washington County	Y	Y	Y	Y	Y	Y	Y	Y	N	*	N	Y	*	Y	Y	Y
Apple Valley	C	N	N	N	C	N	N	Y	N	*	N	Y	Y	Y	Y	Y
Enterprise	Y	N	N	Y	C	N	Y	Y	N	*	N	*	*	Y	Y	Y
Hildale	*	N	Y	N	C	N	N	Y	N	*	N	*	*	Y	Y	Y
Hurricane	Y	N	Y	Y	Y	*	Y	Y	N	*	N	Y	*	Y	Y	Y
Ivins	Y	N	Y	N	Y	N	Y	Y	N	*	N	Y	Y	Y	Y	Y
LaVerkin	Y	N	N	N	C	N	Y	Y	N	*	N	Y	*	Y	Y	Y

Leeds	Y	N	N	N	C	N	N	Y	N	*	N	Y	Y	Y	Y	Y
New Harmony	C	Y	N	N	C	N	N	Y	N	*	N	Y	*	Y	Y	Y
Rockville	C	N	N	N	C	N	N	Y	N	*	N	Y	Y	Y	Y	Y
Santa Clara	Y	N	Y	N	C	N	Y	Y	N	*	N	Y	Y	Y	Y	Y
Springdale	C	N	N	Y	C	N	Y	Y	N	*	N	Y	*	Y	Y	Y
St. George	Y	Y	Y	Y	Y	Y	Y	Y	N	*	N	Y	Y	Y	Y	Y
Toquerville	C	N	N	N	C	N	N	Y	N	*	N	Y	*	Y	Y	Y
Virgin	C	N	N	N	C	N	N	Y	N	*	N	Y	*	Y	Y	Y
Washington City	Y	N	Y	Y	C	N	Y	Y	N	*	N	Y	*	Y	Y	Y

Y - Yes	C - Contracted	N - No/none
* Not available/Unknown		R - Regionally Adopted

Question 1	Has the funding resource been used in past and for what type of activities?								
Question 2	Could the resource be used to fund future mitigation actions?								
Jurisdiction:	**Impact fees for new development**	Question 1	Question 2	**Community Development Block Grant**	Question 1	Question 2	**Community Impact Board Fund**	Question 1	Question 2
Beaver County									
Beaver County	(	*	L	(	N	Y	(	Y	Y
Beaver City	(	*	L	(	N	Y	(	N	Y
Milford	(	*	L	(	N	Y	(	N	Y
Minersville	(	*	L	(	N	Y	(	N	Y
Garfield County									
Garfield County	(	*	L	(	N	Y	(	N	Y
Antimony	(	*	L	(	N	Y	(	N	Y
Boulder	(	*	L	(	N	Y	(	N	Y
Bryce Canyon City	(	*	L	(	N	Y	(	N	Y
Cannonville	(	*	L	(	Y	Y	(	N	Y
Escalante	(	*	L	(	N	Y	(	N	Y
Hatch	(	*	L	(	N	Y	(	N	Y
Henrieville	(	*	L	(	N	Y	(	N	Y
Panguitch	(	*	L	(	N	Y	(	N	Y
Tropic	(	*	L	(	N	Y	(	N	Y
Iron County									
Iron County	(	*	L	(	N	Y	(	N	Y
Brian Head	(	*	L	(	N	Y	(	N	Y
Cedar City	(	*	L	(	N	Y	(	N	Y
Enoch	(	*	L	(	N	Y	(	N	Y
Kanarraville	(	*	L	(	N	Y	(	N	Y
Paragonah	(	*	L	(	N	Y	(	N	Y
Parowan	(	*	L	(	N	Y	(	N	Y
Kane County									
Kane County	(	*	L	(	N	Y	(	N	Y
Alton									
Big Water	(	*	L	(	N	Y	(	N	Y
Glendale									
Kanab	(	*	L	(	N	Y	(	N	Y
Orderville									
Washington County									
Washington County	(	*	L	(	N	Y	(	N	Y
Apple Valley	(	*	L	(	N	Y	(	N	Y
Enterprise	(	*	L	(	N	Y	(	N	Y
Hildale	(	*	L	(	N	Y	(	N	Y
Hurricane	(	*	L	(	N	Y	(	N	Y

Ivins	(	*	L	(	N	Y	(	N	Y
LaVerkin	(	*	L	(	Y	Y	(	N	Y
Leeds	(	*	L	(	N	Y	(	N	Y
New Harmony	(	*	L	(	N	Y	(	N	Y
Rockville	(	*	L	(	N	Y	(	N	Y
Santa Clara	(	*	L	(	N	Y	(	N	Y
Springdale	(	*	L	(	N	Y	(	N	Y
St. George	(	*	L	(	N	Y	(	N	Y
Toquerville	(	*	L	(	N	Y	(	N	Y
Virgin	(	*	L	(	N	Y	(	N	Y
Washington City	(	*	L	(	N	Y	(	N	Y
Y - Yes									
N- No									
L- State Law limits this to storm water, drainage, and flood control facilities									

Jurisdiction:	Ongoing public education or information program	Describe program/organization and how relates to disaster resilience and mitigation	Could the program/organization help implement future mitigation activities?	StormReady certification	Describe program/organization and how relates to disaster resilience and mitigation	Could the program/organization help implement future mitigation activities?	Active Firewise Communities	Describe program/organization and how relates to disaster resilience and mitigation	Could the program/organization help implement future mitigation activities?
Beaver County									
Beaver County	**Y**	Annual News Articles, Fair Booth, and Instant Command Trailer	Y	**N**	A community that participates in a preparedness program by preparing for increasing vulnerability to extreme weather and water events.	Y	**Y**	(Hi-Lo/Arrowhead, Beaver) A fire wise community teaches people how to adapt to living with wildfire and encourages neighbors to work together to prevent loss	Y
Beaver City	*	*	*	**N**	"	"	Y	**N**	"	"	Y
Milford	**Y**	Education through public safety services, Education through library services, Pamphlets through utilities.	y	**N**	"	"	Y	**N**	"	"	Y
Minersville	*	*	*	**N**	"	"	Y	**N**	"	"	Y
Garfield County									
Garfield County	*	*	*	**N**	"	"	Y	**N**	"	"	Y
Antimony	*	*	*	**N**	"	"	Y	**N**	"	"	Y
Boulder	**N**	N/A	N/A	**N**	"	"	Y	**N**	"	"	Y
Bryce Canyon City	**Y**	Fire safety at the Elementary School	Y	**N**	"	"	Y	**N**	"	"	Y
Cannonville	*	*	*	**N**	"	"	Y	**N**	"	"	Y
Escalante	*	*	*	**N**	"	"	Y	**N**	"	"	Y
Hatch	**Y**	Fire safety at the Elementary School	Y	**N**	"	"	Y	**N**	"	"	Y
Henrieville	*	*	*	**N**	"	"	Y	**N**	"	"	Y
Panguitch	**Y**	Fire safety at the Elementary School	Y	**N**	"	"	Y	**N**	"	"	Y
Tropic	**Y**	Fire safety at the Elementary School	Y	**N**	"	"	Y	**N**	"	"	Y
Iron County									
Iron County	*	*	*	**Y**	"	"	Y	**N**	"	"	Y
Brian Head	*	*	*	**N**	"	"	Y	**N**	"	"	Y

Cedar City	Y	Community outreach and WUI compliant	Y	N	" "	Y	N	" "	Y
Enoch	Y	Education outreach through the Police department, Cedar City Fire Department, and the city's monthly newsletter.	Y	N	" "	Y	N	" "	Y
Kanarraville	*	*	*	N	" "	Y	N	" "	Y
Paragonah	*	*	*	N	" "	Y	N	" "	Y
Parowan	*	*	*	N	" "	Y	N	" "	Y
Kane County									
Kane County	*	*	*	N	" "	Y	N	" "	Y
Alton	Not Participating								
Big Water	*	*	*	N	" "	Y	N	" "	Y
Glendale	Not Participating								
Kanab	*	*	*	N	" "	Y	N	" "	Y
Orderville	Not Participating								
Washington County									
Washington County	*	*	*	Y	" "	Y	N	" "	Y
Apple Valley	*	*	*	N	" "	Y	N	" "	Y
Enterprise	*	*	*	N	" "	Y	N	" "	Y
Hildale	*	*	*	N	" "	Y	N	" "	Y
Hurricane	*	*	*	N	" "	Y	N	" "	Y
Ivins	*	*	*	N	" "	Y	N	" "	Y
LaVerkin	*	*	*	N	" "	Y	N	" "	Y
Leeds	*	*	*	N	" "	Y	N	" "	Y
New Harmony	*	*	*	N	" "	Y	N	" "	Y
Rockville	*	*	*	N	" "	Y	N	" "	Y
Santa Clara	*	*	*	N	" "	Y	N	" "	Y
Springdale	*	*	*	N	" "	Y	N	" "	Y
St. George	*	*	*	N	" "	Y	N	" "	Y
Toquerville	*	*	*	N	" "	Y	N	" "	Y
Virgin	*	*	*	N	" "	Y	N	" "	Y
Washington City	*	*	*	N	" "	Y	N	" "	Y

Appendix M - Community Vulnerability

The Following tables are provided for planning purposes, they also provide information on how vulnerable each community in the Five County Region is to all eight hazards assessed in this hazard mitigation plan. Hazards affect communities at various rates and times, and are dependent on a variety of factors. All of the communities in this region may be vulnerable to any of the listed natural hazards, and should not dismiss any of the hazards due to the vulnerability score received. For example a low hazard vulnerability rating does not guarantee that any single event could not be catastrophic.

Hazard Vulnerability								
	Flood	Landslide	Wildfire	Problem Soils	Earthquake	Severe Weather	Radon	Drought
Beaver County Community Mitigation Strategies								
Beaver County	L	L	H	L	L	L	H	H
Beaver City	H	L	L	L	M	L	H	H
Milford	H	L	L	L	L	L	H	H
Minersville	H	L	M	L	M	L	H	H
Garfield County Community Mitigation Strategies								
Garfield County	H	M	L	L	L	L	L	H
Antimony	L	M	H	L	L	L	L	H
Boulder	L	H	H	L	L	L	L	H
Bryce Canyon City	L	L	H	L	L	L	L	H
Cannonville	L	L	M	L	L	L	L	H
Escalante	H	L	H	L	L	L	L	H
Hatch	L	L	H	L	M	L	L	H
Henrieville	L	L	M	L	L	L	L	H
Panguitch	H	L	H	L	M	L	L	H
Tropic	H	M	H	L	L	L	L	H
Iron County Community Mitigation Strategies								
Iron County	H	M	H	L	L	L	L	H
Brian Head	H	H	H	L	M	L	L	H
Cedar City	H	M	M	M	M	L	L	H
Enoch	H	L	L	M	M	L	L	H
Kanarraville	L	L	H	L	M	L	L	H
Paragonah	H	L	H	L	M	L	L	H
Parowan	L	M	H	L	M	L	L	H

Hazard Vulnerability								
	Flood	Landslide	Wildfire	Problem Soils	Earthquake	Severe Weather	Radon	Drought
Kane County Community Mitigation Strategies								
Kane County	H	M	L	L	L	L	L	H
Alton	Not Participating							
Big Water	H	L	L	H	L	L	L	H
Glendale	Not Participating							
Kanab	H	L	M	L	L	L	L	H
Orderville	Not Participating							
Washington County Community Mitigation Strategies								
Washington County	h	M	H	L	M	L	L	H
Apple Valley	H	M	M	L	L	L	L	H
Enterprise	M	M	H	L	M	L	L	H
Hildale	H	L	M	L	L	M	L	H
Hurricane	H	M	M	L	H	L	L	H
Ivins	M	L	M	L	L	L	L	H
LaVerkin	H	H	H	L	M	L	L	H
Leeds	H	H	H	L	L	L	L	H
New Harmony	H	L	H	L	L	L	L	H
Rockville	H	H	H	L	L	L	L	H
St. George	H	H	M	L	L	L	L	H
Santa Clara	H	H	H	M	L	L	L	H
Springdale	M	H	H	L	L	L	L	H
Toquerville	H	H	H	L	M	L	L	H
Virgin	H	H	H	L	L	L	L	H
Washington City	H	H	H	L	H	L	L	H