PRE-DISASTER MITIGATION PLAN

BEAR RIVER REGION, UTAH

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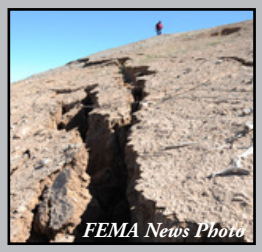
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BEAR RIVER ASSOCIATION OF GOVERNMENTS

August 2015

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SECTION 1: PRE-REQUISITES & ADOPTION BY THE LOCAL JURISDICTIONS

INTRODUCTION & PLAN PURPOSE

The three northernmost Utah counties that make up the Bear River Region are vulnerable to natural, technological, and human caused hazards that have the possibility of causing serious threat to the health, welfare, and security of our citizens. The cost of response and recovery from potential disasters, both in terms of potential loss of life or property, can be lessened when attention is turned to mitigating their impacts before they occur or re-occur.

This plan attempts to identify the region's hazards, understand our vulnerabilities and craft solutions that can significantly reduce threat to life and property. The plan is based on the premise that hazard mitigation works! With increased attention to managing natural hazards, communities can do much to reduce threats to existing citizens and avoid creating new problems in the future. In addition, many solutions can be implemented at minimal cost.

This is not an emergency response or management plan. Certainly, the plan can be used to identify weaknesses and refocus emergency response planning, which is an important mitigation strategy. However, the focus of this plan is to support better decision making directed toward avoiding future risks, and the implementation of activities or projects that will eliminate or reduce the risk for those that may already have exposure to a natural hazard threat.

How The Plan Is Organized

Section 1 introduces the plan, outlines the plan including scope, purpose, and goals, lists participating communities, and includes commentary on changes in the plan from earlier versions. Section 2 documents the planning process, public involvement, and summarizes information on natural hazards in the Bear River Region. Section 3 gives a general regional background including basic demographic, economic, and physiographic characteristics.

Section 4 is the Bear River Regional Risk Assessment. Because of the uniformity of the hazard risk throughout the region and the similarity of vulnerabilities, severe weather, drought, agricultural hazards, radon, and problem soils were analyzed at the regional level. This section also includes commentary regarding implications of the potential effects of natural hazards on future development. Section 5, 6, and 7 includes natural hazard risk assessments for cities, towns, and the unincorporated county areas for Box Elder, Cache, and Rich Counties, respectively. Section 8 documents local community planning and technical capability to implement mitigation strategies, and Section 9 discusses plan implementation, funding, and public involvement.

How The Plan Should Be Used

First, the plan should be used to help local elected and appointed officials plan, design, and implement programs and projects that will help reduce their community's vulnerability to natural hazards. Second, the plan should be used to facilitate inter-jurisdictional coordination and collaboration related to natural hazard mitigation planning and implementation. Third, the plan should be used to develop or provide guidance for local emergency planning. Finally, if adopted, the plan will bring communities in compliance with the Disaster Mitigation Act of 2000, qualifying jurisdictions to apply for funding for pre-disaster mitigation projects and for receiving federal aid in the event of a presidentially declared disaster.

What Is Hazard Mitigation?

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

Hazard mitigation measures must be practical, cost effective, and environmentally and politically

acceptable. Actions taken to limit the vulnerability of society to hazards must not in themselves be more costly than the value of anticipated damages. However, some projects may require financial commitments from local jurisdictions without any measurable monetary reward or benefit, although it may save lives and priceless community assets. Some initial financial investments for projects which lessen risk to local residents and property, may also pay economic dividends later on if legal issues arise.

However, the primary focus of hazard mitigation actions must be on capital investment decisions, and based on vulnerability. Capital investments, whether for homes, roads, public utilities, pipelines, power plants, or public works greatly determine the nature and degree of hazard vulnerability for a community. Once a capital facility is in place, very few opportunities will present themselves over the useful life of the facility to correct any errors in location or construction with respect to hazard vulnerability. It is for these reasons that zoning and other ordinances - which manage development in high vulnerability areas along with building codes and guidelines, are often the most useful mitigation approaches a city can implement.

In general, mitigation measures are the most neglected programs within emergency management. Since the priority to implement mitigation activities is generally low in comparison to perceived threat, implementation may be a timely and highly involved process. Mitigation success may be achieved however, if accurate information is portrayed through complete hazard identification and impact studies, followed by effective mitigation management. Hazard mitigation is the key to eliminating long-term risks to people and property from hazards and their effects. Preparedness for all hazards includes response and recovery plans, training, development, management of resources, and the need to mitigate each jurisdictional hazard.

This multi-jurisdictional plan evaluates the potential impacts, risks and vulnerabilities associated with natural hazards for jurisdictions in the Bear River Region. The plan supports, identifies, describes, and documents potential mitigation projects for municipalities and the unincorporated areas in each county. The suggested actions and plan implementation contained in this document for local governments may reduce the impact severity of future disasters. Only through coordinated partnerships with emergency managers, political entities, public works officials, community planners, the general public, and other individuals working to implement this program will the goals of the plan be accomplished.

For most of the State of Utah, the planning services of the Utah Association of Governments (AOG's) have been utilized to develop the mitigation plans for all jurisdictions in the state. However, some individual jurisdictions have recently completed the plan on their own. For this plan update, Box Elder, Cache, and Rich County emergency managers requested assistance from BRAG to update the plan for the entire region.

The seven Utah Associations of Governments are comprised of the following regional entities:

1. Bear River Association of Governments
2. Wasatch Front Regional Council
3. Mountainland Association of Governments
4. Six County Association of Governments
5. Southeast Utah Association of Local Governments
6. Five County Association of Governments
7. Uintah Basin Association of Governments

Plan Purpose

This Pre-Disaster Mitigation Plan is meant to provide information regarding threats to life and property associated with natural hazards to local and State governments as well as interested agencies and the general public. The intent of this document can be summarized into several over arching goals which:

- Fulfil Federal, State, and local hazard mitigation planning requirements
- Promote pre- and post-disaster mitigation measures, short and long-range strategies

that minimize suffering, loss of life, and damage to property resulting from hazardous or potentially hazardous conditions to which citizens and institutions within the State are exposed.

- Eliminate or minimize conditions which would have an undesirable impact on our citizens, local infrastructure, economy, environment, and the well-being of local, county, and state governments.

Plan Scope

The Bear River Association of Governments (providing regional planning assistance to Cache, Rich, and Box Elder Counties) will submit a current updated plan to the Utah Division of Emergency Services. Future monitoring, evaluating, updating and implementing will take place as new incidents occur and/or every five years. The hazard mitigation plans and strategies will also be included in local planning efforts and plans.

Overall Goals

Coordinate with participating local governments to develop a regional planning process that will meet Local Mitigation Plan Review Tool provided by FEMA. Additional goals include planning to meet expectations set by the State and addressing the concerns of local jurisdictions.

Local Goals

The goals below form the basis for the development of the PDM Plan and are shown from highest to lowest priority. They are:

1. Protection of life before, during, and after the occurrence of a disaster.
2. Protection of emergency response capabilities (critical infrastructure).
3. Improved communication and warning systems.
4. Integration of appropriate emergency medical services and use medical facilities during a natural disaster event.
5. Identification of critical facilities and community infrastructure.
6. Government collaboration across jurisdictional boundaries during natural hazard events.
7. Protection of developed property, homes and businesses, industry, educational opportunities, and the cultural fabric of a community, by combining hazard loss reduction strategies with a community's environmental, cultural/historical, social, and economic needs.
8. Protection of natural resources and the environment when considering mitigation measures.

Regional Goals

1. Eliminate or reduce the long-term risk to human life and property by identifying natural hazards.
2. Aid both the private and public sectors in understanding the risks they may be exposed to from identified hazards, and work with local governments and partners to find mitigation strategies that reduce those risks.
3. Decrease liability for local governments by educating elected officials and staff on natural hazard mitigation and issues.
4. Minimize the impacts of natural hazard risks when they cannot be avoided.
5. Mitigate the impacts of damage as a result of identifying hazards.
6. Implement mitigation strategies in a way that minimizes negative environmental impacts.
7. Provide a basis for funding projects which are outlined as hazard mitigation strategies.
8. Maintain and improve a regional platform to enable communities to take advantage of shared goals, resources, and other available resources.

Prioritization of Mitigation Strategies

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

Recurrence intervals, past events, and damage estimates compiled during the assessment of vulnerability in this plan were also considered for priority and time line values. While there was not a technical cost-benefit analysis for determining mitigation strategies during this planning process, the above criteria were considered for prioritization.

ADOPTION & UPDATING THE PLAN

Participating Jurisdictions

Table 1: Participating Jurisdictions in the Bear River Region

RICH COUNTY	CACHE COUNTY
Garden City	Amalga
Laketown	Clarkston
Randolph	Cornish Town
Woodruff	Hyde Park City
BOX ELDER COUNTY	Hyrum City
Bear River City	Lewiston City
Brigham City	Logan City
Corinne City	Mendon City
Deweyville	Millville City
Elwood	Newton
Fielding	Nibley
Garland City	North Logan City
Honeyville City	Paradise
Howell	Providence City
Mantua	Richmond City
Perry City	River Heights City
Plymouth	Smithfield City
Portage	Trenton
Snowville	Wellsville City
Tremonton City	
Willard City	

Local Adoption of The Plan

On June 1, 2015, the Draft Pre-Disaster Mitigation Plan was put on the BRAG website, located at *www.brag.utah.gov*. A hard copy of the plan was also available at the BRAG office for viewing. After a 30-day public comment period, comments from communities, the public, county working groups, as well as the Utah Division of Emergency Services were integrated into the plan. The draft plan was then sent to FEMA Region VIII for review. After revisions to the draft plan were completed, letters were sent to each jurisdiction explaining the benefits of adopting a FEMA-approved plan and encouraging all 42 jurisdictions in the Bear River Region to adopt the plan. Blank promulgation forms were sent to chief elected officials, and communities were asked to adopt the plan, and send the completed promulgation forms to BRAG for inclusion as an appendix in the plan. The final plan was also made available in its entirety by section on the BRAG website found at *www.brag.utah.gov*. Individual links for each community section were made available.

Plan Updates & Changes

During the 2014-2015 planning process, it was determined that some aspects of the plan should be updated as needed and some should remain as they were in the 2009 version, with minor edits as needed. Background information, such as hazard definitions, the purpose for the plan, scope, goals, local adoption, and other sections remained relatively the same in both plans. However, some changes in this version were necessary, such as general document layout, the planning process, economic and demographic information updates, risk assessment methods and data, mitigation strategy updates, and the community capability assessments. Following are some of the changes that were made to these sections.

Document layout and organization has been altered to create a user friendly and accessible document. Some charts, tables, data, and other information was moved to the appendix to create a more user friendly layout. County risk assessments were renamed to provide a community emphasis, such as "Box Elder County – Community Risk Assessments" to give a sense of ownership for communities and to make the plan easier to navigate. Also, the term "Annex" was removed to avoid confusion and sections were renamed "Box Elder County Hazard Mapping," for example, to

simplify sections.

The planning process was altered slightly as well. The first group that met about the plan was comprised of emergency managers, planners, and others involved in emergency planning in the region. BRAG staff sought input for, and built county working groups based on, meeting input and references from those initial contacts. The working groups were also added to as needed depending on what existing working group members thought was necessary. BRAG staff invited all jurisdictions in the region to send representatives as part of the working group, and invited State and Federal Agencies with land management responsibilities in the Bear River Region. Any other suggestions for members were integrated into the working group as needed. The use of surveys was employed similarly to the 2009 plan, and letters and e-mails were sent regularly throughout the process to each community inviting representatives to meetings, and giving many opportunities for community involvement. BRAG staff also made many phone calls to communities to solicit information critical to the plan.

Understandably, economic and demographic data was updated in the plan, as was historical data and natural hazard event data. New sources were sought where data was limited in the 2009 version, such as historical landslide data, historical wildfire data, and earthquake epicentre data.

New risk assessment methods and up-to-date GIS data was also used in this plan in an attempt to reflect current conditions (See Appendix C). New landslide susceptibility, geological faults, wildfire, dam failure, and floodplain data was utilized. Steep slopes were added to address some problem soil areas. The overlay analysis methodology from 2009 proved to be useful for this analysis, although parcel data and any available new hazards data was used. Model Builder in ArcGIS was used to make the analyses uniform for the entire region where possible. Rich County still had incomplete parcel data, and it is anticipated it will be incomplete for some time. However, updated recorders data was linked to the GIS layers to create a more accurate data set where it existed.

A new wildfire hazard data set was also used for this plan update. Data from the West Wide Wildfire Risk Assessment, completed in 2013 by the Oregon Department of Forestry, was utilized to provide a more accurate risk assessment region-wide.

Mitigation strategies were also updated through interaction with participating communities. Some strategies from 2009 were completed, those that were still applicable were carried over into this plan, and new strategies were created by local governments to better address mitigation issues.

Some communities in the region have either grown and added new employees or now have greater data and GIS capabilities. These capabilities were documented at the end of this document as well, with the realization that some communities will continue to have needs for hazard mitigation planning assistance from BRAG and other State and Federal agencies in the future. BRAG staff will continue to be a resource for those communities.

MITIGATION STRATEGIES IMPLEMENTED FROM 2009-2015

- **North Logan** - Earthquake training (Utah Shakeout). Working with canal companies. Wildfire planning. Geotechnical Requirements. Using flood areas as recreational opportunities.
- **Logan** - Improvements were made to 600 W bridge to prevent overtopping road during floods. Additional water storage still ongoing for the next 5 years.
- **Richmond** - Incorporated the bulk of the strategies used in the 2009 program, but did make some minor changes. Worked with irrigation company to minimize flooding.
- **Trenton** – Earthquake, landslide, and wildfire planning.
- **River Heights** - Sponsored a seminar on the dangers of radon gas, and several residents have installed fan driven ventilation systems.
- **Millville** - Regulating building in wildfire prone areas. Earthquake hazards planning

and ordinance work.

- **Smithfield** - Identified the floodplain running through the city, and have taken steps through the cities ordinance and general plan to minimize the effects of flooding. Smithfield works through LDS stakes with emergency preparedness.
- **Tremonton** - Wildfire protection: Cooperative Wildfire Protection Plan (CWPP) was established Feb 28, 2013 involving residents of Tremonton, Garland, and Box Elder County (unincorporated). Resulting from this agreement and in cooperation with FFSL, US Dept. of Agriculture, Box Elder County, Tremonton, and Garland Fire Departments, a fire break was created above affected homes to protect both residential areas and grazing land.
- **Garland** - Holding table top trainings once a month. These table tops have been covering waterlines, communication, health of others.
- **Brigham City** - Work with the Utah Division of Water Rights and other groups to utilize Emergency Action Plans on a local level. Develop or update an environmental safety zone - with identified hazard areas, disclosure/education, hazard maps. Wildfire Defense Program. Perform seismic upgrades to existing Brigham City Library to meet current building codes. Protect 36" Penstock water line coming from Mantua to Brigham City by burying it. Trim trees to keep limbs clear of electrical power system. Reconcile current development with soon to be adopted FEMA floodplain maps for Box Elder County for NFIP communities. For non-NFIP communities, talk with Utah ESHS about the benefits of NFIP.

OTHER CHANGES FROM 2009-2015

One of the most substantial changes to this updated plan is the document layout and organization. Most of the large charts and extraneous background information was consolidated and put in the appendix.

In this version of the plan, individual community sections were created to make the document more accessible to local community leaders, staff, and emergency managers/planners on the local, state, and federal levels.

A more robust risk analysis was also completed for this plan update. Better GIS data was used where available, including a wildfire risk data set created by Oregon State University in 2013. Updated parcel and US Census data was also utilized, as well as updated geologic hazards data from the Utah Geological Survey. Potential loss analyses were also more comprehensive, and included new data sets such as:

- Natural gas line data (Questar Gas)
- Agricultural amenities
- Recreational amenities
- Natural amenities
- More comprehensive list of Critical Facilities

BRAG staff also tried to make the meetings for the update process more interesting and appealing to elected officials and others. Six natural hazards specialists from state and federal agencies were invited to give presentations at the three county mitigation strategy meetings held. They presented realistic and feasible ideas for mitigating the effects of wildfire, flood, landslides, geologic hazards, and severe weather. Elected officials and staff were invited to ask questions and learn from these specialists.

SECTION 2: PLANNING PROCESS

BEAR RIVER REGION PDM PLANNING PROCESS

This mitigation plan is the result of a comprehensive and coordinated planning process. Beyond the involvement of the general public, a great deal of effort focused on coordinating and obtaining input from the 42 jurisdictions in the Bear River tri-county region. All 42 jurisdictions in the Bear River Region were invited to participate in the planning process, as well as any interested special service districts; none of which notified us of their desire to participate. Those communities that were not able to attend working group meetings participated in other ways such as filling out surveys or through personal communications such as telephone or e-mail.

How The Plan Was Produced and Project Staff

Professional planning staff at Bear River Association of Governments (BRAG) was responsible for coordinating the planning process and producing this document.

Zac Covington, Sr. Regional Planner with BRAG, served as the primary contact with the State during the update process. He worked with project contacts, worked with all county Emergency Managers to form working groups and schedule meetings, oversaw the plan update process, the document, plan adoption, working with elected officials and community staff, and other related tasks. Landon Profaizer, Regional Planner at BRAG, was responsible for GIS analyses and processes/mapping, provided critical input on potential loss methodology, wrote several sections of the plan, helped formulate the planning process, and created the template for this document. Planning Interns Stephanie Tomlin, Bryan Wilson, and Zach Maughan provided valuable assistance with meetings, surveys, spreadsheet management, data entry/calculations, survey administration and processing, and other duties as needed.

The update process was overseen by BRAG's fifteen-member Governing Board who served as the Hazard Mitigation Steering Committee (see membership lists at the end of this section). In

Table 2: 2015 PDMP Meetings

REGIONAL AND COUNTY-WIDE MEETINGS - BRAG 2015 PDMP UPDATE			
Meeting	**Date**	**Location**	**Invitees**
Regional Kick-off Mtg.	6/18/14	Cache County Sheriff's Office, Logan	Elected officials, staff, state and federal agencies, transit providers, emergency managers, planners, chambers of commerce,
Rich County Risk Assessment Mtg.	8/26/14	Garden City Offices	Rich County Working Group
Box Elder County Risk Assessment Mtg.	9/18/14	Tremonton City Offices	Box Elder County Working Group
Cache County Risk Assessment Mtg.	10/7/14	Cache County Sheriff's Office, Logan	Cache County Working Group
Box Elder County Migitation Strategies Mtg.	12/17/14	Box Elder County Sheriff's Complex, Brigham City	Box Elder County Working Group
Cache County Mitigation Strategies Mtg.	12/17/14	Riverwoods Conference Center, Logan	Cache County Working Group
Rich County Mitigation Strategies Mtg.	12/17/14	Bear Lake Pizza, Garden City	Rich County Working Group
Regional Pre-Adoption Meeting	5/28/15	Cache County Sheriff's Office, Logan	Elected officials, staff, state and federal agencies, transit providers, emergency managers, planners, chambers of commerce,
LOCAL COMMUNITY AND OTHER MEETINGS - BRAG 2015 PDMP UPDATE			
Meeting	**Date**	**Location**	**Attendees**
Portage General Plan Update Mtg.	1/7/15	Portage Town Offices	Portage Planning and Zoning Commission and BRAG Staff
Bear River Mitigation Strategies Mtg.	4/15/15	Bear River Town Offices	Mayor and BRAG Staff
Cache County Mitigation Strategies Mtg.	4/9/15	Cache County Sheriff's Office, Logan	Cache Emergency Manager and BRAG Staff
Wellsville Mitigation Strategies Mtg.	4/22/15	Wellsville City Offices	Wellsville City Manager and BRAG Staff
Richmond Risk Assessment Mtg.	10/20/14	BRAG Offices	Richmond City Manager and BRAG Staff
Box Elder County Mayors Association Mtg.	4/15/15	Honeyville Town Offices	Mayors for Honeyville, Fielding, Elwood, Brigham City, Bear River City, Tremonton, Deweyville, Association Secretary, and BRAG Staff
Rich County Commission Mtg.	10/1/14	Rich County Commission Chambers, Randolph	Rich County Commissioners, Bear Lake Regional Commission Executive Director, BRAG Staff, County Clerk, public/others.
Portage Mitigation Strategies Mtg.	4/30/15	Portage Town Offices	City Council Member and BRAG Staff
Laketown Mitigation Strategies Mtg.	4/28/15	Laketown Town Offices	Town Clerk and BRAG Staff
Randolph Mitigation Strategies Mtg.	4/28/15	Randolph Town Offices	Mayor, Town Clerk, and BRAG Staff
Honeyville Mitigation Strategies Mtg.	4/27/15	BRAG Offices	Mayor and BRAG Staff
Brigham City Mitigation Strategies Mtg.	5/12/15	Brigham City Offices	Mayor, City Adminstrator, Emergency Manager, and BRAG Staff
Snowville Mitigation Strategies Mtg.	5/11/15	Snowville Town Offices	Town Clerk and BRAG Staff
North Logan Mitigation Strategies Mtg.	5/13/15	North Logan City Offices	City Planner and BRAG Staff
Nibley Mitigation Strategies Mtg.	5/11/15	Nibley City Offices	City Manager, Public Works Director, and BRAG Staff

* Please see Appendix I for detailed agenda's and attendance lists.

addition, County working groups were created to provide guidance, input, and technical assistance throughout the planning process.

These teams were primarily comprised of emergency management personnel, public works staff, county and city/town planners, federal and state agencies, citizens, and others representing jurisdictions in the Bear River Region.

Meetings Summary

Below is a table showing all of the regional and county-wide meetings for this plan update, as well as local risk assessment and mitigation meetings:

Planning Meetings and Public Outreach

A regional Kick-off meeting was held on June 18, 2014. This meeting was intended to introduce everyone to the planning process, provide a project timetable, explain requirements for the plan, and to outline responsibilities for attendees, elected officials, emergency management staff, state and federal agencies, and others.

Those attending were chosen because of their past and present involvement in emergency and City/County emergency and general planning and/or management.

Newspaper articles were published by several regional newspapers, which described the planning process and gave contact information for BRAG staff. These newspapers included the Herald Journal, Box Elder News Journal, The Leader–Garland Times, The Uinta County Herald, and The News Examiner in the Bear Lake area. The first notification involved a regional public service announcement to inform people of the planning process and how to become involved. See **Appendix F** for newspaper announcements.

Letters and e-mails were also sent to each jurisdiction in the region, notifying them of the plan update process and inviting them to participate.

The next step in the planning process was to identify individuals to serve on county-wide working groups. County working groups helped determine where hazard risks were identified (in addition to current GIS data), gave input on existing critical facilities and infrastructure, explored mitigation strategies, and determined issues and needs to be addressed by this plan update (see attendance lists in **Appendix I** for dates, locations, and attendance for regional and county-wide meetings). Mayors, Emergency Managers, public works, State and Federal government agencies, local Chambers of Commerce, planners, and other interested citizens were invited to be a member of the working group for each County. The public, through public service announcements, were also invited to participate.

The first county working group meetings were dedicated to risk assessment. Attendees discussed known hazards in their county or municipality, severity of the hazards, history of past hazard events, hazard mapping details, and resources of local knowledge regarding the hazards. In-house Geographic Information Systems (GIS) mapping was utilized by BRAG staff for creating maps of known natural hazards, critical facilities, and local infrastructure. Surveys were also passed out to attendees to fill out during the meeting. For those not able to attend, surveys were mailed to each jurisdiction. Included were questions regarding current know natural hazards, previous disaster events, National Flood Insurance Program participation, and other questions related to risk assessment.

It was important that jurisdictions were encouraged to help lead the process for writing the plan, which they would be adopting and implementing, as much as possible. The public and other organizations had ample opportunity to be more involved as desired through newspaper announcements, and word of mouth. As always, while the newspapers reach the vast majority of organizations and the general public in the Bear River Region, it may be advantageous to reach out to others more directly during the next plan update. Other organizations could be invited to be more involved in the next update process are special service districts (including school districts and conservation districts), canal and utility companies, the Utah Department of Transportation (UDOT), Utah Transit Authority,

and others.

After hazard types and locations were determined for each jurisdiction, county mitigation strategies meetings were held. Six natural hazards specialists gave presentations on the most probably future hazard events in the region, including earthquake, landslide, flood, wildfire, and extreme weather. These specialists shared local and regional examples of destructive natural hazard events, and gave recommendations on what types of mitigation strategies would be appropriate for those particular hazards. Attendees were also provided with FEMA's Mitigation Ideas booklet, lists of mitigation strategies from 2009 as a reference for strategy updates, and a mitigation strategies survey. This survey provided an opportunity for communities to document which strategies they wanted to include in the plan.

The final meeting was a regional Draft Plan Presentation and Pre-Adoption Meeting held on Thursday, May 28th in Logan, Utah. At this meeting, the draft plan was presented, and adoption of the plan was discussed. A public comment period began on June 1, 2015 ending on July 1st, and was announced in local newspapers region-wide.

A summary of plan findings was also presented to the BRAG Governing Board on Wednesday, May 27, 2015.

Draft Review

After the draft plan was completed and presented at a regional pre-adoption meeting, a link for the plan was placed on the BRAG website at www.brag.utah.gov. A digital copy was also sent to the Utah Division of Emergency Management (Utah DEM) with a completed crosswalk for a pre-draft review. At the same time, public notices were published in local newspapers announcing a 30-day public comment period and the plan's location on the BRAG website. Communities and working group members were also sent letters notifying them of the comment period and location of the draft plan online.

After all the necessary changes were made to the draft plan, and after the public comment period, the plan was sent to FEMA for review. After FEMA revisions were made, those sections of the plan that were updated were sent back to FEMA for final approval. Copies of the plan were then sent to each community and County in the region, with an example promulgation form. Copies of signed promulgation forms from each participating jurisdiction in the region were then sent to Utah DEM, and, in turn, sent to FEMA.

Hazard Identification

Hazards were identified and evaluated for inclusion in this plan based on historical review of past events, synthesis of existing reports, data and hazard mapping analysis, and input from local level emergency management personnel, planners, and other community officials. Consideration for inclusion was based on the likelihood of a hazard's occurrence, location of the occurrence and the potential impact of the event in terms of its effect on human life and property (See Table 3 below).

This list on the left side of the table includes those natural hazards that were analyzed utilizing Geographic Information Systems (GIS).

Table 3: Natural Hazards in the Bear River Region

NATURAL HAZARDS IN THE BEAR RIVER REGION	
Natural Hazards Analyzed Utilizing GIS (GIS Data Available)	**Other Natural Hazards Included in the Plan**
Dam Failure	**Avalanche**
Faults	**Tornado**
Wildfire	**Tsunami**
Flood	**Volcanic**
Liquefaction	**Radon**
Landslide	**Severe Weather**
Slope	**Drought**
Poorly Drained Soils	**Agricultural**

However, there are several other hazards that were discussed during the planning process in less detail due to a lack of data or a lack of historical evidence showing substantial risk to the jurisdictions in the region. Some hazards were also not discussed in detail in this plan because they are not natural hazards, which are what this plan mainly focuses on, with the understanding that those non-natural hazards should still be planned for by jurisdictions. The previous table is a comprehensive list of all the hazards discussed with local stakeholders throughout this process, including those that were analyzed using GIS.

Summary of Risk Assessment Methodology

(See **Appendix C** for more detailed information)

Assessing Hazard Impacts

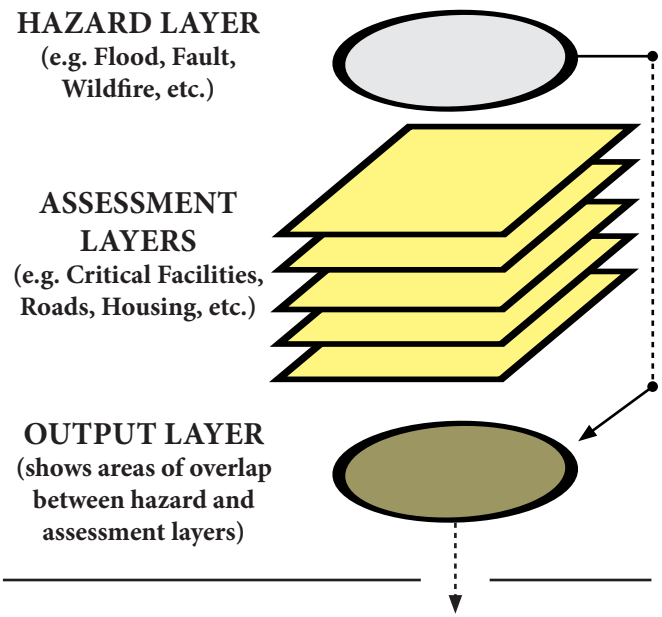
HAZARD LAYERS INCLUDED IN ANALYSIS	
Dam Failure	Faults
FEMA Flood Zone	Landslides
Liquefaction	Poorly Drained Soils*
Steep Slopes**	Wildfire

ASSESSMENT LAYER CATEGORIES	
Agriculture	Critical Facilities
Environment/Recreation	Infrastructure
Population	
See Appendix G for a complete list of risk assessment layers and data sources used in the analysis.	

The risk assessment analysis for this plan was completed using Geographic Information Systems (GIS) software developed by Environmental System Research Institute (ESRI). Spatial layers were obtained from a number of sources throughout the planning process that include the Utah Automated Geographic Reference Center (AGRC), subject matter experts at workshops or meetings, and various local municipal or county planners or technical specialists. Once all the necessary hazard and assessment layers were obtained, ArcGIS Modelbuilder was used to organize and process the necessary spatial tools to identify resources that may be impacted by future hazard events.

The first step in the modelling process includes the acquisition and preparation of all available hazard layers. Once hazard layers are identified and organized by county, assessment layers are organized by category and added to the model to identify areas of overlap with each of the hazard layers. When the model is complete and processed, the resulting layers reveal all potential spatial or geographic threats to persons, property, or resources in the entire region that were included in the analysis.

SAMPLE MODEL FOR ASSESSING THE



Using the area (acres) or distance (miles) of impacted assessment layers, loss estimates were generated to identify the potential losses to life, property, or resources in the event of a natural hazard event.

After all the output layers are generated, and all layers and features affected by hazards are identified, everything is then clipped to each jurisdiction in the region, and loss estimate tables are generated using the area or distance measurements of affected features for each community.

Estimating Losses From Natural Hazards

With the output layers organized by community, the planning team uses layer information, along with other data sources to develop risk and value/loss tables for each of the five assessment layer categories that include:

- Population
- Critical Facilities
- Infrastructure
- Environmental/Recreational
- Agriculture

Population

The population table includes risk to people, as well as value and loss estimates for commercial and residential structures. In order to identify potentially impacted structures, Assessor/GIS tables are filtered to extract Residential vs. Commercial parcels in the region. Structures are then assessed for their overlap or intersection with potential hazards through the modelling process previously described. Following this step, BRAG then used the land and structure Current Market Values associated with the Assessor file to assign loss estimates to structures threatened by hazards. BRAG also developed a Potential Revenue Loss column to identify economic impacts to businesses in the event of a natural hazard. These figures are based on average sales, receipts, or value of shipments of firms with or without paid employees per firm ($688,717 per firm). This information is derived from US Census Bureau and surveys of local/regional business owners.

With residential structures identified from the modelling process, BRAG then assigned population values to all threatened homes. These figures were derived from the 2013 American Community Survey using the average persons per household density estimate that varied slightly by county.

Critical Facilities

Critical facilities are identified from multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input. Hazard layers are overlaid onto all critical facilities layers in the modelling process to show spatial intersection or overlap, and are then summarized in the associated community risk assessment table. Features assessed for hazard risk in this category include:

- Emergency Services/Law Enforcement
- Schools/Public Facilities
- Health Care Facilities
- Places of Worship
- Infrastructure (Bridges, Broadband Anchors, Dams)

Infrastructure

This category includes layers from a combination of local, state, and private entities. Infrastructure layers are first overlaid by hazard layers in the risk assessment model. The overlapping areas are then clipped out and a distance measurement is calculated for all the affected portions of linear infrastructure. Once the affected infrastructure sections are summarized, cost estimates for repair or replacement are then applied to assess the economic impact of each hazard type. Cost estimates are from a variety of sources including prior planning documents or studies, utility providers, and county public works personnel. Features assessed in the infrastructure category include:

- Railroad Lines
- Natural Gas Lines
- Electrical Power Lines
- Roads
- Canals

Environmental/Recreational

This category includes several environmental and recreational layers from multiple data sources including: Utah AGRC, US Fish and Wildlife Service, US Forest Service, US Geological Survey, Utah Division of Water Resources, and public and

community leader input.

All layers were loaded in the risk assessment model and overlaid by hazards. With areas at risk identified, BRAG calculated the area or length of impacted features and summarized the results in the community risk assessment table. Features included in the Environmental/Recreational category are:

Environmental

- Wetlands
- Riparian Areas
- Lakes
- Streams

Recreational

- Parks
- Trails
- Outdoor Amenities

Agriculture

The final risk assessment category includes features associated with agricultural land and/or the historic and cultural resources associated with the history of farming in the region. Data sources for agricultural layers include: Utah Division of Water Resources, Natural Resource Conservation Service (SSURGO), Utah AGRC, and BRAG.

All layers were loaded in the risk assessment model and overlaid by hazards. The model identified areas of land either under current agricultural production or with soils that are assessed by NRCS as Prime Agricultural Land, or Land of Statewide Agricultural Importance that are potentially threatened by hazards. BRAG calculated the area and number of affected features and summarized the results in the community risk assessment table. Features included in the Agriculture category include:

Table 4: Potential Loss Categories

BEAR RIVER REGION PDMP POTENTIAL LOSS CATEGORIES					
RESIDENTS AND PROPERTY	Residents at Risk	Residential Units at Risk		Commercial Units at Risk	
CRITICAL FACILITIES	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
INFRASTRUCTURE	Railroad Lines	Natural Gas Lines	Electrical Power lines	Roads	Canals
AGRICULTURAL AMENITIES	Agriculture Production	Farm Land	Grazing	Century Farms	Historic Barns
ENVIRONMENTAL AND RECREATIONAL AMENITIES	Wetland/ riparian	Lakes	Streams	Parks	Trails/Amenities

- Agriculture Production (producing lands)
- Farmland (soils suitable for agriculture)
- Grazing Lands
- Century Farms
- Historic Barns

Incorporation of Existing Plans, Studies, Reports, and Technical Information

While there have been many documents produced locally and regional in regards to hazards and reducing loss of life and property, most are emergency response and/or management, and do not specifically apply to pre-disaster mitigation. Federal, State, and local government documents have been written for many of the jurisdictions in the region. FEMA and the Utah Division of Emergency Management have both produced

some excellent documents which can be used as a resource for natural hazards planning and pre-disaster mitigation. Many local governments address natural hazards on some level in their General Plan or in local land use ordinances. Some of the more recent documents incorporated as part of the planning process and used for general background information are as follows:

- State of Utah Division of Emergency Management. State of Utah Hazard Mitigation Plan, 2014
- Utah Governor's Office of Management and Budget. Utah 2012 Baseline Report
- US Army Corps of Engineers, Sacramento District, Flood Hazard Identification Study for the Bear River District, 2003
- Utah Geological Survey, Guidelines for Evaluating Surface-Fault Rupture Hazards in Utah, 2003
- Utah Natural Hazards Handbook, 2008
- Floodplain Management in Utah; Quick Guide, 2003
- Southeastern Utah Association of Local Governments. Natural Hazards: Pre-Disaster Mitigation Plan for the Southeastern Region of Utah, 2013
- Box Elder County. Hansel Valley floodplain resident letters, maps, and photos, 2014
- FEMA. G 318 Local Mitigation Planning Workshop Student Manual. 2014.
- Public Safety Canada. All Hazards Risk Assessment Methodology Guidelines, 2012 - 2013.
- State of Utah, Division of Forestry, Fire and State Lands. Catastrophic Wildfire Reduction Strategy. 2012/2013
- Utah Floodplain and Stormwater Management Association. Floods: What You Should Know When Living in Utah, 2013.
- FEMA. Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards, 2013.
- Envision Utah. Envision Cache Valley, 2009.
- Envision Utah. Bear Lake Valley Blueprint, 2011.

SECTION 3: REGIONAL SETTING, BACKGROUND INFORMATION, & DEMOGRAPHIC SUMMARY

PHYSIOGRAPHIC BACKGROUND

Utah's three most northern counties of Box Elder, Cache and Rich comprise the Bear River Region. The region is spread over 7,900 square miles and borders three states; Nevada, Idaho, and Wyoming. Several important regional connections exist between all three counties and the bordering Idaho counties (Franklin, Oneida, and Bear Lake) to the north. Shared geographic, geological, natural, and social-cultural connections are important when considering natural hazards, pre-disaster mitigation, and emergency response and communications planning. Efforts should be coordinated between counties as much as possible to protect the public from natural hazard risks.

Box Elder County comprises 5,594 square miles and is bordered on the east by the Wellsville Mountains, Cache County, and Weber County. The Great Salt Lake and the salt flats can be found extending into the county from the south end. The county borders Nevada to the west and Idaho to the north. Several small ranching communities also occupy this county. The western geography is mainly rolling ranch land and small rural communities, while the eastern side connects to the populated Wasatch Front. The largest fresh water feature is the Bear River that flows from Cache County, out of Cutler Dam, and eventually deposits its waters into the Great Salt Lake. Fifty-five to 60 percent of the Great Salt Lake and its wetlands are found within Box Elder County, and the lake itself covers 8-20 percent of the county, depending on yearly precipitation totals (Box Elder County Comprehensive Wetlands Management Plan, 1999).

Cache County covers approximately 1,174 square miles and is bordered by the Wellsville Mountains on the west and the Bear River Range on the east. Approximately 239,000 acres are cropland and pasture land, 280,000 acres are range and woodland, and nearly 230,000 acres are part of the Cache National Forest (Cache County Resource Assessment, 2011). The northern edge of the county connects to Franklin County, Idaho, and both counties are traditionally termed "Cache Valley." Prominent streams include the Little Bear, Blacksmith Fork, and the Logan Rivers to the south, and the Bear and Cub Rivers in the north. The western, low lying portion of county is composed of the Cutler Marsh. The 10,000 square acre wetland area signifies the confluence of the county's southern and eastern rivers and streams with the Bear River from the north prior to its passage through Cutler Dam. Porcupine, Cutler, Newton and Hyrum Reservoirs are all irrigation-

based reservoirs in the county. The "bench" is an elongated plateau that surrounds the valley; formed by fluctuating shorelines of ancient Lake Bonneville.

Rich County comprises 1,022 square miles and is bordered on the west and south by the Bear River and Monte Cristo Ranges and on the east by the Crawford Mountain Range and the rolling desert highlands of southwestern Wyoming. To the north are the uplands and the mountain ranges of southeastern Idaho. Bear Lake is the largest water body in the county that extends 20 miles in length and 8 miles in width. Forty-four percent of Rich County is administered by federal and state agencies.

Climate

Elevations in the region vary from 4,200 to 9,979 feet, which is the elevation of the region's highest peak, Naomi Peak in Cache County. Annual precipitation ranges from 9 inches to over 40 inches. The high mountain valleys experience long cold winters and short cool summers. The Bear River Region experiences everything from rainstorms, snow, sleet, hail, high winds, and cold temperatures, to hot summer days and drought. During winter months, valley's experience fog and colder temperatures in low elevations and regular winds and increasing snow pack at higher elevations. During the summer months, temperatures can remain above 100° F for weeks, and drought can be problematic for farmers and ranchers.

Rich County has some of the most severe winters in the state. An early settler, J. Golden Kimball, described the climate as "nine months of winter and three months of late fall." Woodruff is one of the coldest towns in the state, with their lowest yearly temperature of -50° F in 1899.

Geology

The region is home to the Wellsville Mountain Range and the Bear River Range. Notable physiographic features of the region include: the Crawford Mountain, Bear Lake Plateau, Goose Creek/Raft River Mountains, Curlew Valley, Hansel Mountains-Blue Springs Hills, Great Salt Lake Desert, Lakeside Section and the Clarkston Mountain/Junction Hills (Stokes, 1988).

The Wellsville Range is east of Brigham City and is known for its long, upward-faulted ridge of Precambrian metamorphic rocks covered by Paleozoic aged sedimentary rocks.

The Paleozoic section of the rock sequence is quite consistent throughout this area with sandstone on bottom, shale, and finally limestone or dolomite. Most of the rocks are of marine or near shore deposits from the ancient Lake Bonneville. The Wasatch Fault is evident in the western edge of the Wellsville Mountain Range with the eastern portion lifted thousands of feet than the western edge. The Eastern portion is comprised of mainly Pennsylvanian and Permian aged rocks. Cache Valley is a dropped portion between the East Cache Fault and the Bear River Range. The Cache Valley was once an arm of Lake Bonneville. Logan Canyon is made up of Paleozoic ant Tertiary rocks with the same sequence as mentioned above. The Bear River Range is situated on the east of the western extent of the Middle Rocky Mountain Physiographic Province. The Overthrust Belt Geologic Province is what uplifted these mountains about 50 million years ago. The Intermountain Seismic Belt is a result of the Overthrust Belt. "The Intermountain Seismic Belt forms a boundary between the Basin and Range and the Middle Rocky Mountain Physiographic provinces" (Mabey, 1999). The older Paleozoic and Mesozoic rocks are visible above the younger Tertiary and Quaternary aged sedimentary rocks because of the many visible faults in this zone. One can see these geological formations from the Bear River Range to the east are part of the Great Basin Physiographic province, which consists of mainly Quaternary age surface deposits such as alluvium, terrace deposits, sand dunes, and lake bed sediments.

Rich County is home to portions of both the Bear Lake and Bear River Valleys. Bear Lake Valley is considered to be an east tilted half graben, with faults on either side of the valley (Covington, 2008).

The soil morphology in this region is characterized by deep to very deep well drained

soils. Down cutting from the Bear River and its tributaries have resulted in massive erosion. Soils on old lake bottoms in the middle of Cache and Salt Lake valleys are nearly level, moderately well to poorly drained, very deep, and derived from lacustrine and alluvial deposits (Department of Landscape Architecture and Environmental Planning USU, 2001).

Environmental and Recreational Amenities

The Bear River Region has much to offer as far as environmental and recreational amenities. Located in Northern Utah, many of the jurisdictions within the three counties are settled around the Rocky Mountain Region. Agriculture and grazing play a large role in Rich, Cache, and Box Elder counties.

In the region, there are many public and state parks that offer a variety of environmental and recreational amenities. There are various opportunities for recreation that are found in this region: reservoirs, fishing, hiking trails, camping and picnic areas, hunting, wildlife watching, etc.

Modern society places increasing emphasis on the availability of good quality recreational amenities, which are seen as beneficial to the physical and mental health and quality of life of the population. The provision of recreational facilities has also been shown to reduce crime and vandalism, positively effect community economics, and contribute to the development of stable communities.

Within the Region there are many reservoirs that provide outdoor recreation. Notable is Bear Lake State Park in Rich County. It is the largest freshwater lake in the region, spanning 8 miles wide and 20 miles long. There are many summer resorts situated around its shores. Boating, water sports, and fishing are a few of many activities enjoyed at this lake. Hyrum State Park as well as Willard Bay State Park offer many recreational activities. A majority of the reservoirs in the region also offer day use picnic areas as well as some campgrounds and facilities.

Several of the most notable environmental amenities in the region are the Bear River Migratory Bird Refuge just north of Willard Bay. In Cache County in the blacksmith fork canyon there is a wildlife preserve area for elk at Hardware Ranch. Cutler marsh in Cache Valley is also a large contributor to wildlife habitats and unique Rocky Mountain ecosystems. These amenities as well as others found in the region provide wonderful opportunities for wildlife viewing.

Along the Logan Canyon Scenic Byway in Cache County, there are countless outdoor recreational opportunities. Popular hiking trails include the Wind Caves, the Logan River Trail, and many others. There are also 3 fishing dams, many rock climbing areas,13 campgrounds, and may day use areas along the way.

Fishing is also a popular past-time, with the Logan River located just east of Logan, and the Blacksmith Fork River located east of Hyrum, which are known for their year round fly fishing for trout and whitefish. Bear Lake also has five indigenous fish species, including the Bear Lake strain of the Bonneville Cutthroat Trout and Bonneville Cisco. There are also large Mackinaw Salmon populations in the lake.

REGIONAL DEMOGRAPHIC SUMMARY

Population Growth and Community Development

The total population for the Bear River Region (Box Elder, Cache, and Rich Counties combined) is approximately 169,991. The regions population grew by 9% between 2009 to 2013 (US Census Bureau, 2013).

Box Elder County had an estimated growth rate of 1.8% for the period of 2009 to 2013 (1,358 additional residents for a total of 50,864 people in 2013). Elwood city had the largest percent of growth in the county population overall with a 16% increase, adding 145 residents. Garland City grew at a rate of 15% adding 316 new residents to the county. Perry City also had an increase of 15% and makes up the county's largest population growth with 581 new residents. The rest of the municipalities grew at a rate under 15%. (US Census Bureau, 2013).

Many of the jurisdictions in Box Elder County may continue to experience high future growth rates, due to their proximity to Weber County.

This portion of the Wasatch Front affords views of the Great Salt Lake, prominent mountain ranges, and parallels Interstate 15. As development from North Ogden and Pleasant View continues to move to the north, southern Box Elder County communities will most likely be utilized by nearby communities to provide housing for those who work along the Wasatch Front.

Cache County grew at an estimated rate of 1.4% from 2009 to 2013 (5,099 people added for a total of 116,909 people in 2013). Astonishingly, Nibley City had a 28% growth in the same period with 1,333 new people, which was the highest growth percentage in the region. North Logan City grew at a rate of 14%, while River Heights grew 8%. All other municipalities in the county grew at a rate lower than 8%. (US Census Bureau Estimates, 2013). One other factor to consider regarding population growth in Cache County is the presence of Utah State University, which currently has an enrolment of 27,662 part and full-time students, with around 13,383 attending school on the Logan, Utah Campus (USU, 2014). Many of these students are not technically considered residents of Cache County or Logan City, since tax and other information most likely remains in their home town.

Cache County is also the only county in the Bear River Region with a Metropolitan Planning Organization (MPO). These MPO's are required for any metropolitan area with more than 50,000 people, in order for jurisdictions to be eligible for federal assistance. The CMPO is responsible for transportation planning in the communities of Smithfield, Hyde Park, North Logan, Logan, River Heights, Providence, Millville, and parts of Nibley and the unincorporated areas of the county.

Rich County had the largest growth between the three counties at an estimated average growth rate of 5.9% from 2009 to 2013, adding 160 residents. Considering the amount of second homes that came to the county during that time, this number seems low. Rich County is home to Bear Lake, a large freshwater body which attracts visitors and cabin/second home development along the western edge of the lake. Laketown had the most growth at 36%, adding 68 residents, and Garden City grew 23% with 108 residents. Woodruff and Randolph both were reported as having slight population loss (US Census Bureau, 2013).

Considerations for Rich County population growth in the future should include the impact of cabin and second home development, and the possibility of homes becoming permanent residences. The US Census Bureau requires 9 months of residency for people to be considered residents of a jurisdiction. Many of the homes in the Bear Lake area are only used for weeks or several months in the summer. Second home and seasonal home ownership in Rich County is estimated to be around 75%. Infrastructure needs and services are still required by the municipalities or by the county for these residences.

Community and Economic Development Profile

Box Elder County

Box Elder County experienced substantial economic issues in for several years following the Great Recession in 2008. This included job loss, business closures, and other issues. The county was considered an economically distressed area by the US Economic Development Administration (EDA) based on per-capita income levels. However, over the past several years the county has slowly recovered. According to the Department of Workforce Services, 2013 ended well with job growth at 4.5%. Unemployment was at 5.1% at the end of 2013, but has been steadily declining. with new jobs totalling 723. Mining grew most significantly by 45.9% from 2012 to 2013. Manufacturing still makes up the majority of the non-farm employment industry, with trade, transportation, and industry coming in second (Utah Department of Workforce Services, 2015). Agricultural production is still a key economic driver in Box Elder County.

Box Elder County per capita personal income in 2013 was $32,461, compared to the national per capita personal income for the same year of 44,765 (BRAG CEDS, 2013). Residents below poverty line accounted for 8.8% of the population in the county in 2013 (US Census Bureau, 2013). As of March, 2015, unemployment in the county was only 3.6%, compared with the national unemployment rate of 5.5% for the same month

(Utah Department of Workforce Services, 2015 and US Bureau of Labor Statistics, 2015).

Most of the residential development in Box Elder County occurred in Perry, Brigham City, and Tremonton. All other communities experienced growth except for Mantua, Fielding, and Snowville. In the unincorporated areas of the county such as the south Willard area, development also increased, which may lead to increased need for sewer and other types of critical infrastructure. Industrial growth is occurring in west Brigham City, Bear River City, and Corinne. West of Corinne is an existing Agricultural Industrial Park, and the new Proctor and Gamble facility is being built west of Bear River City, with sewer and water provided by Brigham City.

Cache County

Cache County's largest employer is Utah State University at 7,000-10,000 employees, which contributes to government being the largest industry in non-farm employment in the county. Cache School District is second, with 2,000-3,000 employees. While the county's workforce has underemployment and low wage issues, the general economy has been stable, with 881 jobs created in 2012-2013. Education, Health, and Social Services was the industry with the highest number of new jobs, while the Financial Activities sector grew the most by percentage at 12%. New employment was positive but modest at 1.7%, and unemployment was at 3.6% during the same period (Utah Department of Workforce Services, 2013). Logan City has a fairly high number of residents living below the poverty level at about 28.3% in 2013 (US Census Bureau, 2013).

Cache County's per capita personal income in 2013 was $31,149. In 2013, 16.6% of the population was below the poverty line. The unemployment rate averaged only 2.7% for March of 2015 (Utah Department of Workforce Services, 2015).

New development in Cache County has increased dramatically in areas such as Nibley, Providence, North Logan, and Mendon. Logan has also grown substantially over the past few years, particularly on the west side of the city. Commercial growth has also been steady with new businesses near 1400 North in Logan.

Rich County

Rich County has the lowest unemployment rate in the region at 3.5%, which is steadily declining. Government is the largest employment sector, while Leisure and Hospitality is close behind. The Professional and Business Services sector grew the most by percentage at 136.9% in 2012, adding 27 new jobs to the economy. Leisure and Hospitality grew by 29 jobs at 22.3%. Agriculture, specifically cattle ranching, is a substantial economic staple in Rich County. While the local school district and other types of government jobs account for the largest employers in the area, the next largest employer is Deseret Land and Livestock, owned by The Church of Jesus Christ of Latter-day Saints, employs around 20-50 people (Utah Department. of Workforce Services, 2013).

Rich County has many economic opportunities in the area of recreation and tourism sector due to Bear Lake, a large freshwater lake on the Utah/Idaho border referred to as The Caribbean of the Rockies. However, incomes based on seasonal tourism in the region have not provided a stable economic situation for residents. Income in the winter months is difficult to attain when part-time residents leave the cold winters of the area. Of all the residences in Rich County, around 75% of all homes are seasonally occupied.

Mining and manufacturing tends to give higher wages in the county. Rich county wages increased by 20% between 2009 and 2013, and per capita personal income in Rich County for 2013 was 38,030. About 7% of county residents were below the poverty line in 2013 (BRAG CEDS, 2015). Unemployment in March of 2015 was at 3% (Utah Department of Workforce Services, 2015).

Residential development in Rich County has mainly been in the form of second homes and seasonal cabins. Garden City is the only municipality that has seen recent growth in the county. Several other large developments are being planned in the area, and could prove to increase

Table 5: NFIP Participation

National Flood Insurance Program (NFIP) Participation and Flood Data/Status						
	Community Name	**CID**	**Date of Entry**	**Current Effective Map**	**Online FIRM?**	**GIS Data Available****
BOX ELDER COUNTY	Bear River, City of	490194#	9/29/2010	9/29/2010	Y	Y
	Box Elder County *	490005#	09/01/87 (R)	09/01/87 (L)	Y	Y
	Brigham City, City of	490006#	08/17/81 (R)	8/17/1981	Y	Y
	Corinne, City of	490197#	07/15/80 (R)	07/15/80 (M)	Y	Y
	Deweyville	***NOT PARTICIPATING***				
	Elwood	***NOT PARTICIPATING***				
	Fielding	***NOT PARTICIPATING***				
	Garland, City of	490207#	9/29/2010	9/30/2011	Y	Y
	Honeyville, City of	490008#	07/29/80 (R)	07/29/80 (M)	Y	Y
	Howell	***NOT PARTICIPATING***				
	Mantua, Town of	490009#	07/08/80 (R)	07/08/80 (M)	Y	Y
	Perry City, City of	490010#	05/20/80 (R)	05/20/80 (M)	Y	Y
	Plymouth	***NOT PARTICIPATING***				
	Portage	***NOT PARTICIPATING***				
	Snowville	***NOT PARTICIPATING***				
	Tremonton, City of	490220#	9/29/2010	6/24/2011	Y	Y
	Willard, City of	490011	07/01/87 (R)	07/01/87 (L)	Y	Y
CACHE COUNTY	*Amalga*	***NOT PARTICIPATING***				
	Cache County*	490012#	02/01/87 (R)	02/01/87 (L)	Y	Y
	Clarkston, Town of	490014#	08/19/80 (R)	08/19/80 (M)	Y	Y
	Cornish	***NOT PARTICIPATING***				
	Hyde Park, Town of	490016#	07/29/80 (R)	07/29/80 (M)	Y	Y
	Hyrum, City of	490017#	04/08/80 (R)	04/08/80 (M)	Y	Y
	Lewiston, City of	490018#	07/29/80 (R)	07/29/80 (M)	Y	Y
	Logan, City of	490019#	09/28/84 (R)	9/28/1984	Y	Y
	Mendon, City of	490020 #	07/22/80 (R)	07/22/80 (M)	Y	Y
	Millville, Town of	490021	03/13/85 (E)	10/22/1976	Y	N
	Newton, Town of	490022#	07/22/80 (R)	07/22/80 (M)	Y	Y
	Nibley, Town of	490023	08/05/86 (R)	08/05/86 (M)	Y	N
	North Logan, City of	490024#	03/18/86 (R)	03/18/86 (M)	Y	Y
	Paradise, Town of	490025#	5/24/2011	12/7/2011	Y	Y
	Providence, City of	490226	02/02/84 (R)	(NSFHA)	N	N
	Richmond, City of	490027#	08/12/80 (R)	08/12/80 (M)	Y	Y
	River Heights, City of	490240#	5/24/2011	5/24/2011	Y	Y
	Smithfield, City of	490029#	03/18/86 (R)	03/18/86 (M)	Y	Y
	Trenton	***NOT PARTICIPATING***				
	Wellsville, City of	490031#	07/29/80 (R)	07/29/80 (M)	Y	Y
RICH COUNTY	*Garden City*	***NO INFORMATION AVAILABLE***				
	Laketown, Town of	490099	07/15/85 (R)	(NSFHA)	N	N
	Randolph	***NO INFORMATION AVAILABLE***				
	Rich County	490234	2011		N	N
	Woodruff, Town of	490101#	07/22/80 (R)	07/22/80 (M)	Y	N

Source: Federal Emergency Management Agency (FEMA) National Flood Insurance Program, 2015

* Unincorporated areas only

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

(E) Emergency Program or (R) Regular Program

(NSFHA) No Special Flood Hazard Area

NFIP PARTICIPATION & BUILDING CODE REPORTS

National Flood Insurance Program Participation

The National Flood Insurance Program was created in 1968 by the Federal Emergency Management Agency (FEMA) to provide homeowners living in the 100-year floodplain an opportunity to purchase flood insurance for their home. In order for individuals to be eligible to purchase flood insurance, their community needs to be a member of the National Flood Insurance Program (NFIP). It is fairly simple to join the NFIP with help from the State Floodplain Manager. There is also limited funding for flood mitigation projects for communities that are members of the NFIP. There are 30 jurisdictions out of 42 in the Bear River Region participating in the NFIP (See Table 4 above for details).

Those communities listed in Table 4 above comply with the minimum standards required by FEMA to be considered participating jurisdictions.

Building Code Effectiveness Grading Reports (BCEGS)

The Building Code Effectiveness Grading Report was implemented in 1995 to evaluate current building codes in a particular community and to determine how well the community enforces its building codes. This program assigns each municipality a grade of one to ten, with one showing excellent commitment to building code enforcement. The concept of the Building Code Effectiveness Grading Reports is that communities with effective, well-enforced building codes should sustain less damage in the event of a natural disaster, and insurance rates can be adjusted accordingly. More information on what determines a community's score can be found at: http://www.isomitigation.com/bcegs/0000/bcegs0003.html.

Building Code Effectiveness Grading Report (BCEGS) Scores for the Bear River Region (2008)		
Jurisdiction Name	**Score**	**Date**
Box Elder County	RES 04 COM 04	2001
Brigham City	RES 03 COM 03	2001
Tremonton	RES 05 COM 05	2000
Willard	RES 05 COM 05	1998
Cache County	RES 03 COM 03	2001
Hyde Park	RES 03 COM 03	2001
Logan City	RES 03 COM 03	1999
North Logan	RES 03 COM 03	1999
Smithfield	RES 04 COM 04	2000
Garden City	RES 99 COM 07	1998

Source: ISO (Insurance Services Office), 2008.

99 is used for jurisdictions which are either unclassified or do not meet the minimum criteria of the BCEGS program. This would include departments which do not do plan review, inspections, have legally adopted codes or have declined to participate in the ISO program.

Table 6: BCEGS Scores - Bear River Region

SECTION 4: REGIONAL RISK ASSESSMENT & MITIGATION STRATEGIES

REGIONAL NATURAL HAZARDS

- **Drought**
- **Severe Weather**
- **Agricultural Hazards**
- **Radon**
- **Problematic Soils**
- **Avalanche**
- **Tornado**
- **Tsunami**
- **Volcanic Activity**

Background

Each of the hazards listed in Table 3 are addressed at some level in this plan. However, drought, severe weather, radon, problematic soils, avalanche, tornado, tsunami, and volcanic risks are very difficult to analyze due to lack of data or the inability to predict destructive events in particular locations. All potential hazards were discussed in county working group meetings. Although geographic data is lacking, the more prevalent regional hazards, such as drought, severe weather, radon, and problematic soils were addressed in the mitigation strategies lists for the entire region. All 42 jurisdictions are susceptible on some level to those hazards and can mitigate effects from those hazards in similar ways.

However, avalanches, tornados, tsunamis, and volcanic activity are limited to smaller geographic areas, physiographic or climatic variation, or have not produced predictable or, in some cases, significant damage. For example, while tornados have caused substantial damage in various parts of Utah, there has not been any reoccurrence of events which merit a reliable prediction on where future events could occur. Communities were allowed, and encouraged, to include mitigation strategies for any and all hazards they felt required mitigation on some level.

Risk Assessment and Mitigation Strategy Surveys were sent to each chief elected official for all jurisdictions in the Bear River Region. Among other questions, the surveys requested local input on the following:

- NFIP status
- Existing natural hazards
- Natural hazard events since November 2009
- List of maps, documents, or plans related to natural hazards planning
- Current zoning and ordinances related to natural hazards
- Future developments that could be affected by natural hazards
- Mitigation strategies completed since 2009
- New mitigation strategies

(See **Appendix D** for detailed survey responses).

History of Regional Natural Hazards in the Bear River Region

Residents and communities in the Bear River Region have knowingly been effected by drought and severe weather since modern settlers came to the area in the mid-1800's. Native American's and early explorers were also well award of the variation in the climate and temperature in the area and planned accordingly. One of the most famous sayings about the weather in the Rocky Mountains is, "If you don't like the weather, just wait 5-minutes!" Long-time residents of the area have experienced the variation which exists and many residents plan accordingly.

However, for others, mitigating the effects of severe weather and drought can be difficult. Educational activities and public awareness campaigns seem to help, but can always be improved. Local communities and other organizations train for emergencies and events on a regular basis.

Other natural hazards, such as avalanche, tornado, tsunami, and volcanic activity are rare, but can be mitigated on some level. Local building codes and ordinances keep most residents and structures safe, but events can be sporadic and variable.

Agricultural hazards, as addressed in this plan, relate mostly to insect infestation. The most prevalent of these is grasshopper and cricket infestation, but bark beetles, ticks, mosquitos, and termites have also been identified by the Utah Department of Agriculture and Food as threats (2015). See **Appendix J** for the statewide cricket and grasshopper infestation map and information.

The threats of Radon have not been very well known by residents and local governments until recent years. Thanks to educational activities promoted by the Bear River Health Department and others, knowledge of Radon has become more prevalent. However, while Radon levels can be relatively high in the region, they cannot be detected for each individual home or other structure unless individual tests are done following construction (See **Appendix L** for Radon risk maps and information).

Problematic soils are prevalent in the region. Hazards can not be fully determined until a local engineering and/or geotechnical study has been performed on site. Most of the larger local communities require studies to determine risk and most, it not all, local communities require contractors to utilize the International Building Code (IBC) which helps mitigate most effects. While most city engineers and other staff are familiar with the hazards problematic soils can incur, more can be done to prevent structure damage and threats to life and property.

(See **Appendix K** for regional historic severe weather events and losses to life and property)

Regional Natural Hazard Profiles

Table 7: Drought Hazard Profile

Frequency	Frequent
Severity	Severe mostly for agricultural producers
Location	Un-irrigated areas are most impacted
Seasonal Pattern	Water supply dependent on winter snowfall. Summer is when impact is realized.
Duration	As many as 10 years
Speed of Onset	Incremental with impact increasing
Probability of Future Occurrences	High

Table 8: Agricultural Hazard Profile

Frequency	Sporadic
Severity	Severe mostly for agricultural producers and gardeners
Location	Everywhere
Seasonal Pattern	Spring & early summer
Duration	Months
Speed of Onset	Days
Probability of Future Occurrences	High

Table 9: Severe Weather

Frequency	Frequent
Severity	Severe for communities, residents, and agricultural producers
Location	Everywhere (Some areas have more inherent risk due to geographic conditions)
Seasonal Pattern	Summer severe thunderstorms/hail & wind, late spring freezing, and heavy winter storms
Duration	Days/weeks
Speed of Onset	Immediate
Probability of Future Occurrences	High

Table 10: Radon Hazard Profile

Frequency	Persistent
Severity	Potentially Severe
Location	Everywhere
Seasonal Pattern	All, higher in winter months
Duration	Always
Speed of Onset	Years for detrimental effects
Probability of Future Occurrences	High

Table 11: Problematic Soils Hazard Profile

Frequency	Always
Severity	Potentially Severe
Location	Varies
Seasonal Pattern	Spring/high soil saturation/following wildfire damage
Duration	Persistent
Speed of Onset	Varies but potentially hours or days
Probability of Future Occurrences	High

Vulnerability and Potential Losses

People have been living with knowledge of current regional natural hazards since settlers first came to the area. Cold, snowy winters, hot dry summers, and other sporadic severe weather events are a part of life in the Rocky Mountains. Over the past decades, science has provided beneficial data related to soils and hazards from various soil types.

Radon and problematic soils data has helped local communities understand risks and studies have provided critical information on how to mitigate their effects. While engineering and technical studies can provide information on what types of soils are evident in particular areas, it is difficult to give precise predictions. However, through education and updated local building and development regulations, most severe problems can be avoided.

Implications for Future Growth and Development

The urbanization of eastern Box Elder County, eastern Cache Valley, and near Bear Lake in Rich County, will put new demands on agricultural water rights. As development moves in on agricultural lands, water is often needed for new residential and commercial structures. In terms of competition for limited water resources, agricultural uses often lose out to those increasing urban demands. This problem is likely to get worse for agricultural users and can become particularly severe during drought periods.

In general, as population increases in the Bear River Region, risk to residents, infrastructure, and property will likely increase for all regional hazards. The more people that live in an area, the more people will likely exposed to potential hazards by utilizing more resources, and spreading out across the landscape. In short, as more people move into the region, more people are likely to be affected by currently existing natural hazards.

Regional Hazard Mitigation Strategies

(See following pages)

BEAR RIVER REGION - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Bear River Region	All	Protect current residents and property	County-wide emergency preparedness fair	N/A	High	2017	Counties, BRAG	Box Elder, Cache, and Rich Counties and BRAG	Minimal	BRAG, Counties, Be Ready Utah, Utah DESHS, local communities, Utah FSSL, GOPB, LEPC's, local HAM radio groups, UGS, NRCS (snow), National Weather Service, LDS Bishops Storehouse, Food Bank
Bear River Region	Severe Weather	Protect current residents and property	Public education/training including 3-5 day power outage survival emergency response (CERT), emergency shelter locations, emergency kits, backup utilities, livestock issues, and interoperable emergency communications planning.	N/A	High	2017	Counties, Utah ESHS, BRAG, Cities, FEMA	Box Elder, Cache, and Rich Counties and BRAG	$50,000	Counties, Utah ESHS, BRAG, Cities, FEMA, NOAA
Bear River Region	Agricultural	Protect current residents and property	Encourage crop diversity, weed and pest management, and coordination with local, State, and Federal agencies on agricultural land management and production.	N/A	Medium	2018	Utah Department of Agriculture and Food, USDA, USU Extension, USFS, BLM,	Box Elder, Cache, and Rich Counties	Minimal	Utah Department of Agriculture and Food, USDA, USU Extension, USFS, BLM,
Bear River Region	Agricultural	Protect current residents and property	Work with various agencies to plan for and mitigate economic losses associated with stock loss due to disease.	N/A	Medium	2018	Utah Department of Agriculture and Food, USDA, USU Extension	Box Elder, Cache, and Rich Counties	minimal	Utah Department of Agriculture and Food, USDA, USU Extension, US Food and Drug Administration, Center for Disease Contro
Bear River Region	Agricultural	Protect current residents and property	Prepare an Emergency Services Function for County Emergency Operations Plans	N/A	Medium	2017	Local	Box Elder, Cache, and Rich Counties	Minimal	Local
Bear River Region	Agricultural	Protect current residents and property	Educate residents on crop insurance program, alternative planting and CRP programs, value of agriculture, pest control, crop diversity, urban tree planting guidelines, etc	N/A	Medium	2017	State, Local, USDA	Box Elder, Cache, and Rich Counties	Minimal	State, Local, USDA
Bear River Region	Drought	Protect current residents and property	Promote water wise landscaping practices and land use ordinances.	N/A	High	2016	Counties, Municipalities, BRAG	All jurisdictions	minimal	Counties, Municipalities, BRAG, USU Extension, NRCS, Utah League of Cities and Towns, GOPB
Bear River Region	Drought	Protect current residents and property	Study feasibility of increasing current water storage capabilities.	N/A	Low	2017	Utah ESHS, BRAG	All jurisdictions	Minimal	Utah ESHS, BRAG
Bear River Region	Drought	Protect current residents and property	Encourage water conservation techniques for all land uses.	N/A	High	2018	Utah DEQ, USDA, Utah Agriculture and Food, Utah APA	All jurisdictions	minimal	Utah DEQ, USDA, Utah Agriculture and Food, Utah APA
Bear River Region	Radon	Protect current residents and property	Provide educational materials to owners of new homes and/or all residents in the local communities	N/A	High	2016	Local	All jurisdictions	Minimal	Bear River Health Department
Bear River Region	Problematic Soils	Protect current residents and property	Review and update local land use ordinances to require soils testing before new construction on suspected instable soil types.	N/A	High	2017	Local	All jurisdictions	Minimal	Utah Geological Survey, Utah APA

BEAR RIVER REGION - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Bear River Region	All	Protect future residents and property	County-wide emergency preparedness fair	N/A	High	2017	Counties, BRAG	Box Elder, Cache, and Rich Counties and BRAG	Minimal	BRAG, Counties, Be Ready Utah, Utah DESHS, local communities, Utah FSSL, GOPB, LEPC's, local HAM radio groups, UGS, NRCS (snow), National Weather Service, LDS Bishops Storehouse, Food Bank
Bear River Region	Severe Weather	Protect future residents and property	Discuss planning needs on the county and city levels to coordinate lan use regulations regarding Severe Weather events and response. This would be intended to prevent damages from extreme weather trigger events and incorporate severe weather into current response plans.	N/A	Medium	2017	Counties, Municipalities, BRAG	All jurisdictions	Minimal	Counties, Municipalities, BRAG, Utah ESHS, Army Corp., Be Ready Utah, FSSL, LEPC, NOAA, NRCS
Bear River Region	Agricultural	Protect future residents and property	Encourage crop diversity, weed and pest management, and coordination with local, State, and Federal agencies on agricultural land management and production.	N/A	Medium	2018	Utah Department of Agriculture and Food, USDA, USU Extension, USFS, BLM,	Box Elder, Cache, and Rich Counties	Minimal	Utah Department of Agriculture and Food, USDA, USU Extension, USFS, BLM,
Bear River Region	Agricultural	Protect future residents and property	Work with various agencies to plan for and mitigate economic losses associated with stock loss due to disease.	N/A	Medium	2018	Utah Department of Agriculture and Food, USDA, USU Extension	Box Elder, Cache, and Rich Counties	minimal	Utah Department of Agriculture and Food, USDA, USU Extension, US Food and Drug Administration, Center for Disease Contro
Bear River Region	Agricultural	Protect future residents and property	Educate residents on crop insurance program, alternative planting and CRP programs, value of agriculture, pest control, crop diversity, urban tree planting guidelines, etc	N/A	Medium	2017	State, Local, USDA	Box Elder, Cache, and Rich Counties	Minimal	State, Local, USDA
Bear River Region	Drought	Protect future residents and property	Discuss purchasing agricultural water rights for culinary water on a county and local leve	N/A	High	2018	County, Local	All jurisdictions	Minimal	County, Local
Bear River Region	Drought	Protect future residents and property	Study feasibility of increasing current water storage capabilities	N/A	Low	2017	Utah ESHS, BRAG	All jurisdictions	Minimal	Utah ESHS, BRAG
Bear River Region	Drought	Protect future residents and property	Encourage water conservation techniques for all land uses.	N/A	High	2018	Utah DEQ, USDA, Utah Agriculture and Food, Utah APA	All jurisdictions	minimal	Utah DEQ, USDA, Utah Agriculture and Food, Utah APA
Bear River Region	Radon	Protect future residents and property	Provide educational materials to owners of new homes and/or all residents in the local communities	N/A	High	2016	Local	All jurisdictions	Minimal	Bear River Health Department
Bear River Region	Problematic Soils	Protect future residents and property	Review and update local land use ordinances to require soils testing before new construction on suspected instable soil types.	N/A	High	2017	Local	All jurisdictions	Minimal	Utah Geological Survey, Utah APA

SECTION 5: BOX ELDER COUNTY RISK ASSESSMENT & COMMUNITY SECTIONS

History and Background of Natural Hazards in Box Elder County

Flooding

Areas in Box Elder County have experienced significant impacts related to flooding in recent recorded history. Box Elder County has several large rivers and smaller tributaries that are susceptible to flooding. The Bear River is the largest river in the county. Cutler Reservoir lies mostly in Cache County, while just across the county line in Box Elder County, there is a hydroelectric dam called Cutler Dam. The existence of this dam does provide some meaningful flood control for downstream portions of the Bear River in Box Elder County. Other major rivers are the Malad River and Box Elder Creek. A number of small intermittent streams are located in some of the canyons of the Wellsville and Wasatch Mountains. Each of these streams can pose a threat in terms of flooding.

In addition a number of canals are located in the county that under certain conditions may fail or overflow and result in flooding. Also, flooding can also take place concurrently with some landslide events, particularly sediment/mud/debris flows. Flood water is rarely clean and clear, and much of the damage from flooding can be in the form of debris.

Most flooding in Box Elder County is attributed to snow melt rates in surrounding watersheds that are in excess of the capacity of the drainage systems or unusually heavy storm events that temporarily overwhelmed drainage capacity (or a combination of the both). Some limited flooding is the result of rising groundwater levels. In terms of property damage and disruption of community life, Brigham City, along with the Willard/Perry area, has been among the communities in the county most impacted by flooding. The floods of August 1923 in Willard were some of the most destructive in the state's recorded history. A significant portion of Willard was inundated by flood water and associated mud and debris flows. Four dwellings were destroyed and two women died when their homes were demolished (see cover photos).

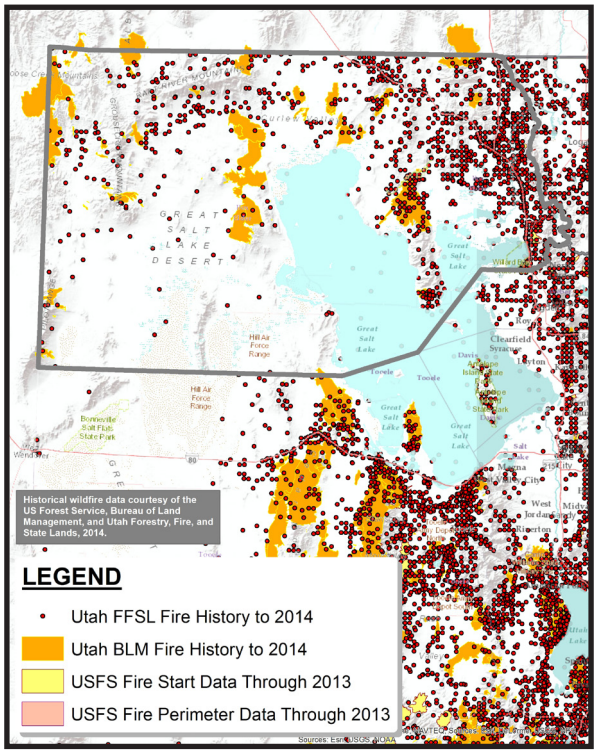
In the mid-1980's large portions of Box Elder County were negatively impacted by the rise in the level of the Great Salt Lake. A significant amount of high value wetlands and agricultural land surrounding the lake were flooded by the rise of the briny water, including the Bear River Bird Refuge. Although their immediate value was reduced by a natural dry cycle that resulted in the lake level dropping, the State of Utah installed large pumps on the lake to moderate the rise of the lake by moving the water to the west desert. These pumps can return to operation if needed.

Wildfires

The vast geographic majority of Box Elder County has minimal threat to life and property from wildfire. However, the most populated areas are at the most risk from wildfire. Much of the development in the county is at the base of the Willard and Wellsville Mountain Ranges. These steep slopes are dry and vulnerable to wildfire, which poses great risk to residents along the benches. Most of western Box Elder County consists of dry land vegetation types which are vulnerable to wildfire. While threats to life and property are not as high in these areas, grazing vegetation loss and wildlife habitat can suffer tremendously.

Major fires in Box Elder County include the "Wildcat", "Fort Ranch", "Thiokol", "Pilot Peak", "Dry Canyon", "Morris Ranch", and "West Hills" fires. In 1992 a large fire burned uncontained for over a week in the mountains above Perry City. There have also been several fires along the east slopes above Brigham City as well. In 2002 there was also a large wildfire in the Promontory area. In August, 2006, there was a wild fire near the Brigham City/Perry border that burned approximately 100 acres. The following graphic illustrates the number, general size, and general location of wildfires in Box Elder County from 1973 to 2008.

Below is a map showing historical wildfire locations in Box Elder County:



Landslides/Steep Slopes

Most of the landslide risk in Box Elder County is in Willard, Honeyville, and Perry. Unincorporated areas on the east foothills north of Brigham City and in south Willard are also in high landslide susceptibility areas. Willard and Honeyville could be substantially at risk if landslide events occurred. Most of the developed areas in these two municipalities are in what the Utah Geological Survey has designated as high landslide susceptibility areas in a 2007 data set. Floods and high water content in soils can also potentially increase damages caused by landslides, and communities should be aware of future potential risks.

Landslide events in Box Elder County have been known to damage homes, roads, and even take lives.

Debris flows associated with the 1923 flooding of Willard City were very destructive and destroyed a number of homes and buildings. Main Street Willard was covered in a thick layer of mud, rocks and debris. The force was strong enough to move large boulders.

In 1949 a five mile stretch of US 89 between South Willard and Utah Hot Springs was covered with mud, rocks and boulders.

In late May 1983 a large landslide occurred on the face of the mountain north of Willard near Facer Creek. Also in 1983-84 Three Mile Canyon near Perry City experienced a mud slide. As a result over $1 Million was spent constructing a detention basin and overflow facilities.

Recent rock falls have also occurred north of Mantua along Highway 89-91, and near Honeyville.

The Perry to south Willard area along the base of the Willard Mountains has had ongoing problems with debris flows, landslides and flash flooding. A number of debris basins have been constructed as well as other debris flow management structures. Portions of the Ogden-Brigham Canal susceptible to debris flow blockage have been placed in culverts to avoid flooding.

Earthquakes

The most populated portions of Box Elder County are located on the Intermountain Seismic Belt and the northern most segment of the Wasatch Fault. Earthquakes are common in Box Elder County, although no major earthquake resulting in significant property damage has occurred since early European settlement. Geologic evidence establishes the possibility of a major earthquake in Box Elder County.

Much of the populated corridor in Box Elder County is located near the Wasatch Fault. According to Hecker (1992), the Wasatch Fault Zone is the longest and most active normal fault in Utah. The Wasatch Fault extends from south of Malad, Idaho to western Sanpete County in Utah, much along the populated Wasatch Front. Ten distinct segments have been identified along the fault.

Based on geologic evidence of the last 6000 years, of all the studied segments of the Wasatch Fault, the Brigham City segment is the most overdue for seismic release. This segment exists along much of the populated areas of the eastern side of the county. Evidence suggests that it has been at least 3,000 years since a significant release has occurred on the Brigham City fault segment.

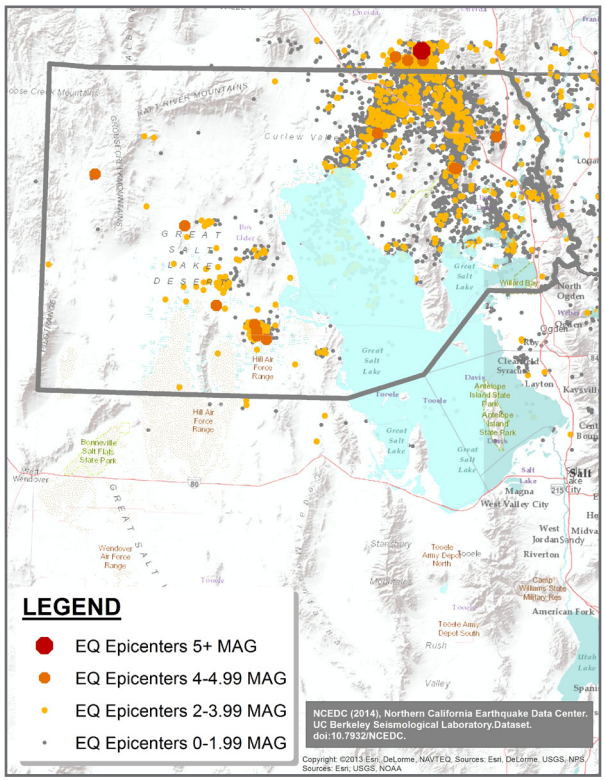
All the other studied segments of the fault indicate faulting in the last 3000 years which suggests these segments have had release of seismic energy (Hecker, 1992).

While a geological fault may not be very wide physically, damage around the fault can be detrimental. This is often referred to as the "damage zone (Susanne Janecke, personal communication, 9/25/08)." This damage zone is now thought to be much larger than recognized previously. While geologists used to recommend a general fault buffer of fifty feet on either side of the fault, they now recognize a much larger damage zone. According to the Utah Geological Survey, up thrown sides of well defined quaternary faults require planning for a 250 foot damage zone; while down thrown sides of well defined faults require planning for a 500 foot damage zone. For those faults not well defined, a general 1,000 foot damage zone should be considered (Richard Giraud, personal communication, 10/6/08; Christopher Duross, personal communication, 10/30/08; Christensen et al., 2003). Because of data inaccuracies in geologic fault data, a standard 1,000 foot damage zone was analyzed for all quaternary faults in the region.

One very important aspect of earthquake damage which is often overlooked is liquefaction. Liquefaction generally occurs when certain soil types when saturated with water can liquefy during an earthquake, moving, tilting, and destroying buildings. Whole foundations can be lifted and moved by the saturated soils. Eastern Box Elder County is largely covered by moderate-high to high liquefaction potential; especially in the lower elevation areas.

The 1934 Hansel Valley Earthquake (6.54 magnitude) is widely regarded as the state's largest earthquake in modern recorded history. Four aftershock earthquakes occurred ranging from 4.8 to 6.1 magnitudes. The epicenter was in a largely unpopulated portion of the county and little or no property damage occurred. This earthquake resulted in surface fault rupture. In 1909 a 6.0 magnitude earthquake also occurred in the Hansel Valley. More recently, an earthquake of 3.9 magnitude occurred near Tremonton on September 1, 2007. This earthquake damaged a historic structure in Tremonton which had to be demolished.

Below is a map of historical earthquake locations in Box Elder County:



Dam Failure

There are 295 active dams located in Box Elder County. Most of these dams are small detention ponds or livestock watering facilities and most pose a minimal threat to human safety or property.

Of the 295 active dams, most are designated as "low hazard" by the State of Utah Division of Water Rights. As defined by state statue, low hazard dams are those dams which, if they fail, would cause minimal threat to human life, and economic losses would be minor or limited from damage sustained.

A total of 8 dams have been designated as "moderate hazard" by the State of Utah in Box Elder County. Moderate Hazard dams which, if they fail, have a low probability of causing loss of human life, but would cause appreciable property damage including damage to public utilities.

The State of Utah has rated 5 dams in Box Elder County as "high hazard" which means that, if they fail, have a high probability of causing loss of human life or extensive economic loss, including damage to critical public utilities.

Dam failure inundation maps and emergency action plans for each of the high risk dams can be found on the Utah Division of Water Right's website at: http://waterrights.utah.gov/cgi-bin/damview.exe?Startup.

High Hazard Dams

Blue Creek Dam

The Blue Creek Dam is located one mile north of the town of Howell and has a hazard rating of high. The inundation area flows southward along blue creek, then just west of the development in Howell before ending at the Great Salt Lake basin.

Mantua Dam

The Mantua reservoir and dam have a high hazard rating. The inundation area covers the entire western side of the dam including significant amounts of the town of Mantua. Within the town, multiple homes and structures are at risk. The inundation continues westward down Box Elder Creek filling the canyon bottom and covering highway 89/91, eventually leading through the center of Brigham City. Once again, significant numbers of people, homes and businesses are within the potential inundation area.

Three Mile Creek (debris and detention basin)

Three Mile Creek detention basin is located about 0.5 miles southwest of the city of Perry. The inundation area flows westward from the dam towards the Great Salt Lake basin. Several structures as well as a section of highway 89/91 lie within the inundation area.

Cutler Dam

Cutler Dam and reservoir lie in extreme western Cache County and about four miles northeast of Fielding in Box Elder County. This facility has a hazard rating of high. The inundation area follows the Bear River flood plain first in southwestern direction and then south past Deweyville, Elwood, Honeyville, Bear River City, and finally Corrine City before ending at the Great Salt Lake. Since the inundation area remains, for the most part, within the flood plain, threats to the population and homes appear to be minimal.

A.V. Watkins Dam

A.V. Watkins Dam, otherwise known as the Willard Bay dam, runs along the southeast corner of the bay. No state data is available. See the following comments regarding safety issues for this dam.

While there are only four dams that are designated as high risk, as noted previously, every dam in the county that had inundation GIS data was analyzed. Potential losses were determined for every community in an inundation area.

No significant dam failures have occurred in Box Elder County. However, A.V. Watkins Dam, on the east side of Willard Bay, did have some leakage occurring in November of 2006. A cement-bentonite wall was placed inside the dam to correct the problem. No damages below the dam were reported, but the repairs cost approximately $17.4 million (http://www.usbr.gov/uc/feature/avwatkins/index.html).

Natural Hazard Profiles

Table 12: Box Elder County Flood Hazard Profile

Frequency	Some flooding occurs nearly every year in Box Elder County
Severity	Moderate
Location	Generally along rivers, streams, ravines, and canals.
Seasonal Pattern	Spring flooding as a result of snowmelt. Mid-late summer cloudburst events.
Duration	A few hours or up to three weeks for snowmelt flooding
Speed of Onset	1-6 hours
Probability of Future Occurrences	High-for delineated flood plains there is a 1% chance of flooding in any given year.

Table 13: Box Elder County Wildfire Hazard Profile

Frequency	Annually to some extent
Severity	Severe
Location	Dispersed throughout the whole county
Seasonal Pattern	Generally the worst from early July to mid September (depends on drought conditions)
Duration	A few hours to two weeks
Speed of Onset	1-6 hours
Probability of Future Occurrences	Very High (Since 1973, there has been an average of more than two wildfires per year that burned 1,000 acres or more)

Table 14: Box Elder County Landslide/Steep Slopes Hazard Profile

Frequency	Annually to some extent
Severity	Severe
Location	Dispersed throughout the whole county, but mostly in the mountains on the east and northwest ends of the county.
Seasonal Pattern	Generally the worst from early July to mid September (depends on drought conditions)
Duration	A few hours to two weeks
Speed of Onset	1-6 hours
Probability of Future Occurrences	Very High

Table 15: Box Elder County Earthquake Hazard Profile

Frequency	Low magnitude events occur frequently. Larger magnitude events are rare (although not necessarily on geologic time).
Severity	Potentially Catastrophic
Location	Entire County with highest frequency north of the Great Salt Lake. Surface fault ruptures are likely to occur in fault zones and liquefaction would impact most of the populated county.
Seasonal Pattern	None
Duration	A few minutes with potential aftershocks
Speed of Onset	No warning
Probability of Future Occurrences	Based on 1962-2001 data, there is a 35.9% chance every year of an earthquake of 4.0 magnitude or greater.

Table 16: Box Elder County Dam Failure Hazard Profile

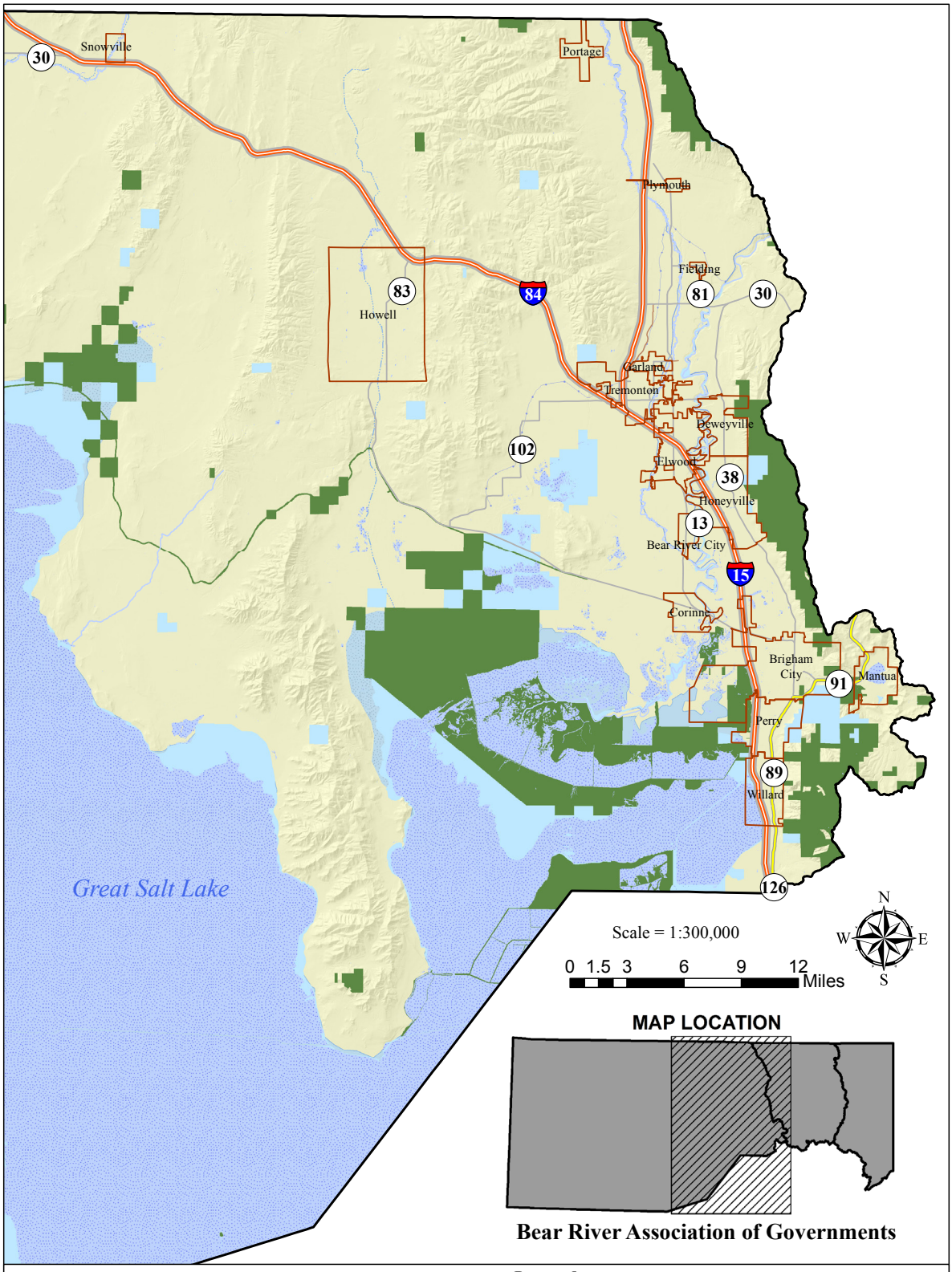
Frequency	Rare
Severity	Potentially Catastrophic
Location	Areas downstream of failed dam.
Seasonal Pattern	Anytime. Highest risk in spring during snowmelt.
Duration	A few hours
Speed of Onset	No warning
Probability of Future Occurrences	Low

Repetitive Loss Properties

There are no repetitive loss properties in Box Elder County (FEMA, 2015).

COUNTY-WIDE NATURAL HAZARD MAPS

(Please see pages 5-43 to 5-51)



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Box Elder
Cache
Rich
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Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Land ownership layer from Utah School & Institutional Trust Lands Administration (SITLA), 2010.

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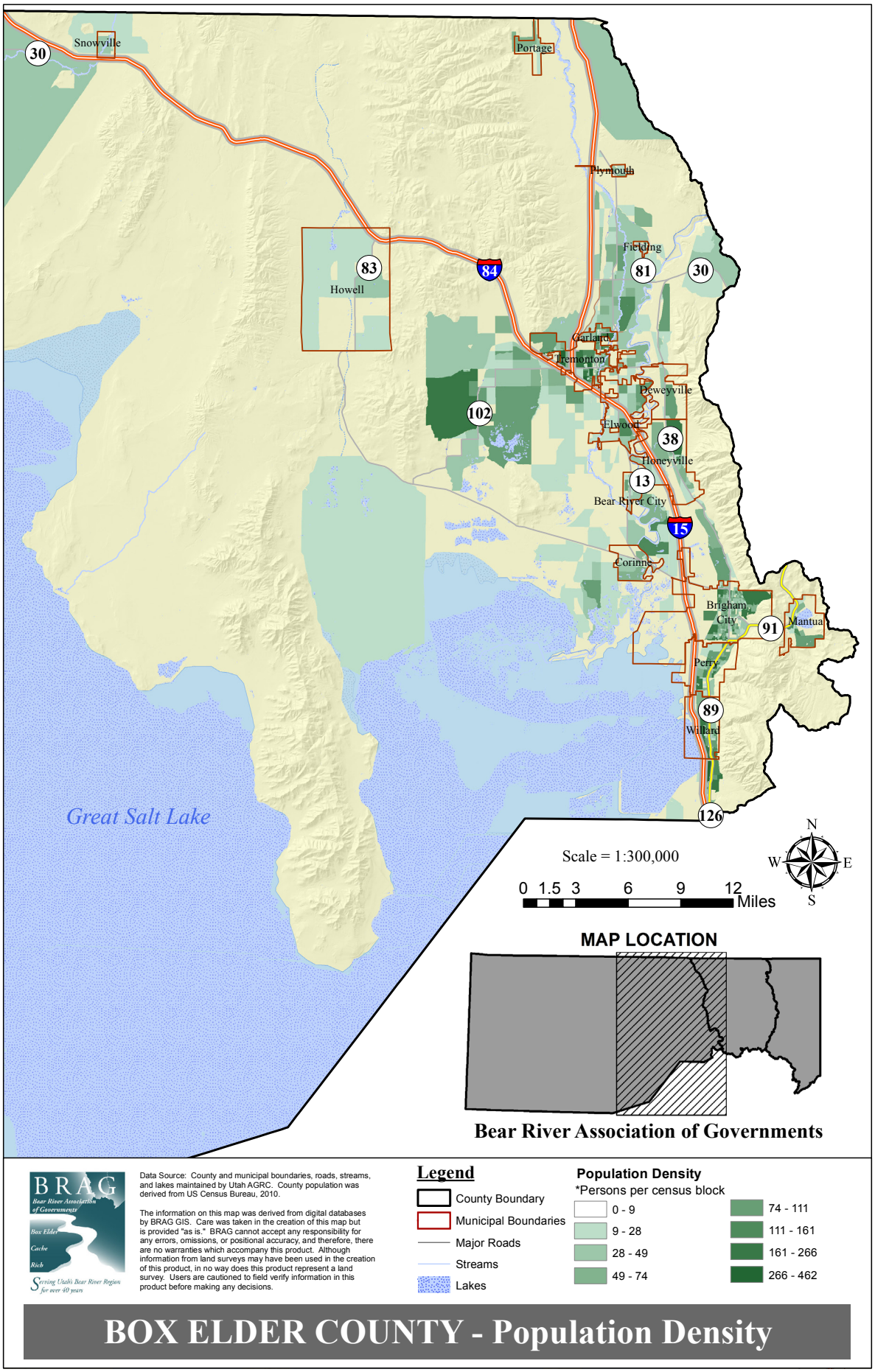
Legend

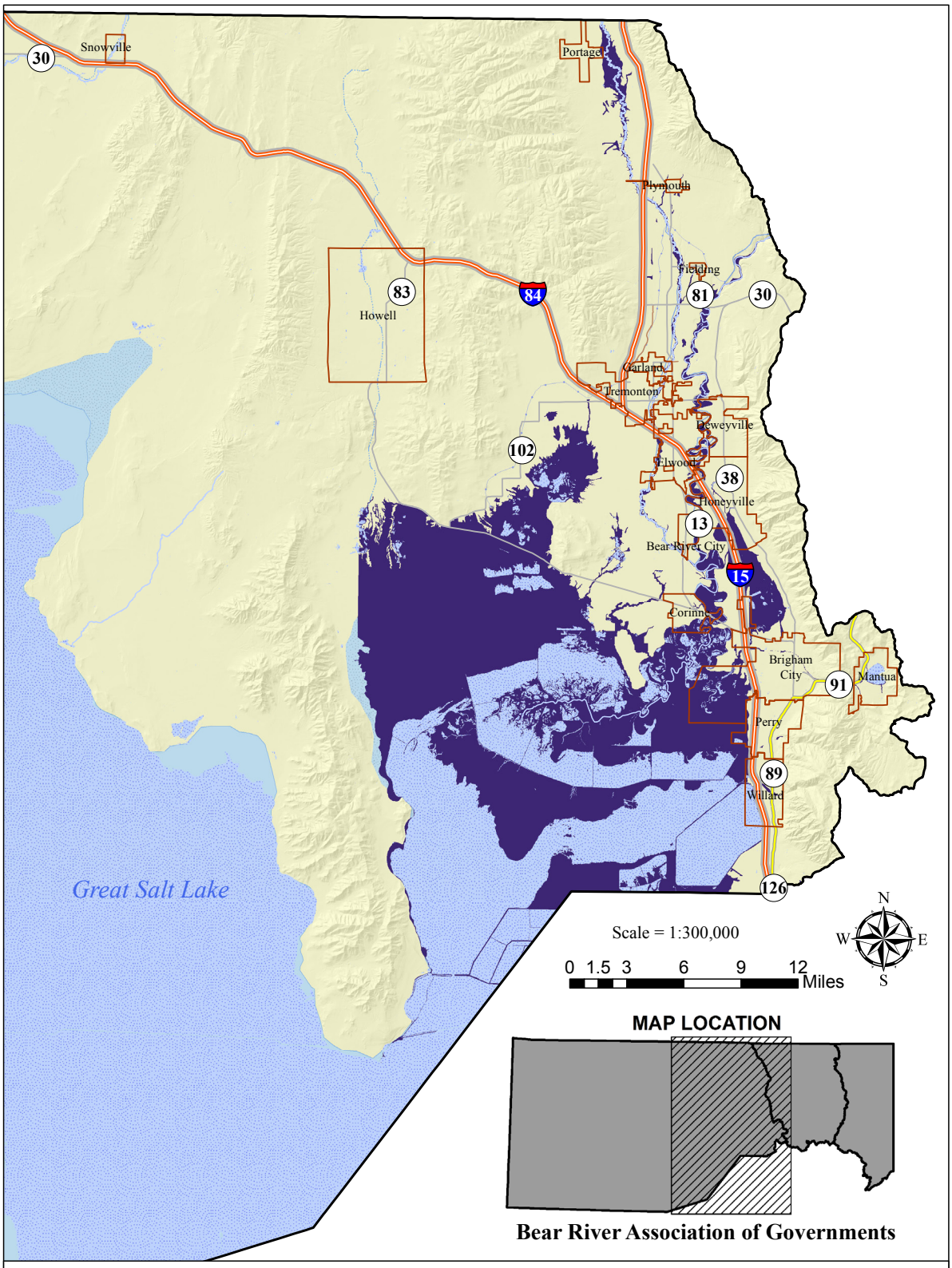
- County Boundary
- Municipal Boundaries
- Major Roads
- Streams
- Lakes

Land Ownership

- Private
- State Lands
- Federal Lands

BOX ELDER COUNTY - Land Ownership


Snowville
Portage
Plymouth
Fielding
Howell
Garland
Tremonton
Deweyville
Elwood
Honeyville
Bear River City
Corinne
Brigham City
Mantua
Perry
Willard
Great Salt Lake
30
83
84
81
30
102
38
13
15
91
89
126
Scale = 1:300,000
0 1.5 3 6 9 12 Miles
N
W
E
S
MAP LOCATION
Bear River Association of Governments
BRAG
Bear River Association of Governments
Box Elder
Cache
Rich
Serving Utah's Bear River Region for over 40 years
Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. County population was derived from US Census Bureau, 2010.
The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.
Legend
County Boundary
Municipal Boundaries
Major Roads
Streams
Lakes
Population Density
*Persons per census block
0 - 9
9 - 28
28 - 49
49 - 74
74 - 111
111 - 161
161 - 266
266 - 462
BOX ELDER COUNTY - Population Density



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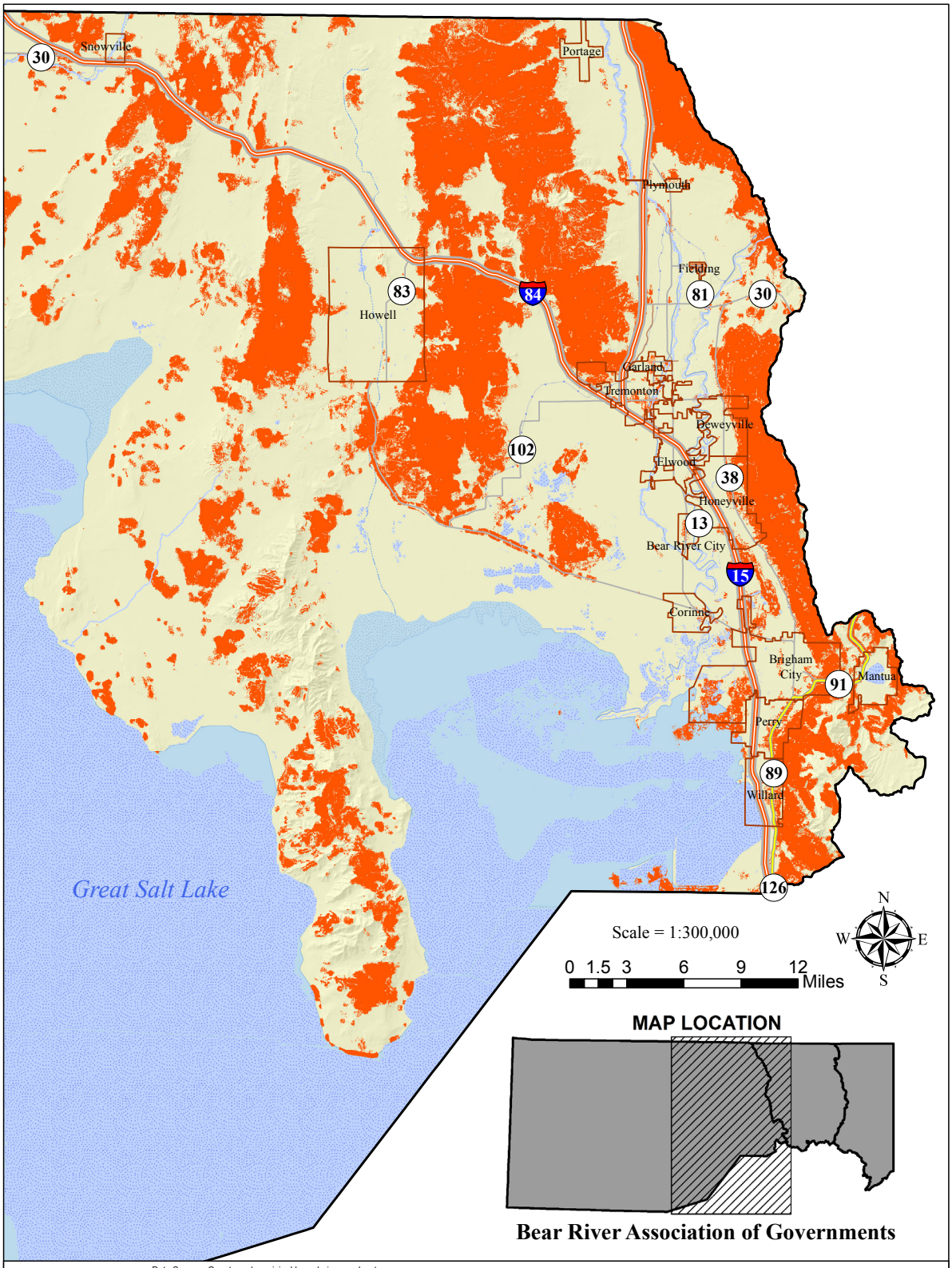
Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Flood layer digitized from FEMA FIRM maps, 2010.

The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.

Legend

- County Boundary
- Municipal Boundaries
- Major Roads
- Streams
- Lakes
- FEMA Flood Zone

BOX ELDER COUNTY - FEMA Flood Zone



Bear River Association of Governments

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Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Fire hazard data from the Oregon Department of Forestry study "West Wide Wildfire Risk Assessment, 2013". Combines moderate to high wildfire risk based on the Fire Risk Index (FRI).

The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.

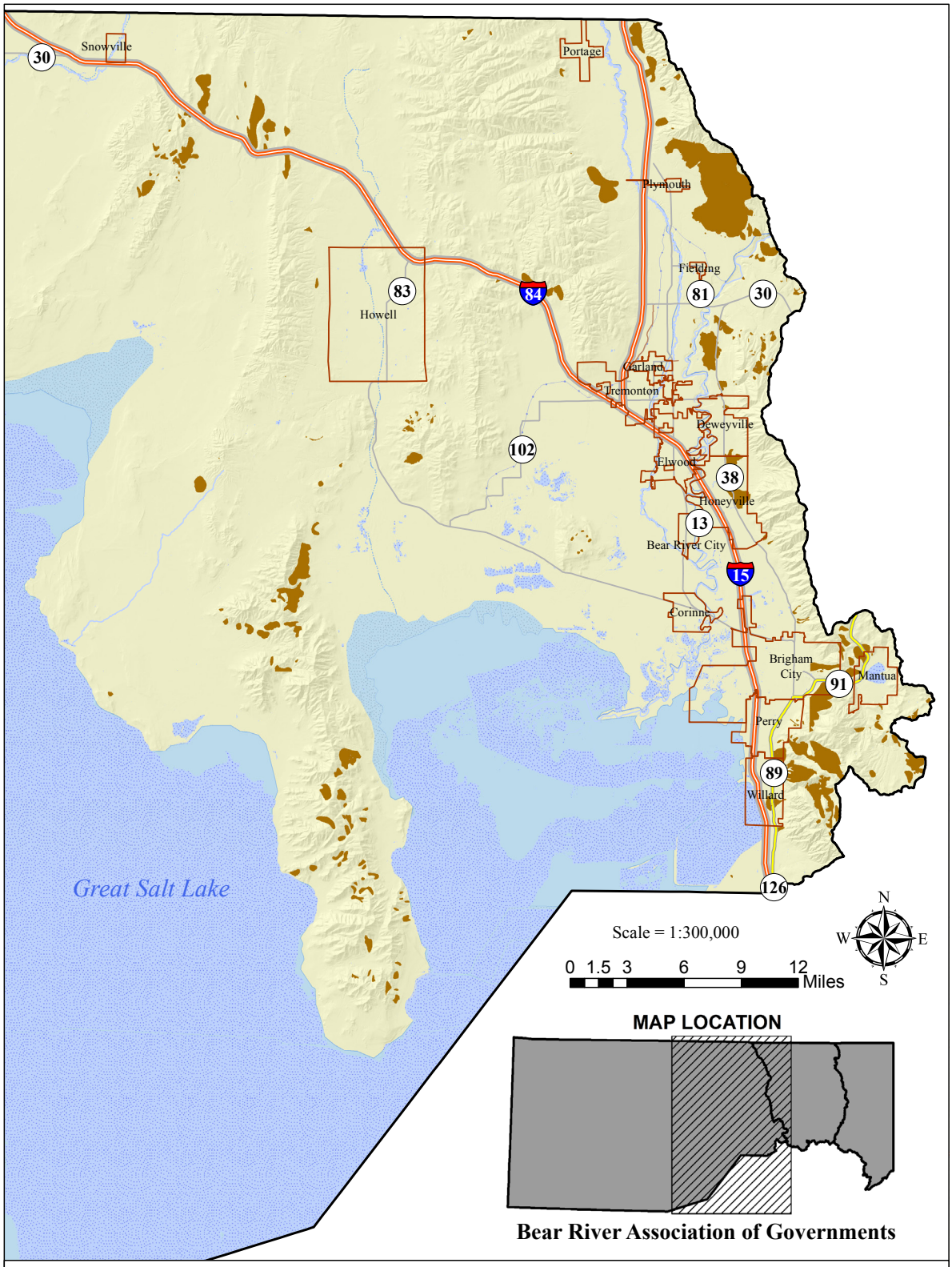
Legend

- County Boundary
- Municipal Boundaries
- Major Roads
- Streams
- Lakes

Fire Risk

- Moderate to High

BOX ELDER COUNTY - Wildfire Hazard



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Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Data obtained from the Utah Geological Survey showing landslide deposits, landslide scarps, and debris-flow travel paths, 2010.

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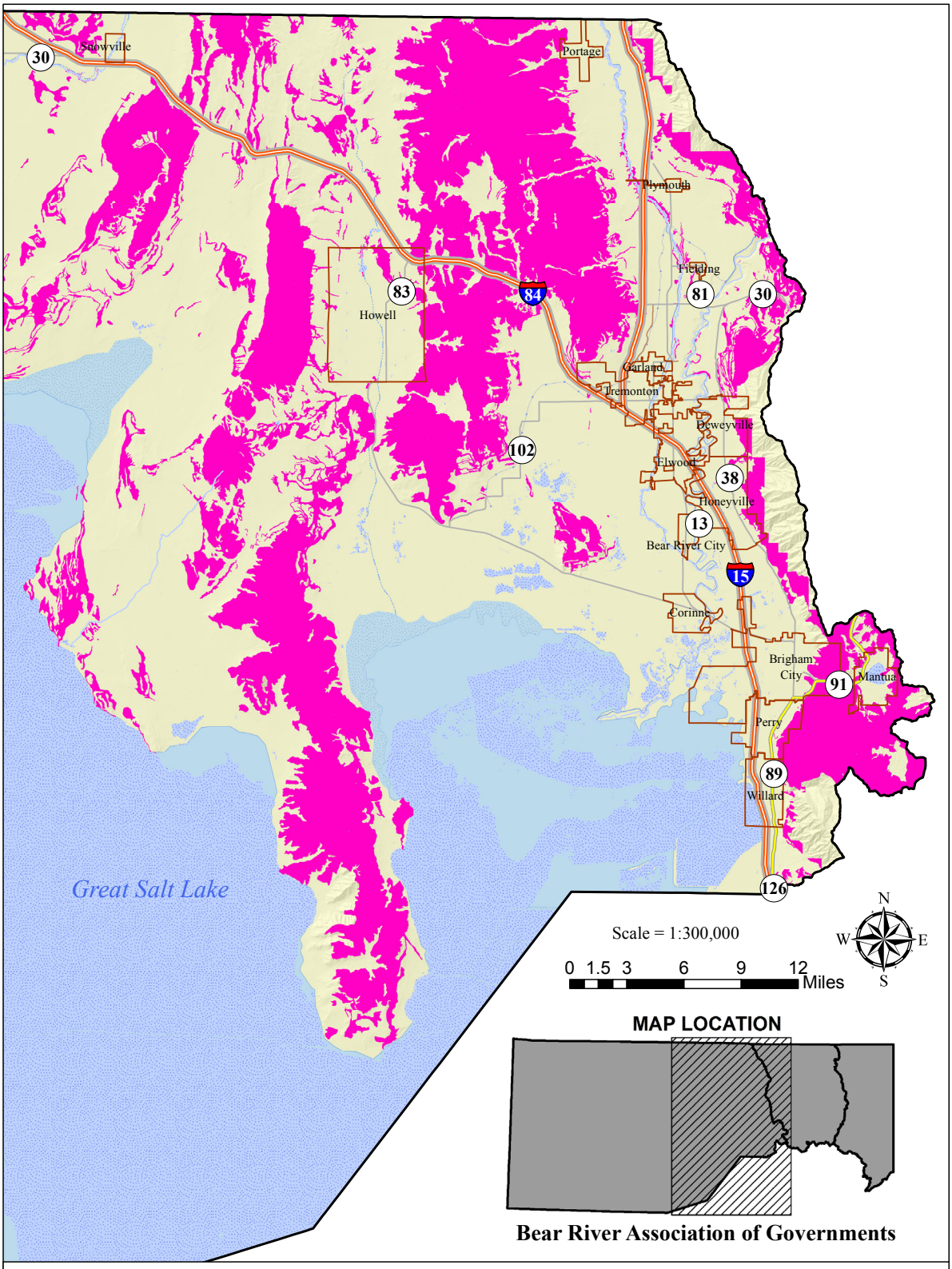
Legend

- County Boundary
- Municipal Boundaries
- Major Roads
- Streams
- Lakes

Landslides

- Deposits, scarps, and debris-flow travel paths

BOX ELDER COUNTY - Landslides



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Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Steep slopes derived from NRCS SSURGO Soils Database 2013 - 20% slope and higher.

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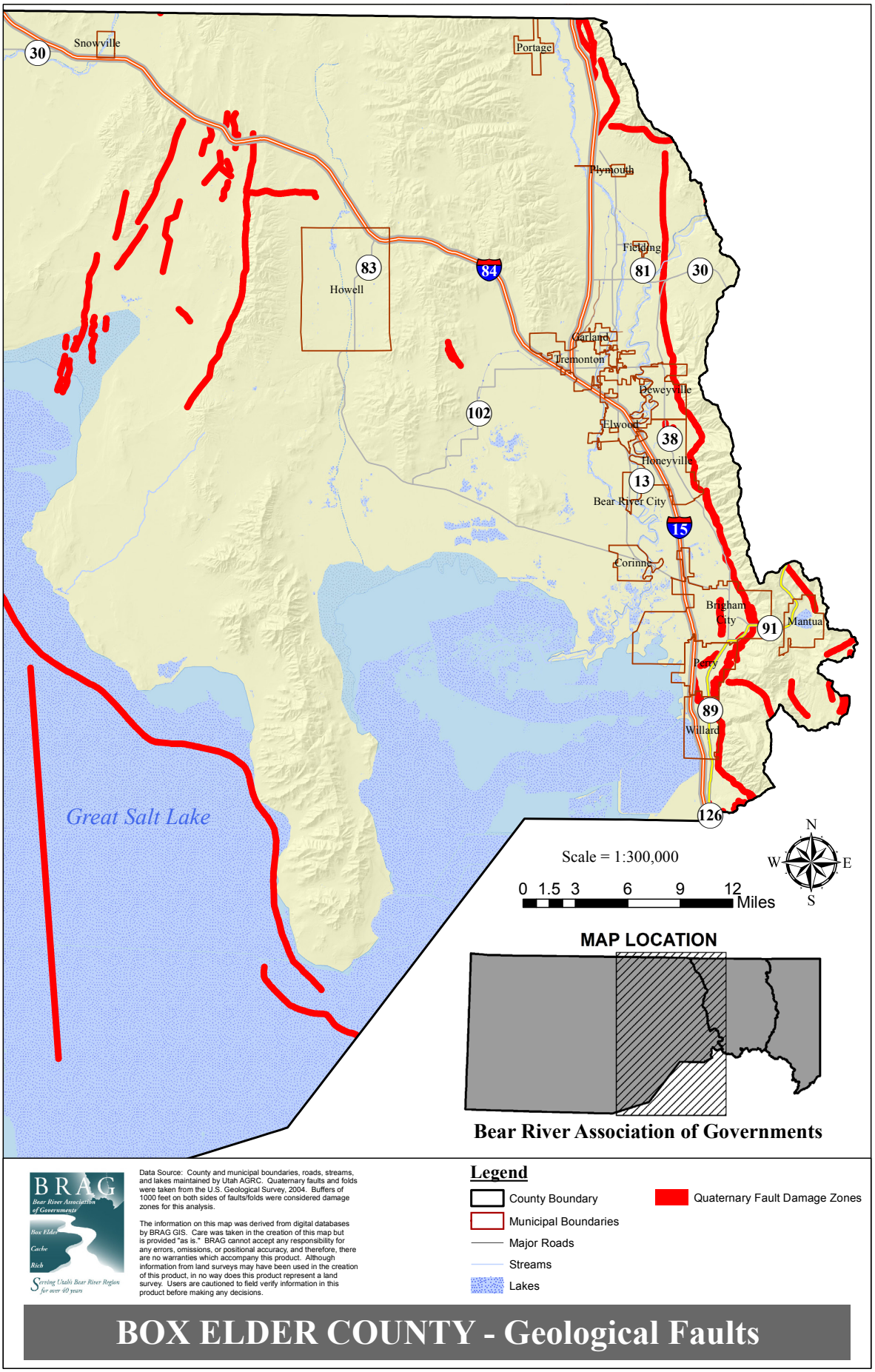
Legend

- County Boundary
- Municipal Boundaries
- Major Roads
- Streams
- Lakes

Steep Slopes

- 20% slope and higher

BOX ELDER COUNTY - Steep Slopes


Snowville
30
Portage
Plymouth
Fielding
81
30
83
Howell
84
Garland
Tremonton
Deweyville
102
Elwood
38
Honeyville
13
Bear River City
15
Corinne
Brigham City
91
Mantua
Perry
89
Willard
126
Great Salt Lake
Scale = 1:300,000
0 1.5 3 6 9 12 Miles
N
W
E
S
MAP LOCATION
Bear River Association of Governments
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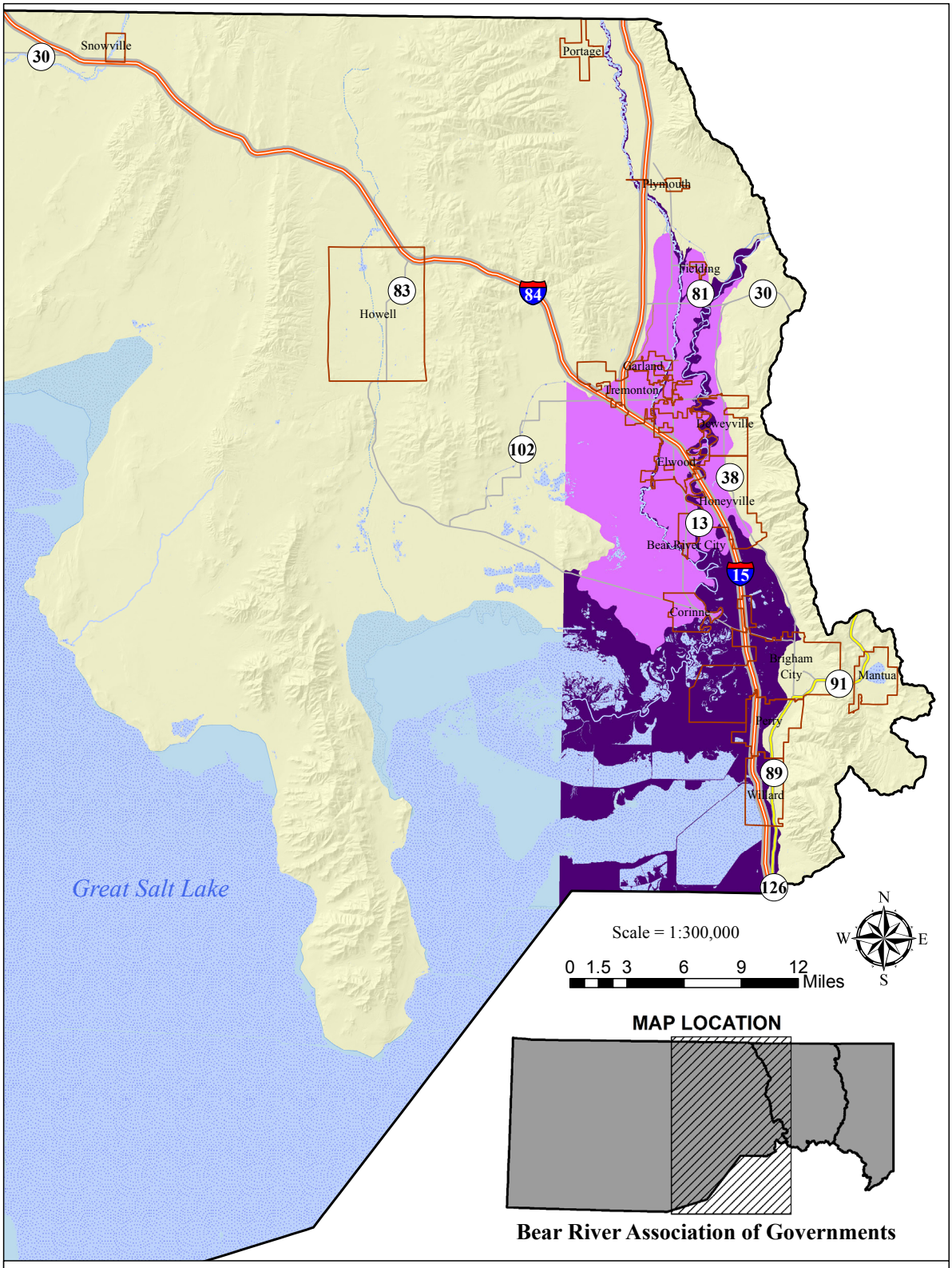
Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Quaternary faults and folds were taken from the U.S. Geological Survey, 2004. Buffers of 1000 feet on both sides of faults/folds were considered damage zones for this analysis.
The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.
Legend
County Boundary
Municipal Boundaries
Major Roads
Streams
Lakes
Quaternary Fault Damage Zones
BOX ELDER COUNTY - Geological Faults



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Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Liquefaction potential was digitized and published by the Utah AGRC, 2001.

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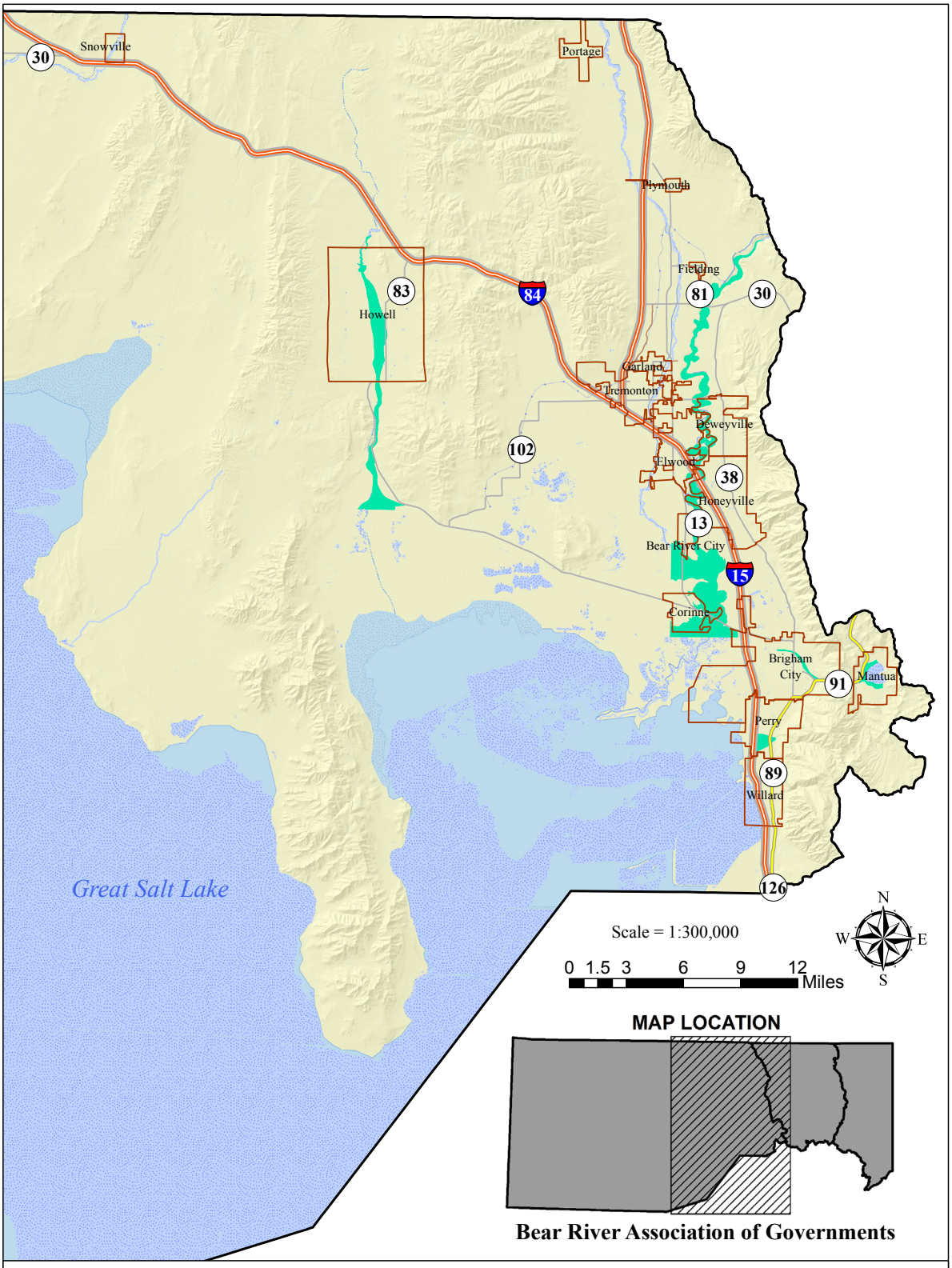
Legend

- County Boundary
- Municipal Boundaries
- Major Roads
- Streams
- Lakes

Liquefaction Potential

- Moderate to High
- High

BOX ELDER COUNTY - Liquefaction Potential



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Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Dam inundation areas provided by Utah Division of Water Rights, 2008.

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Legend

- County Boundary
- Municipal Boundaries
- Major Roads
- Streams
- Lakes

Dam Inundation Areas

- Probable Maximum Flood area resulting from complete dam failure.

BOX ELDER COUNTY - Dam Failure

COMMUNITY SECTIONS: NATURAL HAZARDS, POTENTIAL LOSSES, AND MITIGATION STRATEGIES

BEAR RIVER

Analysis of hazard risk involving the community of Bear River revealed that there is potential risk resulting from **dam failure, flood, liquefaction, and wildfire**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and recreational features within municipal boundaries. Currently, liquefaction and wildfire hazards have the greatest potential to impact the community based on potential loss values. Other natural hazard types not mentioned were found to have no potential impacts to Bear River City. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 17: Bear River Potential Loss Figures

Natural Hazards

Dam failure. Bear River's risk of dam failure involves the eastern portion of town that is adjacent to the Bear River and is situated downstream of Cutler Dam. Structures and amenities in these areas could experience damage if Cutler Dam were to fail. Currently, no other areas in Bear River appear to be at risk from dam failure.

Flood. The Bear River and Malad River pose threats for flooding within the community. Areas to the south and east within the jurisdiction have the greatest risk potential, with structures and features adjacent to the Bear and Malad rivers having risk. Bear River participates in NFIP, joining the program in 2010.

Liquefaction. The City of Bear River currently has moderate-high and high potential risk involving liquefaction. Areas of highest risk are located near the Bear and Malad rivers where a higher level of ground saturation may be present. Other areas of moderate-high risk are associated with the community's relatively

Bear River, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	16	5	973,974	2	729,171	2,414,610
Faults	0	0	0	0	0	0
Wildfire	754	241	34,455,401	13	1,303,229	15,694,965
Flood	13	4	1,083,452	2	729,171	2,414,610
Liquefaction	889	284	42,981,405	18	1,627,727	21,731,490
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.
** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Bear River, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0.24	126,000	0.13	195,000
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0	2.55	1,338,750	0.82	1,230,000
Flood	0	0	0	0	0	0	0.07	36,750	0.06	90,000
Liquefaction	0	0	0	0	0	0	12.49	6,557,250	2.1	3,150,000
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Bear River, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					1 bridge
Faults					
Wildfire					
Flood					1 bridge
Liquefaction		Century School		1 place of worship	1 bridge, 2 broadband anchors
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Bear River, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	182.36	142.45	0	0	0
Faults	0	0	0	0	0
Wildfire	47.93	249.6	0	0	0
Flood	142.83	121.49	0	0	0
Liquefaction	664.07	943.97	0	0	0
Landslide	0	0	0	0	0
Slope	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Bear River, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	91.77	2.4	2.61	0	0	0
Faults	0	0	0	0	0	0
Wildfire	26.1	0.22	1.37	7.91	0	0
Flood	86.23	0.42	2.38	0	0	0
Liquefaction	102.89	2.4	5.83	11.57	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

low elevation within the surrounding landscape.

Wildfire. Bear River has some areas with moderate-high risk potential to wildfires. Most of these areas appear to be urban forested areas within the City's center. Areas adjacent to Highway 13 appear to be most at risk.

Future Development

No concerns involving potential future development within Bear River City were reported by city representatives.

Hazard Mitigation Strategies

Table 18: Bear River City Mitigation Strategies

BEAR RIVER CITY - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Bear River City	Wildfire	Protect current residents and property	Work with county fire marshal to evaluate wildfire risks.	N/A	Low	2017	N/A	Bear River City and Box Elder County	Minimal	County Fire District
Bear River City	Flooding	Protect current residents and property	Review detailed ordinance of development in flood plain	Same	Low	2016	N/A	Bear River City	Minimal	Fema, State Public Safety, Brag
Bear River City	Dam Failure	Protect current residents and property	Coordinate with county emergency response for potential evacuation or bridge damage.	N/A	Medium	2016	N/A	Bear River City and Box Elder County	Minimal	County, City
Bear River City	Landslides	Protect current residents and property	Review ordinance to ensure risk areas are minimized for development.	N/A	Low	2017	N/A	Bear River City	Minimal	Utah Geo Survey, City, BRAG
Bear River City	Earthquake / Liquefaction	Protect current residents and property	Education for Planning commission and council regarding liquefaction, including loss of critical infrastructure.	N/A	Medium	2015	N/A	Bear River City, UGS	Minimal	Utah Geo Survey, BRAG

BEAR RIVER CITY - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Bear River City	Wildfire	Protect future residents and property	Review land use ordinance to ensure identified risk areas are minimized	N/A	Low	2017	N/A	Bear River City	Minimal	City, County, BRAG
Bear River City	Flooding	Protect future residents and property	Ensure proper ordinance for development in flood plain	Same	Medium	2015	N/A	Bear River City, Utah DEM	Minimal	City, FEMA, State Safety, BRAG
Bear River City	Dam Failure	Protect future residents and property	Work with county to set up local emergency response facility, fire station, first responder.	N/A	Medium	2016	FEMA,PDM,CDGB,BRAG	Bear River City	TBD	State Emergency Service, County Brag
Bear River City	Landslides	Protect current residents and property	Review ordinance to ensure risk areas are minimized for development.	N/A	Low	2017	N/A	Bear River City, UGS	Minimal	Utah Geo Survey, City, BRAG
Bear River City	Earthquake Liquefaction	Protect future residents and property	Review general plan to include liquefaction and problem soils.	N/A	Low	2016	State, Local	Bear River City, UGS	Minimal	City, Local, BRAG

BOX ELDER COUNTY (UNINCORPORATED)

Analysis of hazard risk involving the community of the unincorporated portions of Box Elder County revealed that there is potential risk resulting from **dam failure, faults, flood, liquefaction, landslides, steep slopes, and wildfire**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and recreational features within municipal boundaries. Currently, liquefaction, floods, and wildfire hazards have the greatest potential to impact human life, property, and various community amenities based on potential loss values. Other natural hazard types not mentioned were found to have no potential impacts to the unincorporated portions of Box Elder County. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 19: Box Elder County Potential Loss Tables

Natural Hazards

Dam failure. Box Elder County's risk of dam failure involves the eastern portion of the county near incorporated municipalities. Blue Creek Dam located near Howell places a portion of the county directly south of Howell at risk to dam failure. A small segment of Sardine canyon between Mantua and Brigham City is at risk of inundation. Life, property, and various amenities located in these areas could experience damage. Additionally, portions of the county that run adjacent the Bear River below Cutler Dam also are at risk of dam failure, however most inundation areas are located within the current flood plain for the Bear River and thus are less threatening to large portions of the population. Currently, no other areas in the County appear to be at risk from dam failure.

Faults. There are fault damage zones in Box Elder County with potential to affect structures. Areas associated most greatly with fault damage zones are development areas and structures in the unincorporated

Box Elder County, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	457	146	33,674,494	38	66,226,779	45,877,590
Faults	457	146	51,231,780	39	10,076,449	47,084,895
Wildfire	2,989	955	212,421,483	245	262,273,017	295,789,725
Flood	742	237	77,182,222	99	62,117,305	119,523,195
Liquefaction	5,841	1,866	405,039,019	334	329,074,937	403,239,870
Landslide	238	76	15,829,986	37	23,986,882	44,670,285
Slope	1,027	328	79,203,894	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.
** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.
[Figures also include Hansel Valley special flood hazard area potential losses]

Box Elder County, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	1.18	1,770,000	5.88	8,232,000	1.23	156,210	33.78	17,734,500	5.2	2,730,000
Faults	4.71	7,065,000	10.6	14,840,000	16.62	2,110,740	92.71	48,672,750	7.12	3,738,000
Wildfire	28.49	42,735,000	20.84	29,176,000	87.84	11,155,680	1335	701,043,000	37.05	19,451,250
Flood	7.71	11,565,000	9.22	12,908,000	12.99	1,649,730	176.9	92,851,500	80.69	42,362,250
Liquefaction	68.55	102,825,000	49.21	68,894,000	83.85	10,648,950	745.9	391,613,250	181.4	95,214,000
Landslide	2.42	3,630,000	6.52	9,128,000	10.38	1,318,260	197.4	103,614,000	4.89	2,567,250
Slope	0	0	14.26	19,964,000	31.42	3,990,340	951.9	499,737,000	7.95	4,173,750
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.
[Figures also include Hansel Valley special flood hazard area potential losses]

Box Elder County, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					7 bridges, 3 dams
Faults					3 bridges, 1 broadband anchor, 5 dams
Wildfire					
Flood					25 bridges, 18 dams
Liquefaction		1 airport, Box Elder Landfill		4 places of worship	90 bridges, 3 broadband anchors, 38 dams
Landslide					5 dams
Slope				1 place of worship	2 bridges, 41 dams
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.
[Figures also include Hansel Valley special flood hazard area potential losses]

Box Elder County, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	8,379.93	7,116.64	566.98	0.00	2.00
Faults	6,317.64	9,776.15	15,843.21	2.00	1.00
Wildfire	28,594.41	140,946.15	312,117.40	3.00	5.00
Flood	30,008.77	8,409.24	7,422.51	1.00	2.00
Liquefaction	76,714.07	42,413.92	167.27	12.00	7.00
Landslide	6,477.99	5,755.49	29,257.88	2.00	1.00
Slope	17,764.71	0.00	303,759.79	1.00	1.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.
[Figures also include Hansel Valley special flood hazard area potential losses]

Box Elder County, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	4,227.95	352.48	99.50	0.00	0.91	0.00
Faults	13,617.25	21,911.36	178.80	0.00	18.91	1.00
Wildfire	10,521.70	510.76	2,752.93	0.00	42.73	2.00
Flood	330,539.12	159,281.61	1,242.14	0.00	0.55	1.00
Liquefaction	123,285.79	72,075.48	713.61	0.00	0.00	0.00
Landslide	263.14	24.87	357.28	0.00	15.25	3.00
Slope	243.80	171.59	2,122.75	0.00	58.48	2.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00	0.00

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.
[Figures also include Hansel Valley special flood hazard area potential losses]

areas along the eastern portion of the county. These areas overlap portions of the Brigham City Segment of the Wasatch Fault and could impact a variety of residential and commercial units on the areas east of Portage stretching south to Willard.

Flood. Substantial portions of Box Elder County are at risk to flooding, however risk to flooding impacts is lessened due to large portions of the flood plain existing in the uninhabited areas bordering Great Salt Lake. Structures near the Bear River Bay of the Great Salt Lake are at risk. Areas of greatest concern lie within the FEMA flood plains of the Bear and Malad Rivers in the eastern portion of the county. In particular, a large area stretching from Bear River City and Honeyville south to Brigham City and Corrine has potential to flood. Intermittent streams and drainages in the county also pose risk to structures in the region. Another area of concern is that of Hansel Valley where there exists a special flood hazard area.

Liquefaction. Areas of Box Elder County's unincorporated lands have moderate-high and high risk of liquefaction in the event of an earthquake. The majority of areas susceptible to liquefaction exist in the lower elevation areas on the eastern side of the county. Areas of moderate-high liquefaction risk from areas just north and west of Fielding south to areas south and west of Corrine. Some area of high risk exist within these areas, especially areas adjacent to the Bear and Malad Rivers. Other areas of high risk include areas and structures situated between Honeyville, Bear River City, Corrine, and Brigham City, as well as portions of the Bear River Bay as it enters into the Great Salt Lake.

Landslides. Isolated pockets of Box Elder County's unincorporated areas could suffer potential losses to landslides. Populations, structures, and amenities that are most likely to be impacted include eastern portions of the county in proximity to the Wellsville Mountains, other portions of the Wasatch Mountain Range, and other mountainous areas throughout the county. Landslides have the potential to impact life, property, critical facilities, infrastructure, and environmental, recreational and agricultural features in the jurisdiction.

Steep Slopes. Box Elder County has risk associated with steep slopes within its unincorporated areas. Areas of greatest concern have slopes of over 20%, which are commonly found in areas directly adjacent to mountainous areas of the Wellsville and Wasatch Mountain Ranges, as well as other ranges found to the west. Areas bordering streams and rivers also appear to have an increased exposure to risk. Steep slopes have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction.

Wildfire. Box Elder County is susceptible to moderate-high risk of wildfire throughout large portions of its unincorporated areas. Moderate-high risk is most closely associated with development and amenities adjacent to mountainous areas, including portions of the Wasatch Mountains, the Wellsville Mountains, and other ranges in the region. Additionally, some areas at lower elevations are also at risk due to their proximity to adjacent jurisdictions and their urban forests or the presence of grassy and shrubby vegetation types. Wildfires have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction.

Future Development

Future development is anticipated along portions of the Bear River. This development could face moderate to high risk involving flooding, dam failure, liquefaction, and wildfire. Developments in areas that overlap with hazards increase exposure to in terms of human life, property, infrastructure, and environmental, recreational and agricultural amenities.

Hazard Mitigation Strategies

Table 20: Box Elder County Mitigation Strategies

BOX ELDER COUNTY - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Box Elder County	Dam Failure	Protect current residents and property	Warning system needed for Boy Scout camp below Cutler Dam	N/A	Medium	2016	PacifiCorp	Box Elder County, Bureau of Reclamation, Utah Dam Safety	N/A	Private
Box Elder County	Earthquake	Protect current residents and property	Retrofit the County Court House	N/A	Medium	2017	Mitigation grant	Box Elder County	$1.5 Million	N/A
Box Elder County	Flood	Protect current residents and property	Need to reconcile with recently adopted flood plain maps	N/A	Medium	2016	N/A	Box Elder County, Utah DEM	Minimal	Planning and Zoning
Box Elder County	Landslide	Protect current residents and property	Identify landslide areas and educate the property owners.	N/A	Medium	2017	N/A	Box Elder County, UGS	Minimal	Planning and Zoning

BOX ELDER COUNTY- COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Box Elder County	Dam Failure	Protect future residents and property	Make sure new building permit holders are notified of current procedure, update city watch notification system (pending)	N/A	Medium	2016	None	Box Elder County, Bureau of Reclamation, Utah Dam Safety	Minimal	Planning and Zoning
Box Elder County	Earthquake	Protect future residents and property	Identify hazardous areas and notify	N/A	Medium	2016	N/A	Box Elder County	Minimal	Planning and Zoning
Box Elder County	Flood	Protect future residents and property	Need to reconcile with recently adopted flood plain maps	N/A	Medium	2016	N/A	Box Elder County, Utah DEM	Minimal	Planning and Zoning
Box Elder County	Landslide	Protect future residents and property	Prevent building in landslide areas through planning commission	N/A	Medium	2017	N/A	Box Elder County, UGS	Minimal	Planning and Zoning

BRIGHAM CITY

Analysis of hazard risk involving the community of Brigham City revealed that there is potential risk resulting from **dam failure, faults, flood, liquefaction, landslides, steep slopes, and wildfire**. These hazards have varying potential to impact human life, property, infrastructure, agriculture, and recreational features within municipal boundaries. Currently, earthquakes resulting in liquefaction and fault damage have the greatest potential to impact human life, property, and various community amenities based on potential loss values. Other natural hazard types not mentioned were found to have no potential impacts to Brigham City. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Natural Hazards

Dam failure. Brigham City has risk to dam failure involving Mantua Reservoir. Areas at risk include the mouth of Sardine Canyon and along Box Elder Creek. Life, structures and amenities in these areas could be effected in the case of a dam failure event.

Faults. Brigham City has potentially the greatest risk of fault damage in Box Elder County due to its large number of population located within the fault damage zone. The eastern portions of the city, especially areas of the foothills and bench, lie along portions of the Northern Wasatch Fault, which historically is the most overdue for activity in the region. Human life, structures, and other amenities in the fault zone could suffer catastrophic damage in the event of a large earthquake.

Table 21: Brigham City Potential Loss Figures

Brigham City, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	873	279	45,421,393	14	2,714,950	16,902,270
Faults	5,296	1,692	241,231,151	50	22,317,078	60,365,250
Wildfire	776	248	54,575,507	106	100,830,048	127,974,330
Flood	288	92	14,770,407	11	17,457,674	13,280,355
Liquefaction	1,750	559	107,591,100	138	105,642,781	166,608,090
Landslide	222	71	16,199,172	1	254,800	1,207,305
Slope	210	67	16,419,123	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.
** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Brigham City, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0.87	1,305,000	0.08	112,000	0.57	72,390	11.69	6,137,250	8.34	12,510,000
Faults	7.04	10,560,000	5.78	8,092,000	2.06	261,620	58.9	30,922,500	5.27	7,905,000
Wildfire	5.31	7,965,000	3.29	4,606,000	4.41	560,070	28.28	14,847,000	11.6	17,400,000
Flood	0.08	120,000	0.39	546,000	4.9	622,300	13.32	6,993,000	6.06	9,090,000
Liquefaction	22.24	33,360,000	5.82	8,148,000	14.24	1,808,480	263.3	138,237,750	24.32	36,480,000
Landslide	0	0	0.77	1,078,000	0	0	7.35	3,858,750	1.28	1,920,000
Slope	0	0	2.86	4,004,000	0.81	102,870	21.05	11,051,250	4.4	6,600,000
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Brigham City, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure				1 place of worship	1 bridge, 1 dam
Faults	Brigham City Ambulance, Brigham City Emergency Services	Triumph Center for Youth, Facility, Box Elder High, Young Intermediate school	7 health care facilities	6 places of worship	1 bridge, 1 dam, 11 broadband anchors
Wildfire					
Flood	Fish and Wildlife Service Office of Law Enforcement				4 bridges, 1 broadband anchor, 1 dam
Liquefaction	5 law enforcement offices, 1 EMS station, 1 Fire Station, 1 correctional facility	18 schools, 1 airport, 7 public facilities	20 healthcare facilities	22 places of worship	14 bridges, 53 broadband anchors, 6 dams
Landslide					
Slope					2 bridges, 1 dam
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Brigham City, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Acres	# of Miles
Dam Failure	79.11	246.85	0.00	0.00	0.00
Faults	80.12	771.01	0.00	1.00	0.00
Wildfire	288.06	381.62	0.00	0.00	0.00
Flood	438.39	255.29	0.00	0.00	0.00
Liquefaction	3,539.76	2,062.91	0.00	0.00	0.00
Landslide	0.00	1.56	0.00	0.00	0.00
Slope	0.00	1.66	0.00	0.00	0.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Brigham City, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	6.42	3.62	6.12	16.77	0.30	2.00
Faults	6.72	4.65	5.21	54.95	5.41	3.00
Wildfire	2,976.77	185.71	29.52	52.44	8.52	2.00
Flood	6,258.58	450.97	42.86	16.78	0.06	2.00
Liquefaction	7,165.79	489.91	4.87	0.00	0.00	0.00
Landslide	0.00	0.00	2.62	3.80	0.00	0.00
Slope	0.40	0.71	9.24	0.00	10.07	0.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00	0.00

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

Flood. Portions of Brigham City are at risk to flooding. Areas most susceptible to flooding are in areas of the city to the west of Interstate 15. These areas are influenced by the Bear River as it enters the Bear River Bay of the Great Salt Lake. Other areas of concerns with the city include areas adjacent to Box Elder Creek, as well as structures in proximity to the portion of the Ogden-Brigham (Pineview) Canal and the Perry Canal. Intermittent streams and drainages in the city also pose risk to structures within jurisdictional boundaries. Floods resulting in these areas pose a threat to human life, structures, critical facilities, infrastructure, and other environmental, recreational, and agricultural amenities and lands within city limits.

Liquefaction. Following fault damage, liquefaction poses the greatest risk to human life and property in Brigham City. Areas of Brigham City have high risk of liquefaction in the event of an earthquake. The majority of areas susceptible to liquefaction exist in the lower elevation areas on the eastern side of the city. Areas of high risk exist approximately 2 miles east of Interstate 15 and west of the I-15. Liquefaction occurring in these areas poses a threat to human life, structures, critical facilities, infrastructure, and other environmental, recreational, and agricultural amenities and lands within city limits.

Landslides. Isolated portions of Brigham City could suffer potential losses to landslides. Populations, structures, and amenities that are most likely to be impacted include eastern portions of the county in proximity to the Wellsville Mountains, other portions of the Wasatch Mountain Range, and other mountainous areas throughout the county. Landslides have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction.

Steep Slopes. Brigham City has risk associated with steep slopes within its jurisdictional boundaries. Steep slopes have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction. Over 200 people and 67 structures are estimated to be at risk from steep slopes.

Wildfire. Brigham City is susceptible to moderate-high risk of wildfire in portions of the city. Moderate-high risk is most closely associated with development and amenities adjacent to mountainous areas, including portions of the Wasatch Mountains, the Wellsville Mountains, and other ranges in the region. Additionally, some areas at lower elevations are also at risk due to their proximity to urban forests, such as the city center, or the areas of grassy and shrubby vegetation types, such as west of I-15 and the northwest portion of the jurisdiction that borders I-15. Wildfires have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction.

Future Development

Future development is anticipated in areas of the valley floor, as well as in areas of higher elevation that border more mountainous areas of the Wasatch and Wellsville mountain ranges. Higher elevation developments could face moderate to high risk wildfire as it is considered to be in the wildland-urban interface zone of wildfire risk. Future development in the valley floors could be impacted by liquefaction in the case of an earthquake. Additionally, if such development occurs in the far western portion of the jurisdiction, it could be at risk to flood damage. Developments in areas that overlap with hazards increase exposure to in terms of human life, property, infrastructure, and environmental, recreational and agricultural amenities.

Hazard Mitigation Strategies

Table 22: Brigham City Mitigation Strategies

BRIGHAM CITY - COMMUNITY MITIGATION STRATEGIES

Protecting Current Residents and Property

Jurisdiction	Hazard	Goal	Action	Action (For NFIP Compliance, if Applicable)	Priority (High, Medium, Low)	Time-frame (Year)	Potential Funding Sources	Responsible Entity	Estimated Cost	Resources
Brigham City	Earthquake	Protect current residents and property	Seismic upgrade of Brigham City Chamber of Commerce Building	N/A	High	2017	Brigham City, FEMA Grants, Historical Preservation	Brigham City and Chamber of Commerce	$350,000	UGS, County
Brigham City	Earthquake	Protect current residents and property	Complete seismic upgrade to Brigham City Hall	N/A	High	2018	Brigham City, Grants	Brigham City	$400,000	UGS, County
Brigham City	Dam Failure	Protect current residents and property	Work with local, state, and county governments to determine risk and potential response tactics to prevent loss and damage.	N/A	Medium	2017	Brigham City	Brigham City and Bureau of Reclamation/State Dam Safety	Minimal	Utah DEM, FEMA, BRAG
Brigham City	Landslide	Protect current residents and property	Determine areas of risk and educate officials and the public on risk areas, especially related to water sources and power failure. Also could affect electrical power generatior	N/A	Medium	2017	Brigham City	Brigham City	Minimal	Utah DEM, UGS, USGS
Brigham City	Slope	Protect current residents and property	Determine slope percentages representing greatest risk to residents and property.	N/A	Medium	2017	Brigham City, UGS, USGS	Brigham City, UGS	Minimal	Utah DEM, UGS, USGS
Brigham City	Wildfire	Protect current residents and property	Work with Utah FFSL on exploring potential WUI and/or CWPP plan for eastern benches.	N/A	Medium	2018	Brigham City, Utah FFSL	Brigham City, Utah FFSL	Minimal	Utah FFSL, County
Brigham City	Flood	Protect current residents and property	Work with state agencies and BRAG to review current flood hazard areas and update. Replace culverts to allow more water storage in Mantua Reservoir. Work with property owners and city staff to keep Box Elder channel free of debris.	Work with state floodplain manager to make sure city is compliant with NFIP and make changes as necessary.	Medium	2017	BRAG	Brigham City, BRAG	Minimal	BRAG, FEMA
Brigham City	Anything causing Power Failure	Protect current residents and property	Generator backup at the City Hall/ EOC	N/A	High	2016	Brigham City, Grants	Brigham City	$200,000	State DEM, FEMA, BRAG
Brigham City	Anything causing Power Failure	Protect current residents and property	Generator Backup of Varous Major Culinary Water Wells	N/A	High	2016	Brigham City, FEMA Grants	Brigham City	$400,000	State DEM, FEMA, BRAG

BRIGHAM CITY - COMMUNITY MITIGATION STRATEGIES

Protecting Future Residents and Property

Jurisdiction	Hazard	Goal	Action	Action (For NFIP Compliance, if Applicable)	Priority (High, Medium, Low)	Time-frame (Year)	Potential Funding Sources	Responsible Entity	Estimated Cost	Resources
Brigham City	Earthquake	Protect future residents and property	Seismic upgrade of Brigham City Chamber of Commerce Building	N/A	High	2017	Brigham City, FEMA Grants, Historical Preservation	Brigham City and Chamber of Commerce	$350,000	UGS, County
Brigham City	Earthquake	Protect future residents and property	Complete seismic upgrade to Brigham City Hall	N/A	High	2018	Brigham City, Grants	Brigham City	$400,000	UGS, County
Brigham City	Dam Failure	Protect future residents and property	Educate local officials and the public on potential risks from dam failure.	N/A	Medium	2017	Brigham City	Brigham City and Bureau of Reclamation/State Dam Safety	Minimal	Utah DEM, FEMA, BRAG
Brigham City	Landslide	Protect future residents and property	Determine areas of risk and educate officials and the public on risk areas, especially related to water sources and power failure. Also could affect electrical power generatior	N/A	Medium	2017	Brigham City	Brigham City, UGS	Minimal	Utah DEM, UGS, USGS
Brigham City	Slope	Protect future residents and property	Review current ordinances and mapping to determine ways to better protect future residences and property	N/A	Medium	2017	Brigham City, UGS, USGS	Brigham City	Minimal	Utah DEM, UGS, USGS
Brigham City	Wildfire	Protect future residents and property	Review current ordinances and mapping to determine ways to better protect future residences and property	N/A	Medium	2018	Brigham City, Utah FFSL	Brigham City	Minimal	Utah FFSL, County
Brigham City	Flood	Protect future residents and property	Work with FEMA, State DEM, and others to explore updating the floodplain ordinance to better protect future structures and property. Protect flood channels from future growth to mitigate damage to residents and property.	Work with state floodplain manager to make sure city is compliant with NFIP and make changes as necessary.	Medium	2017	BRAG	Brigham City, BRAG, Utah DEM	Minimal	BRAG, FEMA
Brigham City	Anything causing Power Failure	Protect future residents and property	Generator backup at the City Hall/ EOC	N/A	High	2016	Brigham City, Grants	Brigham City	$200,000	State DEM, FEMA, BRAG
Brigham City	Anything causing Power Failure	Protect future residents and property	Generator Backup of Varouis Major Culinary Water Wells	N/A	High	2016	Brigham City, FEMA Grants	Brigham City	$400,000	State DEM, FEMA, BRAG

CORRINE

Analysis of hazard risk involving the community of Corrine revealed that there is potential risk resulting from **dam failure, flood, liquefaction, and wildfire**. These hazards have varying potential to impact human life, property, infrastructure, agriculture, and recreational features within municipal boundaries. Currently, earthquakes resulting in liquefaction, as well as dam failure, and wildfire have the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts floods appear to have less potential for impacts. Other natural hazard types not mentioned were found to have no potential impacts to Corrine. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 23: Corinne Potential Loss Figures

Natural Hazards

Dam failure. Corrine has risk to dam failure involving Cutler Reservoir and would be heavily impacted in such an event. Areas most at risk include portions of the eastern and southern parts of the community, as these areas are in close proximity to the Bear River. Substantial risk to human life, structures and amenities in these areas could be effected in the case of a dam failure event.

Flood. Portions of Corrine City are at risk to flooding. Corrine participates in NFIP. Areas most susceptible to flooding are southern portion of the community. These areas are influenced by the Bear River as it enters the Bear River Bay of the Great Salt Lake. There is also some potential flood hazard in the Mill Run areas to the north. Portions of the Bear River flood plain also border most the city except its western

Corrine, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	326	104	1,838,200	12	13,272,120	14,487,660
Faults	0	0	0	0	0	0
Wildfire	294	94	12,287,864	11	1,319,900	13,280,355
Flood	81	26	1,127,852	10	3,174,986	12,073,050
Liquefaction	754	241	31,594,000	47	51,185,874	56,743,335
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.
** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Corrine, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0.82	1,230,000	0	0	0	0	5.45	2,861,250	0.09	135,000
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0.89	1,335,000	0	0	0	0	1.02	535,500	0	0
Flood	0.03	45,000	0	0	0	0	2.16	1,134,000	0	0
Liquefaction	2.9	4,350,000	0	0	0	0	18.3	9,607,500	1.24	1,860,000
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Corrine, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					1 dam
Faults					
Wildfire					
Flood					1 dam
Liquefaction	Corrine Fire Department	Corinne Early Learning Center, 1 public facility		1 place of worship	3 broadband anchors, 2 dams
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Corrine, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	697.64	52.13	0.00	0.00	0.00
Faults	0.00	0.00	0.00	0.00	0.00
Wildfire	43.65	4.91	0.00	0.00	0.00
Flood	535.64	92.92	0.00	0.00	0.00
Liquefaction	1,820.66	169.32	0.00	0.00	0.00
Landslide	0.00	0.00	0.00	0.00	0.00
Slope	0.00	0.00	0.00	0.00	0.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Corrine, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	481.89	65.68	7.73	0	0	0
Faults	0	0	0	0	0	0
Wildfire	19.6	6.02	0.12	0	0	0
Flood	470.77	65.09	7.25	0	0	0
Liquefaction	500.04	65.68	10.69	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

edge. Floods resulting in these areas pose a threat to human life, structures, critical facilities, infrastructure, and other environmental, recreational, and agricultural amenities and lands within city limits.

Liquefaction. Areas of Corrine City have moderate-high and high risk of liquefaction in the event of an earthquake. The majority of areas susceptible to high risk liquefaction exist in the lower elevation areas on the western edge of the jurisdiction that border the Bear River, and in areas along the south portion of the jurisdiction. Areas of moderate-high liquefaction risk exist throughout the rest of the community. Liquefaction has the greatest potential to Corrine with nearly 750 people at risk and nearly 300 structures.

Wildfire. Corrine is susceptible to moderate-high risk of wildfire in small portions of the city. Moderate-high risk is most closely associated with development and amenities near the Bear River in areas of grassy and shrubby vegetation types. Wildfires have the potential to impact over 300 people in the City, as well as over 100 structures.

Future Development

No concerns involving potential future development within Corrine were reported by city representatives.

Hazard Mitigation Strategies

Table 24: Corinne Mitigation Strategies

**Corinne did not provide mitigation strategies for this plan update.*

DEWEYVILLE

Analysis of hazard risk involving the community of Deweyville revealed that there is potential risk resulting from **dam failure, faults, flood, liquefaction, landslide, steep slopes, and wildfire**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, earthquakes resulting in liquefaction, as well as wildfire have the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from dam failures, faults, floods, landslides, and steep slopes appear to have less potential for impacts, yet still pose risks. Other natural hazard types not mentioned were found to have no potential impacts to Deweyville. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 25: Deweyville Potential Loss Figures

Natural Hazards

Dam failure. Deweyville's risk of dam failure involves the western portions of the jurisdiction that border the Bear River. If Cutler Dam were to become breached, populations, structures, infrastructure, lands, and amenities adjacent the Bear River could suffer serious impacts. Currently, there appears to be little development in this area, so widespread impacts appear limited.

Faults. Deweyville has risk of fault damage in along a portion the northern portion of the Wasatch Fault. The eastern portions of the town, especially areas of the foothills and bench, lie along portions of the fault, which historically is the most overdue for activity in the region. Human life, structures, and other amenities in the fault zone could suffer damage in the event of a large earthquake, however, widespread damage from faulting is not likely due to the lower amount of development in this portion of the jurisdiction.

Flood. Portions of Deweyville are at risk to flooding. Deweyville does not participate in NFIP,

Deweyville, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	3	1	436,825	3	726,520	3,621,915
Faults	9	3	1,247,574	0	0	0
Wildfire	203	65	9,680,432	5	674,945	6,036,525
Flood	3	1	436,825	3	726,520	3,621,915
Liquefaction	391	125	20,259,886	14	1,325,320	16,902,270
Landslide	59	19	3,011,439	3	166,850	3,621,915
Slope	63	20	3,755,313	1	35,955	1,207,305
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.
** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Deweyville, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0.14	73,500	0	0
Faults	0	0	0	0	2.85	361,950	4.25	2,231,250	0.15	225,000
Wildfire	0.07	105,000	0	0	4.26	541,020	7.15	3,753,750	1.09	1,635,000
Flood	0	0	0	0	0	0	0.07	36,750	0	0
Liquefaction	4.06	6,090,000	0	0	9.25	1,174,750	21.89	11,492,250	3.19	4,785,000
Landslide	0	0	0	0	0	0	1.13	593,250	0.13	195,000
Slope	0	0	0	0	0.91	115,570	3.27	1,716,750	0.75	1,125,000
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Deweyville, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					
Wildfire					
Flood					
Liquefaction					1 place of worship
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Deweyville, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	231.11	248.00	0.00	0.00	0.00
Faults	1.00	6.94	0.00	0.00	0.00
Wildfire	22.83	63.76	0.00	3.00	0.00
Flood	191.59	187.60	0.00	0.00	0.00
Liquefaction	1,794.75	1,926.69	0.00	1.00	0.00
Landslide	52.43	73.37	0.00	1.00	0.00
Slope	1.18	0.00	0.00	1.00	0.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Deweyville, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	333.1	0.37	3.5	0	0	0
Faults	0	0	2.55	0	3.24	0
Wildfire	10.93	0.13	6.16	0	3.29	0
Flood	338.15	0.37	3.41	0	0	0
Liquefaction	422.46	3.34	8.96	0	0	0
Landslide	0	0	0.14	0	0.13	0
Slope	0	0	3.48	0	1.69	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

likely because its risk of flooding is less than other communities in the region. Areas most susceptible to flooding are western portions of the community that fall with the Bear River's flood plain. Additionally, there is some risk of flood from drainages exiting the Wellsville Mountains on the eastern portion of the city. Floods resulting in these areas pose a threat to human life, structures, infrastructure, and other environmental, recreational, and agricultural amenities and lands within city limits.

Liquefaction. Areas of Deweyville Town have moderate-high and high risk of liquefaction in the event of an earthquake. The majority of areas susceptible to high risk liquefaction exist in the lower elevation areas on the western edge of the jurisdiction that border the Bear River. Areas of moderate-high liquefaction risk exist throughout the rest of the community in lower elevation area below the benches and hilly areas. Liquefaction has the greatest potential to impact human life and structures with nearly 400 people at risk and nearly 140 structures.

Landslides. Isolated portions of Deweyville could suffer potential losses to landslides. Populations, structures, infrastructure, amenities and lands that are most likely to be impacted include eastern portions of the town in proximity to the Wellsville Mountains, as well as some area along the banks of the Bear River. Landslides have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction. Nearly 60 people and 20 structures are estimated to be at risk within the jurisdiction.

Steep Slopes. Deweyville has risk associated with steep slopes within its boundaries. Areas of greatest concern have slopes of over 20%, which are commonly found in areas directly adjacent to mountainous areas of the Wellsville Mountain Range. Areas bordering streams and rivers also appear to have an increased exposure to risk. Steep slopes have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction. Nearly 60 people and 20 structures are estimated to be at risk within the jurisdiction.

Wildfire. Deweyville is susceptible to moderate-high risk of wildfire in eastern portions of the city such as the benches and hilly areas adjacent to the Wellsville Mountains. Wildfires have the potential to impact over 200 people in the City, as well as nearly 70 structures.

Future Development

No concerns involving potential future development within Deweyville were reported by city representatives.

Hazard Mitigation Strategies

**Deweyville Town did not provide mitigation strategies for this plan update.*

ELWOOD

Analysis of hazard risk involving the community of Elwood revealed that there is potential risk resulting from **dam failure, flood, liquefaction, and wildfire**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, earthquakes resulting in liquefaction, as well as wildfire have the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from dam failures, faults, floods, landslides, and slopes appear to have less potential for impacts, yet still pose risks. Other natural hazard types not mentioned were found to have no potential impacts to Elwood. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 26: Elwood Town Potential Loss Figures

Natural Hazards

Dam failure. Elwood's risk of dam failure involves the eastern portions of the jurisdiction that border the Bear River. If Cutler Dam were to become breached, populations, structures, infrastructure, lands, and amenities adjacent the Bear River could suffer serious impacts. Currently, there appears to be little development in this area, so widespread impacts appear limited.

Flood. Portions of Elwood are at risk to flooding. Elwood does not participate in NFIP, yet its risk of flooding poses risk for several aspects of the town and its population. Areas most susceptible to flooding are western portions of the community that fall with the Malad River's flood plain, as well as eastern portions of the town that fall within or border portions of the Bear River flood plain. Floods resulting in these areas pose a threat to human life, structures, critical facilities, infrastructure, and other environmental, recreational, and agricultural amenities and lands within city limits.

Elwood, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	13	4	946,472	6	1,277,720	7,243,830
Faults	0	0	0	0	0	0
Wildfire	56	18	3,876,186	5	1,325,890	6,036,525
Flood	88	28	5,503,744	13	2,840,260	15,694,965
Liquefaction	1,042	333	69,326,487	40	10,227,080	48,292,200
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.
** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Elwood, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	1.65	866,250	0	0
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0	0	0	0.24	360,000
Flood	0	0	0	0	0	0	2.34	1,228,500	0.7	1,050,000
Liquefaction	3.23	4,845,000	5.55	7,770,000	0	0	36	18,900,000	14.75	22,125,000
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Elwood, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					
Wildfire					
Flood					4 bridges
Liquefaction				1 place of worship	14 bridges, 1 dam
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Elwood, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	174.15	157.28	0.00	0.00	0.00
Faults	0.00	0.00	0.00	0.00	0.00
Wildfire	21.67	33.00	0.00	0.00	0.00
Flood	304.86	178.59	0.00	0.00	0.00
Liquefaction	4,186.75	4,694.65	0.00	3.00	0.00
Landslide	0.00	0.00	0.00	0.00	0.00
Slope	0.00	0.00	0.00	0.00	0.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Elwood, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	185.84	0.76	1.39	0	0	0
Faults	0	0	0	0	0	0
Wildfire	26.13	0	0.58	0	0	0
Flood	265.08	9.79	5.46	0	0	0
Liquefaction	361.56	11.78	20.03	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

Liquefaction. Areas of Elwood Town have moderate-high and high risk of liquefaction in the event of an earthquake. The majority of areas susceptible to high risk liquefaction exist in the lower elevation areas on the eastern edge of the jurisdiction that border the Bear River. Areas of moderate-high liquefaction risk exist throughout the rest of the community. Liquefaction has the greatest potential to impact human life and structures with over 1000 people at risk and nearly 340 structures.

Wildfire. Elwood is susceptible to moderate-high risk of wildfire in small portions of the town with steeper slopes and grassy and shrubby vegetation types. These areas are found primarily near the Bear and Malad Rivers. Wildfires have the potential to impact over 50 people in the town, as well as over 20 structures.

Future Development

No concerns involving potential future development within Elwood were reported by city representatives.

Hazard Mitigation Strategies

Table 27: Elwood Town Mitigation Strategies

ELWOOD - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Elwood	Dam Failure	Protect current residents and property	Work with the Utah Division of Water Rights and other groups to utilize Emergency Action Plans on a local level.	N/A	Low	2020	Utah Division of Water Rights, Local	Elwood and Utah Division of Water Rights	Minimal	Utah Division of Water Rights, Local
Elwood	Flood	Protect current residents and property	Using subdivision and Development regulations to regulate development in Potential flood risk areas.	N/A	High	2020	State, FEMA	Elwood	N/A	N/A
Elwood	Earthquake	Protect current residents and property	Develop or update an environmental safety zone - with identified hazard areas, disclosure/education, hazard maps	N/A	Medium	2020	State, Local	Elwood and UGS	Minimal	State, Local
Elwood	Liquefaction	Protect current residents and property	Educate current residents and businesses regarding steps to prepare old structures.	N/A	High	2020	State, Local	Elwood and UGS	Minimal	Federal, State, Local Training

ELWOOD - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Elwood	Dam Failure	Protect current residents and property	Work with the Utah Division of Water Rights and other groups to utilize Emergency Action Plans on a local level.	N/A	Low	2020	Utah Division of Water Rights, Local	Elwood and Utah Division of Water Rights	Minimal	Utah Division of Water Rights, Local
Elwood	Flood	Protect future residents and property	Update town ordinance with durable surface drainage project.	Surface drainage project	High	2020	State, Fema	Elwood	$10,000,000	State, Fema, Local
Elwood	Earthquake	Protect future residents and property	Develop and identify hazard zones	N/A	Medium	2020	State, Local	Elwood and UGS	Minimal	State, Local
Elwood	Liquefaction	Protect future residents and property	Tools in place for building codes	N/A	High	2020	State, Local	Elwood and UGS	Minimal	Federal, State, Local

FIELDING

Analysis of hazard risk involving the community of Fielding revealed that there is potential risk resulting from **liquefaction, steep slopes and wildfire**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, earthquakes resulting in liquefaction, as well as wildfire have the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from steep slopes appear to have less potential for impacts, yet still pose risks. Other natural hazard types not mentioned were found to have no potential impacts to Fielding. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Natural Hazards

Liquefaction. Areas of Fielding have moderate-high risk of liquefaction in the event of an earthquake. Areas of moderate-high liquefaction risk exist throughout the rest of the community. Liquefaction has the greatest potential to impact human life and structures with over 400 people at risk and nearly 140 structures.

Steep Slopes. Fielding has risk associated with steep slopes within its boundaries. Areas of greatest concern have slopes of over 20%, which are commonly found in hilly areas and areas bordering streams and rivers. Steep slopes have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction. An estimated 16 people and 7 structures are at risk within the jurisdiction.

Table 28: Fielding Potential Loss Figures

Fielding, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Earthquakes	0	0	0	0	0	0
Wildfire	391	125	16,302,576	10	258,492	12,073,050
Flood	0	0	0	0	0	0
Liquefaction	426	136	17,853,623	11	415,256	13,280,355
Landslide	0	0	0	0	0	0
Slope	16	5	760,486	2	4,800	2,414,610
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.
** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Fielding, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Earthquakes	0	0	0	0	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0	1.66	871,500	0	0
Flood	0	0	0	0	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0	5.71	2,997,750	0	0
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0.11	57,750	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Fielding, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					
Wildfire					
Flood					
Liquefaction	Fielding Fire Department & EMS	Fielding School		1 place of worship	4 broadband anchors
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Fielding, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	0	0	0	0	0
Wildfire	31.58	111.91	0	1	0
Flood	0	0	0	0	0
Liquefaction	112.68	263.08	0	1	0
Landslide	0	0	0	0	0
Slope	2.98	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Fielding, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Earthquakes	0	0	0	0	0	0
Wildfire	0.68	0	0	0	0	0
Flood	0	0	0	0	0	0
Liquefaction	0.95	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

Wildfire. Fielding is susceptible to moderate-high risk of wildfire in small portions of the town. Moderate-high risk is most closely associated with development and amenities near areas of greater slopes with grassy and shrubby vegetation types. Wildfires have the potential to impact over 390 people in the town, as well as over 130 structures.

Future Development

No concerns involving potential future development within Fielding were reported by city representatives.

Hazard Mitigation Strategies

**Fielding Town did not provide mitigation strategies for this plan update.*

GARLAND

Analysis of hazard risk involving the community of Garland revealed that there is potential risk resulting from **flood, liquefaction, and wildfire**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, earthquakes resulting in liquefaction, as well as wildfire have the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from flooding appear to have less potential for impacts, yet still pose risks. Other natural hazard types not mentioned were found to have no potential impacts to Garland. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 29: Garland City Potential Loss Figures

Natural Hazards

Flood. Portions of Garland are at risk to flooding. Garland does participate in NFIP as of September, 2010. Areas most susceptible to flooding are eastern portions of the community that fall with the Malad River's flood plain. Floods resulting in these areas pose a threat to human life, structures, critical facilities, infrastructure, and other environmental, recreational, and agricultural amenities and lands within city limits.

Liquefaction. Areas of Garland have moderate-high and high risk of liquefaction in the event of an earthquake. The majority of areas susceptible to high risk liquefaction exist in the lower elevation areas that border the Bear River. Areas of moderate-high liquefaction risk exist throughout the rest of the community. Liquefaction has the greatest potential to impact human life and structures with over 2200 people at risk and over 750 structures.

Garland, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	964	308	38,154,327	32	3,137,358	38,633,760
Flood	9	3	800,621	1	59,300	1,207,305
Liquefaction	2,235	714	86,721,168	62	11,757,423	74,852,910
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.
** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Garland, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0.56	840,000	0	0	0	0	3	1,575,000	0.13	195,000
Flood	0.045	67,500	0	0	0	0	0.24	126,000	0	0
Liquefaction	3.62	5,430,000	0.33	462,000	0	0	16.49	8,657,250	0.93	1,395,000
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Garland, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency	Schools/Public	Health Care	Places of	Infrastructure
Dam Failure					
Faults					
Wildfire					
Flood					2 bridges
Liquefaction	Garland Fire Station, Garland Police Department	5 schools	1 healthcare facility	4 places of worship	3 bridges, 7 broadband anchors
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Garland, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	0	0	0	0	0
Wildfire	24.59	128.41	0	0	0
Flood	28.69	0	0	0	0
Liquefaction	600.13	1029.47	0	1	0
Landslide	0	0	0	0	0
Slope	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Garland, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	1.54	0	0.44	0	0	0
Flood	12.59	0	1.37	0	0	0
Liquefaction	16.2	0	2.3	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

Wildfire. Garland is susceptible to moderate-high risk of wildfire in small portions of the city. Moderate-high risk is most closely associated with development and amenities near steeper slopes along the Malad River or areas of grassy and shrubby vegetation types, as well as urban forested areas. Wildfires have the potential to impact over 950 people in the town, as well as 340 structures.

Future Development

No concerns involving potential future development within Garland were reported by city representatives.

Hazard Mitigation Strategies

Table 30: Garland City Mitigation Strategies

GARLAND - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Garland	Flood	Protect current residents and property	Work with state, local, and other agencies to determine local flood risk and ways to prevent damage to homes and businesses.	Work with state floodplain manager regarding NFIP compliance and improvements.	High	2015	City	Garland and Utah DEM	Minimal	Utah DEM, FEMA, BRAG
Garland	Liquefaction	Protect current residents and property	Education and outreach to officials and residents.	N/A	Medium	2016	City	Garland and UGS	Minimal	Utah DEM, UGS, USGS, BRAG
Garland	Wildfire	Protect current residents and property	Meet with other surrounding jurisdictions to improve emergency response and coordination.	N/A	Medium	2016	Utah FFSL, City	Garland, Box Elder County	Minimal	Utah DEM, Utah FFSL, BRAG
Garland	Dam Failure	Protect current residents and property	Work with various government agencies to determine risk to residents.	N/A	Low	2017	Utah DEM, FEMA, BRAG	Garland, Bureau of Reclamation, Utah Dam Safety	Minimal	Utah DEM, FEMA, BRAG

GARLAND - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Garland	Flood	Protect future residents and property	Work with state, local, and other agencies to determine local flood risk and ways to prevent damage to homes and businesses.	Work with state floodplain manager regarding NFIP compliance and improvements.	High	2015-2016	N/A	Garland, Utah DEM	$55	N/A
Garland	Liquefaction	Protect future residents and property	Education and outreach to officials and residents.	N/A	Medium	2016	City	Garland and UGS	Minimal	Utah DEM, UGS, USGS, BRAG
Garland	Wildfire	Protect future residents and property	Work with Utah FFSL and others to explore the possibility of working on a WUI plan with other neighboring communities.	N/A	Medium	2016	Utah FFSL, City	Garland, Utah FFSL	Minimal	Utah DEM, Utah FFSL, BRAG
Garland	Dam Failure	Protect future residents and property	Work with Utate Dam Failure to find ways to minimize risk to future structures and residents.	N/A	Low	2017	Utah DEM, FEMA, BRAG	Garland, Bureau of Reclamation, Utah Dam Safety	Minimal	Utah DEM, FEMA, BRAG

HONEYVILLE

Analysis of hazard risk involving the community of Honeyville revealed that there is potential risk resulting from **dam failure, faults, flood, liquefaction, landslide, steep slopes, and wildfire**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, wildfire, earthquakes resulting in liquefaction, as well as landslides have the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from dam failures, faults, floods, and steep slopes appear to have less potential for impacts, yet still pose risks. Other natural hazard types not mentioned were found to have no potential impacts to Honeyville. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 31: Honeyville Potential Loss Figures

Honeyville, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	28	9	2,984,952	3	2,453,149	3,621,915
Faults	141	45	9,801,341	4	1,315,608	4,829,220
Wildfire	1,005	321	54,768,811	38	6,540,412	45,877,590
Flood	69	22	5,974,607	3	2,216,839	3,621,915
Liquefaction	645	206	45,599,874	19	5,395,556	22,938,795
Landslide	723	231	36,405,119	24	1,651,234	28,975,320
Slope	97	31	7,323,317	7	1,684,308	8,451,135
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.
** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Natural Hazards

Dam failure. Honeyville's risk of dam failure involves the western portions of the jurisdiction that border the Bear River. If Cutler Dam were to become breached, populations, structures, infrastructure, lands, and amenities adjacent the Bear River could suffer serious impacts. Currently, there appears to be little development in this area, so widespread impacts appear limited.

Faults. Honeyville has risk of fault damage in along a portion the northern portion of the Wasatch Fault. The eastern portions of the town, especially areas of the foothills and bench, lie along portions of the fault, which historically is the most overdue for activity in the region. Human life, structures, and other amenities in the fault zone could suffer significant damage in the event of a large earthquake, with nearly 140 people at risk and 50 structures.

Flood. Portions of Honeyville are at risk to

Honeyville, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0.22	308,000	0.6	76,200	1.46	766,500	0.08	120,000
Faults	0.85	1,275,000	0	0	1.3	165,100	3.61	1,895,250	1.52	2,280,000
Wildfire	0.71	1,065,000	0	0	9.24	1,173,480	14.4	7,560,000	4.3	6,450,000
Flood	0.58	870,000	0.45	630,000	1.44	182,880	4.72	2,478,000	3.61	5,415,000
Liquefaction	6.76	10,140,000	3.47	4,858,000	14.36	1,823,720	49.15	25,803,750	7.9	11,850,000
Landslide	0.17	255,000	0.04	56,000	2.74	347,980	9.65	5,066,250	1.92	2,880,000
Slope	0.12	180,000	0	0	3.79	481,330	3.29	1,727,250	2.65	3,975,000
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Honeyville, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					1 bridge
Faults					
Wildfire					
Flood					2 bridges
Liquefaction	BE Central Fire, Honeyville Fire Department	Head Start Honeyville		2 places of worship	4 bridges, 2 dams, 3 broadband anchors
Landslide	Box Elder Central Fire District, Honeyville Fire Department, Honeyville Ambulance Services, Honeyville Ambulance			1 place of worship	3 broadband anchors
Slope					1 dam
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Honeyville, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	794.93	253.27	0.00	0.00	0.00
Faults	438.96	5.93	3.29	1.00	0.00
Wildfire	1,463.80	335.44	1.83	1.00	0.00
Flood	1,555.25	1,089.04	31.39	0.00	0.00
Liquefaction	8,124.37	1,204.65	31.83	1.00	0.00
Landslide	618.67	3.33	0.09	0.00	0.00
Slope	86.77	14.87	2.42	1.00	0.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Honeyville, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	253.27	0.00	4.57	0.00	0.00	0.00
Faults	5.93	3.29	2.78	0.00	0.00	1.00
Wildfire	335.44	1.83	11.61	0.00	1.73	5.00
Flood	1,089.04	31.39	14.51	0.00	0.00	0.00
Liquefaction	1,204.65	31.83	19.88	0.00	0.00	0.00
Landslide	3.33	0.09	2.65	0.00	0.29	4.00
Slope	14.87	2.42	5.56	0.00	0.96	4.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00	0.00

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

flooding. Honeyville does participate in NFIP. Areas most susceptible to flooding are eastern portions of the community bordering the Wellsville Mountains, local areas canals, Salt Creek, and portions of the Bear River Flood Plain. Floods resulting in these areas pose a threat to human life, structures, critical facilities, infrastructure, and other environmental, recreational, and agricultural amenities and lands within city limits.

Liquefaction. Areas of Honeyville have moderate-high and high risk of liquefaction in the event of an earthquake. The majority of areas susceptible to high risk liquefaction exist in the lower elevation areas in the southern portion of the jurisdiction near Salt Creek as well as near portions of the Bear River along the western edge of the jurisdiction. Areas of moderate-high liquefaction risk exist throughout the rest of the community, except the higher elevation areas on the east side of the jurisdiction. Liquefaction has the 3rd greatest potential to impact human life and structures with over 640 people at risk and nearly 220 structures.

Landslides. Isolated portions of Honeyville could suffer potential losses to landslides. Populations, structures, infrastructure, amenities and lands that are most likely to be impacted include eastern portions of the town in adjacent to portions of Highway 38, as well as some area along the banks of the Bear River. Landslides have the potential to impact life, property, critical facilities, infrastructure, and environmental, recreational and agricultural features in the jurisdiction. Landslides have the 2nd greatest potential to impact human life and structures with over 720 people and nearly 250 structures at risk, including emergency response facilities.

Steep Slopes. Honeyville has risk associated with steep slopes within its boundaries. Areas of greatest concern have slopes of over 20%, which are commonly found in areas directly adjacent to mountainous areas of the Wellsville Mountain Range. Areas bordering streams, rivers, and drainages also appear to have an increased exposure to risk. Steep slopes have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction. Ninety-seven people and 38 structures are estimated to be at risk within the jurisdiction.

Wildfire. Honeyville is susceptible to moderate-high risk of wildfire in eastern portions of the city such as the benches and hilly areas adjacent to the Wellsville Mountains, as well as some lower lying grassy and shrubby areas in the town. Wildfires have the potential to impact the greatest number of people in the town, with possibly over 1000 people and 350 structures at risk.

Future Development

No concerns involving potential future development within Honeyville were reported by city representatives.

Hazard Mitigation Strategies

Table 32: Honeyville Mitigation Strategies

HONEYVILLE - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Honeyville	Earthquake / Fault / Liquefaction	Protect current residents and property	Work with local officials and neighboring communities to determine local earthquake risk to residents.	N/A	Medium	2017	City	Honeyville, UGS	Minimal	State, County, BRAG
Honeyville	Flood	Protect current residents and property	Determine risk to local residents from flood prone areas east of town.	Work with State floodplain manager to be compliant with NFIP.	Medium	2017	City	Honeyville, Utah DEM	Minimal	Utah DEM, FEMA, BRAG
Honeyville	Slope	Protect current residents and property	Work with state and local agencies to determine local risk to high slope areas and risk to residents.	N/A	Medium	2017	City	Honeyville, UGS	Minimal	UGS, USGS, BRAG
Honeyville	Wildfire	Protect current residents and property	Work with Utah FFSL to discuss possibility of WUI plan.	N/A	High	2017	State, County	Honeyville, Utah FFSL	$100,000	Utah FSSL, Local
Honeyville	Dam Failure	Protect current residents and property	Educate citizens on possibility of dam failure and train emergency response.	N/A	Low	2017	City	Honeyville, Bureau of Reclamation, Utah Dam Safety	Minimal	State, County
Honeyville	Dam Failure	Protect current residents and property	Educate citizens on possibility of dam failure and train emergency response.	N/A	Low	2017	City	Honeyville, Bureau of Reclamation, Utah Dam Safety	Minimal	State, County
Honeyville	Landslide	Protect current residents and property	Education and work with UGS to update hazard mapping.	N/A	Medium	2017	City, Utah UGS	Honeyville, UGS	Minimal	BRAG, Utah UGS, Engineering Firms

HONEYVILLE - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Honeyville	Earthquake / Liquefaction/ Fault	Protect future residents and property	Education and review future faults/ liquefaction- review ordinances to see if there area ways to better protect future homes from earthquake damage.	N/A	Medium	2017	City	Honeyville, UGS	Minimal	State, County, BRAG
Honeyville	Flood	Protect future residents and property	Review current ordinances to see if more can be done to protect future residents and property.	Work with State floodplain manager to be compliant with NFIP.	Medium	2018	City	Honeyville, Utah DEM	Minimal	Utah DEM, FEMA, BRAG
Honeyville	Slope	Protect future residents and property	Explore possiblity of more strict sensitive lands ordinance which includes steep slope areas.	N/A	Medium	2019	City	Honeyville, UGS	Minimal	UGS, USGS, BRAG
Honeyville	Wildfire	Protect future residents and property	Education and Improve on Emergency Response staff and equipment	N/A	High	2017	State, County	Honeyville, Utah FFSL	$100,000	Utah FSSL, Local
Honeyville	Dam Failure	Protect future residents and property	Educate residents on conservation in hazard areas. Ordinance revisions	N/A	Low	2017	City	Honeyville, Bureau of Reclamation, Utah Dam Safety	Minimal	State, County
Honeyville	Dam Failure	Protect future residents and property	Educate residents on conservation in hazard areas. Ordinance revisions	N/A	Low	2017	City	Honeyville, Bureau of Reclamation, Utah Dam Safety	Minimal	State, County
Honeyville	Landslide	Protect future residents and property	Education and update hazard mapping	N/A	Medium	2017	City, Utah UGS	Honeyville, UGS	Minimal	BRAG, Utah UGS, Engineering Firms

HOWELL

Analysis of hazard risk involving the community of Howell revealed that there is potential risk resulting from **dam failure, steep slopes, and wildfire**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, dam failure has the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from steep slopes and wildfire appear to have less potential for impacts, yet still pose risks. Other natural hazard types not mentioned were found to have no potential impacts to Howell. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 33: Howell Town Potential Loss Figures

Natural Hazards

Dam failure. Howell's risk of dam failure involves portions of the jurisdiction that border the Blue Creek drainage below Blue Creek Dam. This area is located in the center of jurisdiction. If Blue Creek Dam were to become breached, populations, structures, infrastructure, lands, and amenities adjacent the Bear River could suffer serious impacts. Dam failure is likely to cause the greatest loss of human life in the community of all natural disasters. Currently, there appears to be enough development in this area to impact nearly 50 people and 22 structures.

Slopes. Howell has risk associated with steep slopes within its boundaries. Areas of greatest concern have slopes of over 20%, which are commonly found in hilly and mountainous areas and areas bordering drainages, streams and rivers. Steep slopes have the

Howell, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	50	16	1,290,248	6	439,837	7,243,830
Faults	0	0	0	0	0	0
Wildfire	16	5	636,934	8	553,035	9,658,440
Flood	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	16	5	670,841	4	418,103	4,829,220
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.
** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Howell, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0.2	280,000	0	0	3.22	1,690,500	0.88	1,320,000
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0	0	0.2	280,000	0	0	2.33	1,223,250	0	0
Flood	0	0	0	0	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0	0	0	0	0
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	4.57	2,399,250	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Howell, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					1 dam
Faults					
Wildfire					
Flood					
Liquefaction					
Landslide					
Slope					2 bridges
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Howell, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns	
	Agricultural	Farming	Grazing	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	1,768.60	198.95	0.00	0.00	0.00
Faults	0.00	0.00	0.00	0.00	0.00
Wildfire	735.45	322.24	0.00	0.00	0.00
Flood	0.00	0.00	0.00	0.00	0.00
Liquefaction	0.00	0.00	0.00	0.00	0.00
Landslide	0.00	0.00	0.00	0.00	0.00
Slope	471.40	0.00	0.00	0.00	0.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Howell, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	837.98	133.91	16.56	0	0	0
Faults	0	0	0	0	0	0
Wildfire	25.88	0.26	5.94	0	0	0
Flood	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	14.35	9.04	10.15	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction. An estimated 16 people and 9 structures are at risk within the jurisdiction.

Wildfire. Howell is susceptible to moderate-high risk of wildfire in isolated portions of the town, such as the benches and hilly areas adjacent to the mountainous areas and areas with steeper slopes or grassy and shrubby vegetation. Wildfires have the potential to impact an estimated 16 people in the town, as well as nearly 13 structures.

Future Development

No concerns involving potential future development within Howell were reported by community representatives.

Hazard Mitigation Strategies

Table 34: Howell Mitigation Strategies

HOWELL - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Howell	Wildfire	Protect current residents and property	Install fire hydrant on south end to fill water trucks	N/A	Medium	2017	Howell Town	Howell	$2,500	Howell Town Water Fund
Howell	Flood-Dam Failure	Protect current residents and property	Follow up on information received from test holes	N/A	Medium	2017	Local	Howell	Minimal	Bureau of Reclamation, Blue Creek Irrigation Co.
Howell	Earthquake	Protect current residents and property	Identify structures requiring retrofit	N/A	Medium	2017	State or Federal	Howell, UGS	$50,000	DHS, FEMA, BRAG

HOWELL - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Howell	Wildfire	Protect future residents and property	Install fire hydrant on south end to fill water trucks	N/A	Medium	2017	Howell Town	Howell	$2,500	Howell Town
Howell	Flood-Dam Failure	Protect future residents and property	Follow up on information received from test holes	Follow up on information received from test holes	Medium	2017	Local, County	Howell	N/A	Bureau of Reclamation, Blue Creek Irrigation Co.
Howell	Earthquake	Protect future residents and property	Incorporate Emergency Plan	N/A	Medium	2017	County	Howell, UGS	Minimal	County

MANTUA

Analysis of hazard risk involving the community of Mantua revealed that there is potential risk resulting from **dam failure, faults, floods, liquefaction, landslide, steep slopes, and wildfire**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, dam failure and floods create the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from steep slopes, wildfire, and landslides appear to have less potential for impacts, yet still pose risks to human life. Liquefaction and faults also pose a degree of risk, however, these risks are substantially less as human life is not as greatly in jeopardy. Other natural hazard types not mentioned were found to have no potential impacts to Mantua. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 35: Mantua Potential Loss Figures

Natural Hazards

Dam failure. Mantua's risk of dam failure involves the portions of the jurisdiction located below Mantua Reservoir. If Mantua Reservoir were to become breached, populations, structures, infrastructure, lands, and amenities adjacent the dam could suffer serious impacts. Dam failure is the greatest risk to human life and structures in the community with potential to impact over 200 residents and nearly 80 structures.

Faults. Mantua has risk of fault damage in along eastern portions of the town. Widespread damage from faulting is not likely due to the lower amount of development in this portion of the jurisdiction. No threats to life or structures are currently expected within the jurisdiction.

Flood. Portions of Mantua are at risk to flooding. Mantua does participate in NFIP as areas within the jurisdiction have substantial risk to impacts. Areas most susceptible to flooding are portions of the community bordering Mantua Reservoir, as well as por-

Mantua, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	219	70	10,666,853	11	434,808	13,280,355
Faults	0	0	0	0	0	0
Wildfire	50	16	2,854,704	5	108,242	6,036,525
Flood	97	31	4,222,315	7	242,907	8,451,135
Liquefaction	0	0	0	0	0	0
Landslide	13	4	761,773	3	57,177	3,621,915
Slope	41	13	2,137,038	6	218,422	7,243,830
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.
** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Mantua, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	4.33	2,273,250	0.12	180,000
Faults	0	0	0	0	0	0	0.16	84,000	0	0
Wildfire	0	0	0	0	0	0	1.37	719,250	0.08	120,000
Flood	0	0	0	0	0	0	1.48	777,000	0.05	75,000
Liquefaction	0	0	0	0	0	0	20.74	10,888,500	0	0
Landslide	0	0	0.26	364,000	0	0	1.49	782,250	0	0
Slope	0	0	0	0	0	0	2.83	1,485,750	0.4	600,000
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Mantua, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure	Mantua Police Dept.				1 bridge, 1 broadband anchor, 1 dam
Faults					
Wildfire					
Flood					1 bridge, 2 dams
Liquefaction	Mantua Police Dept., Mantua Fire Dept.			1 place of worship	1 bridge, 3 broadband anchors, 3 dams
Landslide					
Slope					1 bridge
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Mantua, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	177.84	284.36	0	0	0
Faults	99.53	0.86	0	0	0
Wildfire	15.9	23.69		0	0
Flood	16.14	59.82	0	1	
Liquefaction	0	0	0	0	0
Landslide	18.9	26.9		0	0
Slope	17.08	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Mantua, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	#of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	77.12	18.79	2.43	0	0	0
Faults	0	0	0.65	0	0	0
Wildfire	2.11	0	1.98	0	0	0
Flood	531.8	518.58	5.3	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0.41	0	1.1	0	0	0
Slope	4.75	2.91	3.22	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

tions of the Big Creek drainage below the reservoir and areas of Box Elder Creek. Floods resulting in these areas pose a threat to human life, structures, critical facilities, infrastructure, and other environmental, recreational, and agricultural amenities and lands within city limits.

Liquefaction. Areas of Mantua have risk of liquefaction in the event of an earthquake. Liquefaction does not appear to pose a great risk to human life in the jurisdiction. However there is some risk to critical facilities, as well as some infrastructure.

Landslides. Isolated portions of Mantua could suffer potential losses to landslides. Populations, structures, infrastructure, amenities and lands that are most likely to be impacted include western and northern portions of the town west of Highway 89/91. Landslides have the potential to impact life, structures, infrastructure, environmental, and agricultural features in the jurisdiction. Landslides have potential to impact human life and structures with an estimated 13 people and 7 structures at risk.

Steep Slopes. Mantua has risk associated with steep slopes within its boundaries. Areas of greatest concern have slopes of over 20%, which are commonly found in hilly and mountainous areas, and areas bordering drainages, streams and rivers. Steep slopes have the potential to impact life, property, infrastructure, and other features in the jurisdiction. An estimated 41 people and 19 structures are at risk within the jurisdiction.

Wildfire. Mantua is susceptible to moderate-high risk of wildfire in isolated portions of the town, such as the benches and hilly areas adjacent to the mountainous areas and areas with steeper slopes or grassy and shrubby vegetation. Wildfires have the potential to impact an estimated 50 people in the town, as well as nearly 20 structures.

Future Development

No concerns involving potential future development within Mantua were reported by community representatives.

Hazard Mitigation Strategies

Table 36: Mantua Town Mitigation Strategies

MANTUA - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Mantua	Dam Failure	Protect current residents and property	Work with Utah Dam Safety and other groups to utilize Emergency Action Plans on a local level.	N/A	Low	2016	Utah Division of Water Rights, Local	Mantua, Utah Dam Safety	Minimal	Utah Division of Water Rights, Local
Mantua	Wildfire	Protect current residents and property	Map and assess vulnerability to wildfire. Talk with Utah FSSL about writing a community wildfire protection plan and encourage fire wise ordinances and buildings.	N/A	Low	2016	Utah FSSL, Local	Mantua, Utah FFSL	Minimal	Utah FSSL, Local
Mantua	Flood	Protect current residents and property	Reconcile current development with soon to be adopted FEMA floodplain maps for Box Elder County for NFIP communities. For non-NFIP communities, talk with Utah ESHS about the benefits of NFIP.	Investigate benefits of NFIP compliance vs. Non compliance for town and residents.	High	2015-2016	FEMA, Local	Mantua, Utah DEM	Minimal	FEMA, Utah ESHS
Mantua	Landslide	Protect current residents and property	Develop or update an environmental safety zone - with identified hazard areas, disclosure/education, hazard maps	N/A	Low	2016	State, Local	Mantua, UGS	Minimal	State, Local
Mantua	Earthquake	Protect current residents and property	Map and assess community vulnerability to seismic hazards.	N/A	Low	2015	State, Local	Mantua, UGS	Minimal	State, Local

MANTUA - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Mantua	Dam Failure	Protect future residents and property	Review current town ordinance to determine if changes are required to prevent the endangerment of future structures.	N/A	Low	2016	Utah Division of Water Rights, Local	Mantua, Utah Dam Safety	Minimal	Utah Division of Water Rights, Local
Mantua	Wildfire	Protect future residents and property	Reduce the risk through land use planning within the land use management code.	N/A	Low	2016	Utah FSSL, Local	Mantua, Utah FFSL	Minimal	Utah FSSL, Local
Mantua	Flood	Protect future residents and property	Review flood plain maps for Box Elder County, determine if areas within town limits are affected. Consider what if any action should be taken. Identify flood plain in town emergency preparedness plan, with actions to be taken.	N/A	High	2015-2016	FEMA, Local	Mantua, Utah DEM	Minimal	FEMA, Utah ESHS
Mantua	Landslide	Protect future residents and property	Manage development in landslide hazard areas.	N/A	Low	2016	State, Local	Mantua, UGS	Minimal	State, Local
Mantua	Earthquake	Protect future residents and property	Incorporate earthquake mitigation into local planning. Protect critical facilities and infrastructure to reduce potential damage to critical facilities and infrastructures.	N/A	Low	2015	State	Mantua, UGS	Minimal	State

PERRY

Analysis of hazard risk involving the community of Perry revealed that there is potential risk resulting from **dam failure, faults, flood, liquefaction, landslide, steep slopes, and wildfire**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, wildfire, earthquakes resulting in liquefaction and fault damage, and dam failure have the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from floods, landslides, and steep slopes appear to have less potential for impacts, yet still pose risks. Other natural hazard types not mentioned were found to have no potential impacts to Perry. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 37: Perry City Potential Loss Figures

Natural Hazards

Dam failure. Perry's risk of dam failure involves the portions of the jurisdiction located below the Three Mile Creek Dam, which is a retention basin for Perry Canyon. If the dam were to become breached, populations, structures, infrastructure, lands, and amenities adjacent the dam could suffer serious impacts. Dam failure is the 4th greatest risk to human life and structures in the community with potential to impact over 500 residents and nearly 200 structures.

Faults. Perry has risk of fault damage in along a portion the northern portion of the Wasatch Fault. The eastern portions of the town, especially areas of the foothills and bench, lie along portions of the fault, which historically is the most overdue for activity in the region. Human life, structures, and other amenities in the fault zone could suffer damage in the event of a large earthquake. Damage in the fault zone could result in the 3rd greatest risk to human life with over

Perry, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	582	186	39,335,240	8	1,427,234	9,658,440
Faults	930	297	68,546,347	25	9,512,139	30,182,625
Wildfire	3,230	1,032	228,609,539	58	32,732,408	70,023,690
Flood	25	8	1,678,900	1	665,000	1,207,305
Liquefaction	736	235	53,730,878	25	19,393,095	30,182,625
Landslide	38	12	1,912,842	3	133,635	3,621,915
Slope	72	23	9,146,313	4	2,607,700	4,829,220
Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.
** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Perry, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	4.67	2,451,750	0	0
Faults	1.82	2,730,000	1.19	1,666,000	3.45	438,150	15.95	8,373,750	2.5	3,750,000
Wildfire	0.07	105,000	0	0	2.6	330,200	15.77	8,279,250	3.05	4,575,000
Flood	0	0	0	0	0.58	73,660	0.74	388,500	0.53	795,000
Liquefaction	3.73	5,595,000	0	0	4.03	511,810	58.31	30,612,750	0.53	795,000
Landslide	0	0	0	0	0.64	81,280	1.95	1,023,750	0.73	1,095,000
Slope	0	0	0	0	2.35	298,450	5.26	2,761,500	1.68	2,520,000
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Perry, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure	EMS Perry, Perry Police Dept.			1 place of worship	1 broadband anchor
Faults		Three Mile Creek School			2 bridges, 1 broadband anchor
Wildfire					
Flood					1 dam
Liquefaction	Perry Police Dept., EMS Perry	2 schools	3 healthcare facilities		3 bridges, 4 dams, 4 broadband anchors
Landslide					
Slope					1 dam
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Perry, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# Farms	# of Barns
Dam Failure	260.76	361.20	0.00	1	0.00
Faults	688.80	839.69	0.00	0.00	0.00
Wildfire	454.51	644.24	0.00	0.00	0.00
Flood	111.47	93.41	0.00	0.00	0.00
Liquefaction	1,866.73	1,835.40	0.00	0.00	0.00
Landslide	73.36	45.18	0.00	0.00	0.00
Slope	27.96	0.00	0.00	0.00	0.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Perry, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	3.44	0	1.09	0	0	0
Faults	22.77	4.31	5.24	0	3.89	9
Wildfire	151.07	1.39	6.42	0	3.95	8
Flood	415.65	60.33	2.76	0	0.59	3
Liquefaction	757.52	66.75	8.88	0	0	0
Landslide	0	0.12	0.97	0	0.86	7
Slope	0.05	0.09	3.29	0	3.7	9
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

900 people at risk. Additionally, over 325 structures are at risk.

Flood. Portions of Perry are at risk to flooding. Perry does participate in NFIP as areas within the jurisdiction have substantial risk to impacts. Areas most susceptible to flooding are portions of the community west of I-15. Eastern drainages originating in the Wasatch Mountains also pose risk, such as Three Mile Creek and Black Slough drainages. Floods resulting in these areas pose a threat to human life, structures, critical facilities, infrastructure, and other environmental, recreational, and agricultural amenities and lands within city limits.

Liquefaction. Areas of Perry have high risk of liquefaction in the event of an earthquake. The majority of areas susceptible to high risk liquefaction exist in the lower elevation areas to the west of Highway 89. Liquefaction has the 3rd greatest potential to impact human life and structures with over 700 people at risk and nearly 250 structures.

Landslides. Isolated portions of Perry could suffer potential losses to landslides. Populations, structures, infrastructure, amenities and lands that are most likely to be impacted include eastern portions of the town in adjacent to portions of Highway 89, as well as some area along the Wasatch Front Mountain Range. Landslides have the potential to impact life, structures, infrastructure, and environmental, recreational and agricultural features in the jurisdiction. Landslides have the potential to impact human life and structures with an estimated 38 people and nearly 15 structures at risk.

Steep Slopes. Perry has risk associated with steep slopes within its boundaries. Areas of greatest concern have slopes of over 20%, which are commonly found in areas directly adjacent to mountainous areas of the Wasatch Mountain Range. Areas bordering streams, rivers, and drainages also appear to have an increased exposure to risk. Steep slopes have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction. Seventy-two people and 27 structures are estimated to be at risk within the jurisdiction.

Wildfire. Perry is susceptible to moderate-high risk of wildfire primarily in eastern portions of the city such as the benches and hilly areas adjacent to the Wasatch Mountains, as well as some lower lying grassy and shrubby areas in the town. Wildfires have the potential to impact the greatest number of people in the town, with possibly over 3,200 people and 1,075 structures at risk.

Future Development

Concerns involving new development exist for development along the east side of the city on the bench and hillsides. These areas appear to be at risk to a variety of natural hazards, such as wildfire, earthquake faulting, landslides, and steep slope failures. New developments located at the base of drainages originating in the Wasatch Mountain are also at risk to flood damage during server weather events. Any new development located below the Perry Retention Basin for Three Mile Creek would also be a risk to dam inundation.

Hazard Mitigation Strategies

Table 38: Perry City Mitigation Strategies

PERRY - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Perry	Dam Failure	Protect current residents and property	Work with the Utah Dam Safety and other groups to utilize Emergency Action Plans on a local level.	N/A	Low	2016	Utah Division of Water Rights, Local	Perry, Utah Dam Safety	Minimal	Utah Division of Water Rights, Local
Perry	Drought	Protect current residents and property	Develop process to work with county and state on regular basis to evaluate water levels and inform citizens.	N/A	Low	2017	Local	Perry, Box Elder County, Utah Climate Center	Minimal	Local, County, State
Perry	Flood	Protect current residents and property	Make sure that Perry City understands state of emergency and how to get county and state involved.	N/A	Low	2016	Local	Perry, Utah DEM	Minimal	Local
Perry	Landslide	Protect current residents and property	Develop a process when building permit is applied for and inform or handout safety zone map to all who apply.	N/A	Low	2017	Local	Perry, UGS	Minimal	Local
Perry	Severe Weather	Protect current residents and property	Develop and understand emergency protocols locally and when to declare state of emergency.	N/A	Low	2017	Local	Perry	Minimal	Local
Perry	Steep Slopes	Protect current residents and property	Work with state and other groups to utilize emergency action plans at local level.	N/A	Low	2017	State, Local	Perry, UGS	Minimal	State, Local
Perry	Earthquake	Protect current residents and property	Develop or update an environmental safety zone - with identified hazard areas, disclosure/education, hazard maps	N/A	Low	2017	State, Local	Perry, UGS	Minimal	State, Local

PERRY - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Perry	Dam Failure	Protect future residents and property	Review city ordinances and update city maps containing flood plains.	N/A	Low	2016	Local	Perry, Utah Dam Safety	Minimal	Local
Perry	Drought	Protect future residents and property	Develop handout to give to residents based on goal #1	N/A	Low	2017	Local	Perry, Box Elder County, Utah Climate Center	Minimal	Local
Perry	Flood	Protect future residents and property	Review city ordinances and update city maps with flood plains.	N/A	Low	2016	Local	Perry, Utah DEM	Minimal	Local
Perry	Landslide	Protect future residents and property	Develop or update an environmental safety zone with identified hazardous areas disclosure and education maps.	N/A	Low	2017	State, Local	Perry, UGS	Minimal	State, Local
Perry	Severe Weather	Protect future residents and property	Incorporate weather reporting into city webpage.	N/A	Low	2017	Local	Perry	Minimal	Local
Perry	Steep Slopes	Protect future residents and property	Review city ordinances and update city plans and maps.	N/A	Low	2017	Local	Perry, UGS	Minimal	Local
Perry	Earthquake	Protect future residents and property	Identify any structure that would be unsafe or needing an update.	N/A	Low	2017	State, Local	Perry, UGS	Minimal	State, Local

PLYMOUTH

Analysis of hazard risk involving the community of Plymouth revealed that there is potential risk resulting from **flood, liquefaction, steep slopes, and wildfire**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, wildfire has the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from floods, liquefaction and steep slopes appear to pose no risks to human life, yet still pose risks to other features and amenities in the community. Other natural hazard types not mentioned were found to have no potential impacts to Plymouth. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 39: Plymouth Potential Loss Figures

Natural Hazards

Flood. Portions of Plymouth are at risk to flooding. Plymouth does not participate in NFIP. Areas within the jurisdiction do not appear to have large risk to impacts, except for one commercial building and some agricultural production land. Areas most susceptible to flooding appear to be the result of adjacent water sources that are currently serviced in the town by piped drains. Should these drains or infrastructure fail, the town could see flooding occur at a greater level.

Liquefaction. Areas of Plymouth have risk of liquefaction in the event of an earthquake. Liquefaction has low risk to impact human life and structures, with most risk associated with small portions of infrastructure, agricultural lands, and environmental features.

Steep Slopes. Plymouth has risk associated with steep slopes within its boundaries. Areas of great-

Plymouth, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	113	36	4,678,671	7	20,337,429	8,451,135
Flood	0	0	0	1	43,765	1,207,305
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.
** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Plymouth, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0.01	15,000	0	0	0	0	0.39	204,750	0	0
Flood	0	0	0	0	0	0	0	0	0	0
Liquefaction	0.02	30,000	0	0	0	0	4.87	2,556,750	0	0
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Plymouth, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					
Wildfire					
Flood					
Liquefaction	Plymouth Fire and EMS Station				3 broadband anchors
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Plymouth, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	0	0	0	0	0
Wildfire	26.45	21.41	0	0	0
Flood	1.66	0.03	0	0	0
Liquefaction	2	0	0	0	0
Landslide	0	0	0	0	0
Slope	1.68	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Plymouth, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	0	0	0.02	0	0	0
Flood	0	0	0.07	0	0	0
Liquefaction	0	0	0.07	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0.03	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

est concern have slopes of over 20%, which are commonly found in hilly and mountainous areas, and areas bordering drainages, streams and rivers. Steep slopes have the potential to impact some environmental features and agricultural lands in the jurisdiction. No risk to life or structures is estimated.

Wildfire. Plymouth is susceptible to moderate-high risk of wildfire in northern and eastern portions of the town, such as the hilly areas adjacent to more mountainous areas surrounding the jurisdiction. Some lower lying grassy and shrubby areas in the town are also at risk. Wildfires have the potential to impact the greatest number of people in the town, with possibly over 110 people and 40 structures at risk.

Future Development

No concerns involving potential future development within Plymouth were reported by community representatives.

Hazard Mitigation Strategies

Table 40: Plymouth Town Mitigation Strategies

PLYMOUTH - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Plymouth	Flood	Protect future residents and property	Learn about the NFIP program and consider joining so residents can purchase flood insurance.	N/A	Low	2015	Public Safety Budget	Plymouth, Utah DEM	N/A	Area CERT
Plymouth	Earthquake	Protect future residents and property	Educate home owners on safety techniques to follow during and after an earthquake through our CERT.	N/A	Low	2015	Public Safety Budget	Plymouth, Box Elder County	$100	Area CERT
Plymouth	Wildfire	Protect future residents and property	Fire Marshal to show elected officials potential threats and educate the residents.	N/A	Low	2015	N/A	Plymouth, Box Elder County	N/A	Box Elder County Fire Marshal
Plymouth	Landslides	Protect future residents and property	Pinpoint vulnerable areas and educate the elected officials and the residents.	N/A	Low	2015	Public Safety Budget	Plymouth, UGS	$100	Area CERT
Plymouth	Steep Slopes	Protect future residents and property	Pinpoint vulnerable areas and educate the elected officials and the residents.	N/A	Low	2015	Public Safety Budget	Plymouth, UGS	$100	Area CERT

PLYMOUTH - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Plymouth	Flood	Protect future residents and property	Learn about the NFIP program and consider joining so residents can purchase flood insurance.	N/A	Low	2015	Public Safety Budget	Plymouth, Utah DEM	N/A	Area CERT
Plymouth	Earthquake	Protect future residents and property	Educate home owners on safety techniques to follow during and after an earthquake through our CERT.	N/A	Low	2015	Public Safety Budget	Plymouth, Box Elder County	$100	Area CERT
Plymouth	Wildfire	Protect future residents and property	Fire Marshal to show elected officials potential threats and educate the residents.	N/A	Low	2015	N/A	Plymouth, Box Elder County	N/A	Box Elder County Fire Marshal
Plymouth	Landslides	Protect future residents and property	Pinpoint vulnerable areas and educate the elected officials and the residents.	N/A	Low	2015	Public Safety Budget	Plymouth, UGS	$100	Area CERT
Plymouth	Steep Slopes	Protect future residents and property	Pinpoint vulnerable areas and educate the elected officials and the residents.	N/A	Low	2015	Public Safety Budget	Plymouth, UGS	$100	Area CERT

PORTAGE

Analysis of hazard risk involving the community of Portage revealed that there is potential risk resulting from **flood, liquefaction, and wildfire**. These hazards have varying potential to impact critical facilities, infrastructure, agriculture, and environmental features within municipal boundaries. Currently, wildfire has the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from floods, liquefaction and steep slopes appear to pose no risks to human life, yet still pose risks to other features and amenities in the community. Other natural hazard types not mentioned were found to have no potential impacts to Plymouth. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Natural Hazards

Flood. Portions of Plymouth are at risk to flooding. Plymouth does not participate in NFIP. Areas within the jurisdiction do not appear to have large risk to impacts, except for one commercial building and some agricultural production land. Areas most susceptible to flooding appear to be the result of adjacent water sources that are currently serviced in the town by piped drains. Should these drains or infrastructure fail, the town could see flooding occur at a greater level.

Liquefaction. Areas of Portage have high risk of liquefaction in the event of an earthquake. The limited areas are susceptible to high risk liquefaction along the eastern edge of the jurisdiction that border the Malad River. Liquefaction has the greatest potential to impact critical facilities, as well as infrastructure within the jurisdiction.

Table 41: Portage Potential Loss Figures

Portage, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0
Flood	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.
** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Portage, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0	0.09	47,250	0	0
Flood	0	0	0	0	0	0	0.13	68,250	0	0
Liquefaction	0.55	825,000	0	0	0	0	9.25	4,856,250	0	0
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Portage, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					
Wildfire					
Flood					
Liquefaction	Portage Fire and Rescue (EMS)			1 place of worship	2 broadband anchors
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Portage, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	0	0	0	0	0
Wildfire	3.7	2.22	0	0	0
Flood	40.06	0	0	0	0
Liquefaction	2.41	0	0	0	0
Landslide	0	0	0	0	0
Slope	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Portage, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0
Flood	8.21	0	0	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

Wildfire. Portage is susceptible to moderate-high risk of wildfire in western portions of the city such as the benches and hilly areas adjacent to mountainous regions, as well as some lower lying grassy and shrubby areas in the town. Wildfires have the potential to some infrastructure and agricultural lands in the jurisdiction, but are predicted to pose a risk to human life or structures within the town.

Future Development

Concerns involving new development exist for development in a canyon to the south of the town center. These areas appear to be at risk to a variety of natural hazards, such as wildfire, and steep slope failures, and flooding. New developments located at the base of drainages could also be at risk to flood damage during server weather events.

Hazard Mitigation Strategies

Table 42: Portage Town Mitigation Strategies

PORTAGE - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Portage	Earthquake	Protect current residents and property	Review and update natural hazard and earthquake plan	N/A	Low	2017	N/A	Portage, UGS	Minimal	BRAG, LOCAL, STATE, COUNTY
Portage	Wildfire	Protect current residents and property	Purchase new fire engine	N/A	High	2015	FEMA, State, CDBG	Portage, Utah DEM	$315,000	FEMA, State, BRAG
Portage	Steep Slopes	Protect current residents and property	current mapping and hazards	N/A	Medium	2017	N/A	Portage, UGS	N/A	BRAG, County
Portage	Urban Fire and Public Health	Protect current residents and property	take down old homes in town that are uninhabitable	N/A	Medium	2016	State, Federal	Portage, Utah DEM	$20,000	State

PORTAGE - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Portage	Earthquake	Protect future residents and property	Review and update natural hazard and earthquake plan	N/A	Low	2017	N/A	Portage, UGS	Minimal	BRAG, LOCAL, STATE, COUNTY
Portage	Wildfire	Protect future residents and property	Update ordinances to limit amount of hay in town	N/A	High	2016	N/A	Portage, Utah DEM	Minimal	County, State, Land use ordinance
Portage	Steep Slopes	Protect future residents and property	Update Ordinances	N/A	Medium	2017	N/A	Portage, UGS	Minimal	BRAG, State
Portage	Urban Fire and Public Health	Protect future residents and property	take down old homes in town that are uninhabitable	N/A	Medium	2016	State, Federal	Portage, Utah DEM	$20,000	State

SNOWVILLE

Analysis of hazard risk involving the community of Portage revealed that there is potential risk resulting from **wildfire**. Wildfire has varying potential to impact human life, infrastructure, agriculture, and environmental features within municipal boundaries. Currently, wildfire has the greatest potential to impact human life, property, and various community amenities based on potential loss values. Other natural hazard types not mentioned were found to have no potential impacts to Snowville. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 43: Snowville Town Potential Loss Figures

Natural Hazards

Wildfire. Snowville is susceptible to moderate-high risk of wildfire in eastern and southern portions of the city such as the benches and hilly areas adjacent to mountainous regions, as well as some lower lying grassy and shrubby areas in the town. Wildfires have the potential to impact the greatest number of people in the town, with nearly 70 people and 35 structures at risk.

Future Development

No concerns involving potential future development within Snowville were reported by community representatives.

Snowville, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	69	22	1,636,062	17	2,746,329	20,524,185
Flood	0	0	0	0	0	0
Liquefaction	0		0	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.
** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Snowville, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0	0.46	241,500	0	0
Flood	0	0	0	0	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0	0	0	0	0
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Snowville, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					
Wildfire					
Flood					
Liquefaction					
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Snowville, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	0	0	0	0	0
Wildfire	73.11	117.87	0	0	0
Flood	0	0	0	0	0
Liquefaction	0	0	0	0	0
Landslide	0	0	0	0	0
Slope	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Snowville, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	0.45	0	0.9	0	0	0
Flood	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

Hazard Mitigation Strategies

Table 44: Snowville Town Mitigation Strategies

SNOWVILLE - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Snowville	Wildfire	Protect current residents and property	Work with FFSL to determine fire risks.	N/A	High	2017	FFSL	Snowville, Utah FFSL	Minimal	FFSL, BRAG, EM
Snowville	Severe Weather	Protect current residents and property	working with rocky mountain power to improve resiliency of power and infrastructure. And also get a number of oxygen and other needs requiring power.	N/A	High	2015	Local	Snowville, Rocky Mountain Power	Minimal	Rocky Mountain Power
Snowville	Earthquake	Protect current residents and property	Work with state and local to assess risks retrofitting town hall. Also education and awareness.	N/A	Medium	2018	Utah Geological survey, Utah EM, BRAG,	Snowville, UGS, Utah DEM	Minimal	Utah Geological Survey, Utah EM, BRAG
Snowville	Dam Failure	Protect current residents and property	Assess the risk; education for residents	N/A	Low	2019	BRAG, Local	Snowville, Bureau of Reclamation, Utah Dam Safety	Minimal	State of Idaho and Utah, BRAG
Snowville	Drought	Protect current residents and property	Educate citizens for water and food preservation. Work toward implementing water conservation plan.	N/A	Medium	2017	Rural Water, Brag, Local, State	Snowville, Utah Climate Center, NOAA	Minimal	Rural Water, BRAG

SNOWVILLE - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Snowville	Wildfire	Protect future residents and property	Work with FFSL to determine fire risks.	N/A	High	2017	FFSL	Snowville, Utah FFSL	Minimal	FFSL, BRAG, EM
Snowville	Severe Weather	Protect future residents and property	working with rocky mountain power to improve resiliency of power and infrastructure. And also get a number of oxygen and other needs requiring power.	N/A	High	2015	Local	Snowville, Rocky Mountain Power	Minimal	Rocky Mountain Power
Snowville	Earthquake	Protect future residents and property	Work with state and local to assess risks retrofitting town hall. Also education and awareness.	N/A	Medium	2018	Utah Geological survey, Utah EM, BRAG,	Snowville, UGS, Utah DEM	Minimal	Utah Geological Survey, Utah EM, BRAG
Snowville	Dam Failure	Protect future residents and property	Assess the risk; education for residents	N/A	Low	2019	BRAG, Local	Snowville, Bureau of Reclamation, Utah Dam Safety	Minimal	State of Idaho and Utah, BRAG
Snowville	Drought	Protect future residents and property	Water development, develop secondary water source.	N/A	Medium	2017	USDA, Rural Water, BRAG, Local	Snowville, Utah Climate Center, NOAA, Bear River Water Conservation District	N/A	USDA, Rural Water, BRAG, Local

TREMONTON

Analysis of hazard risk involving the community of Tremonton revealed that there is potential risk resulting from **floods, liquefaction, landslide, steep slopes, and wildfire**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, wildfire and earthquakes resulting in liquefaction have the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from floods, landslides, and steep slopes appear to have less potential for impacts, yet still pose risks. Other natural hazard types not mentioned were found to have no potential impacts to Tremonton. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 45: Tremonton Potential Loss Figures

Natural Hazards

Flood. Portions of Tremonton appear at risk to flooding. Tremonton began NFIP participation in 2010. Areas within the jurisdiction associated most closely with risk include the flood plain of the Malad River, which meanders through town. Floods resulting in these areas pose a threat to human life, structures, critical facilities, infrastructure, and other environmental, recreational, and agricultural amenities and lands within city limits.

Liquefaction. Areas of Tremonton have moderate-high and high risk of liquefaction in the event of an earthquake. The majority of areas susceptible to high risk liquefaction exist in the lower elevation areas on the eastern portion of the jurisdiction that border the Malad River. Areas of moderate-high liquefaction risk exist throughout the rest of the community except the far western portion. Liquefaction has the greatest potential to impact human life and structures with

Tremonton, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	2,542	812	122,330,061	173	110,773,788	208,863,765
Flood	44	14	3,094,709	12	3,707,359	14,487,660
Liquefaction	6,482	2,071	300,699,052	260	184,647,520	313,899,300
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.
** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Tremonton, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	1.7	2,550,000	0	0	1.1	139,700	15.55	8,163,750	1.87	2,805,000
Flood	0	0	0	0	0	0	0.25	131,250	0	0
Liquefaction	5.05	7,575,000	4.83	6,762,000	1.51	191,770	59.08	31,017,000	9.75	14,625,000
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0.37	46,990	0.31	162,750	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Tremonton, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency	Schools/Public	Health Care	Places of	Infrastructure
Dam Failure					
Faults					
Wildfire					
Flood		2 public facilities			2 bridges
Liquefaction	Tremonton Fire Dept. & EMS, Tremonton Police Dept.	3 schools, 6 public facilities	7 healthcare facilities	8 places of worship	24 bridges, 13 broadband anchors
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Tremonton, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0.00	0.00	0.00	0.00	0.00
Faults	0.00	0.00	0.00	0.00	0.00
Wildfire	200.79	714.66	0.00	0.00	1.00
Flood	47.50	1.33	0.00	0.00	0.00
Liquefaction	0.00	0.00	0.00	1.00	2.00
Landslide	1,768.28	3,476.52	0.00	0.00	0.00
Slope	0.00	0.00	0.00	0.00	0.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Tremonton, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	28.05	0	2.68	13.71	0	3
Flood	41.46	0	2.24	12.58	0	3
Liquefaction	78.45	0	12.11	38.28	0	3
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

over 6,400 people at risk and over 300 structures.

Landslides. Isolated portions of Tremonton could suffer potential losses to landslides. Agricultural lands are estimated to be at risk in portions of the town. No risk to life or structures is estimated.

Steep Slopes. Tremonton has risk associated with steep slopes within its boundaries. Areas of greatest concern have slopes of over 20%, which are commonly found in hilly and mountainous areas, and areas bordering drainages, streams and rivers. Steep slopes have the potential to impact some infrastructure in the jurisdiction, but potential losses are estimated to be minimal.

Wildfire. Tremonton is susceptible to moderate-high risk of wildfire in western portions of the city, such as the benches and hilly areas adjacent to mountainous regions, as well as some lower lying grassy and shrubby areas in the town. Wildfires have the potential to impact the 2nd greatest number of people in the town, with possibly over 2,500 people and nearly 1,000 structures at risk.

Future Development

Concerns involving future development exist for earthquakes throughout the city, due to its high potential for liquefaction. Future development could potentially occur in areas along the Malad River flood plain, which would increase the exposure of human life, structures, and other amenities to flooding. Future development is likely to also continue in the northwest portion of town. Development in these areas could be more susceptible to wildfire risk.

Hazard Mitigation Strategies

Table 46: Tremonton City Mitigation Strategies

TREMONTON - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Tremonton	Wild land Urban Interface	Protect current residents and property	Continue education and project manpower assistance for defensible space in homes located within the CWPP.	N/A	High	2015	Annual FD wages budget	Tremonton City, Utah FFSL	$2,000	TFD wild land equipment and personnel
Tremonton	Earthquake	Protect current residents and property	Public awareness safety fair for earthquake dangers and recommended practices.	N/A	Medium	2016, 2019	EM budget	Tremonton, UGS	$500 (building rental)	ACH Intermediate School, local and regional vendors, local and state expert presenters.
Tremonton	Earthquake	Protect current residents and property	Public awareness campaign for earthquake preparedness (EM website, CERT Training, local preparedness presentations, booth at hospital and other safety fairs).	N/A	High	2020 the annually	EM wages and budget	Tremonton, UGS	varied	County preparedness kit, internet resources
Tremonton	Wildfire	Protect future residents and property	Monitor fire break status	N/A	Medium	2020 and annually	EM budgets	Tremonton, Utah FFSL	Varies	N/A
Tremonton	Flood	Protect current residents and property	Update ordinances as needed for NFIP compliance	planning and zoning update	Medium	2020 and annually	N/A	Tremonton, Utah DEM	N/A	N/A

TREMONTON - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Tremonton	Wild land Urban Interface	Protect future residents and property	Provide annual education for new residents on wildfire issues, invite residents to participate in CWPP projects.	N/A	Medium	2020	EM wages and expense budget	Tremonton City, Utah FFSL	minimal outside of EM budget	City buildings (public meetings)
Tremonton	Earthquake	Protect future residents and property	Update building codes for earthquake protection	N/A	High	2020 and annually	inspector budget	Tremonton, UGS	varies	N/A
Tremonton	Earthquake	Protect future residents and property	Public awareness campaign for earthquake preparedness (EM website, CERT Training, local preparedness presentations, booth at hospital and other safety fairs).	N/A	High	2020 and annually	EM wages and budget	Tremonton, UGS, Box Elder County	varied	County preparedness kit, internet resources
Tremonton	Wildfire	Protect future residents and property	Monitor fire break status	N/A	Medium	2020 and annually	EM budgets	Tremonton, Utah FFSL	Varies	N/A
Tremonton	Flood	Protect future residents and property	Update ordinances as needed for NFIP compliance	planning and zoning update	Medium	2020 and annually	N/A	Tremonton, Utah DEM	N/A	N/A

WILLARD

Analysis of hazard risk involving the community of Willard revealed that there is potential risk resulting from **faults, floods, liquefaction, landslide, steep slopes, and wildfire**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, wildfires, earthquakes resulting in liquefaction and fault zone damage, as well as landslides have the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from floods, and steep slopes appear to have less potential for impacts, yet still pose risks. Other natural hazard types not mentioned were found to have no potential impacts to Willard. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 47: Willard City Potential Loss Figures

Natural Hazards

Faults. Willard has risk of fault damage in along a section of the northern portion of the Wasatch Fault. The eastern portions of the town, especially areas of the foothills and bench, lie along portions of the fault, which historically is the most overdue for activity in the region. Human life, structures, and other amenities in the fault zone could suffer damage in the event of a large earthquake. Damage from faulting is likely to impact an estimated 47 people and nearly 30 structures.

Flood. Portions of Willard appear at risk to flooding. Willard is an NFIP participant. Areas within the jurisdiction associated most closely with risk include areas adjacent to Facer, Willard, Cook, Holmes, and Pearsons Canyons, and portions of the town near Willard Bay Reservoir. Willard Creek meanders through town from east to west and poses the greatest risk of flooding within the city. Floods resulting in these areas pose a threat to human life, structures, critical facilities, infrastructure, and other environmen-

Willard, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	47	15	6,108,935	11	5,217,838	13,280,355
Wildfire	1,687	539	100,825,948	37	9,254,891	44,670,285
Flood	91	29	8,117,945	6	1,118,593	7,243,830
Liquefaction	485	155	39,688,959	28	9,559,454	33,804,540
Landslide	876	280	44,887,987	16	1,081,105	19,316,880
Slope	13	4	1,414,597	1	149,458	1,207,305
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.
** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Willard, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0.47	705,000	1.55	2,170,000	2.13	270,510	7.88	4,137,000	2.37	3,555,000
Wildfire	2	3,000,000	0	0	3.55	450,850	11	5,775,000	2.3	3,450,000
Flood	0.15	225,000	0	0	0.21	26,670	1.67	876,750	0.26	390,000
Liquefaction	4.96	7,440,000	0	0	6.88	873,760	43.61	22,895,250	0.29	435,000
Landslide	0	0	0.15	210,000	0.5	63,500	7.28	3,822,000	0.55	825,000
Slope	0	0	0	0	0.94	119,380	1.82	955,500	1.14	1,710,000
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Willard, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency	Schools/Public	Health Care	Places of	Infrastructure
Dam Failure					
Faults					3 dams
Wildfire					
Flood					1 dam
Liquefaction	Willard Police Department, Willard Fire and First Responders,	Willard School, Willard Bay State Park Rangers		1 place of worship	2 bridges, 5 dams, 7 broadband anchors
Landslide	Willard City Fire Department and First Responders, Willard Police Dept.	Willard School			6 broadband anchors
Slope					
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Willard, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0.00	0.00	0.00	0.00	0.00
Faults	401.12	506.64	0.00	0.00	0.00
Wildfire	213.70	518.12	0.00	0.00	0.00
Flood	161.40	91.60	0.00	0.00	0.00
Liquefaction	1,471.23	1,542.88	0.00	0.00	0.00
Landslide	94.55	199.82	0.00	0.00	0.00
Slope	1.64	0.00	0.00	0.00	0.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Willard, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0.00	0.00	0.00	0.00	0.00	0.00
Faults	73.13	6.14	2.93	0.00	2.11	2.00
Wildfire	80.57	9.67	3.74	13.71	2.03	2.00
Flood	1,138.41	947.89	1.80	12.58	0.00	0.00
Liquefaction	1,362.76	974.41	1.03	38.28	0.00	0.00
Landslide	0.00	0.56	0.84	0.00	0.52	2.00
Slope	0.00	0.00	1.71	0.00	1.55	2.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00	0.00

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

tal, recreational, and agricultural amenities and lands within city limits.

Liquefaction. Areas of Willard have areas of high risk of liquefaction in the event of an earthquake. The majority of areas susceptible to high risk liquefaction exist in the lower elevation areas to the west of Highway 89. Liquefaction has the 3rd greatest potential to impact human life and structures with over 480 people at risk and nearly 175 structures.

Landslides. Isolated portions of Willard could suffer potential losses to landslides. Populations, structures, infrastructure, amenities and lands that are most likely to be impacted include portions of the town adjacent to portions of Highway 89, as well as some areas along the Wasatch Front Mountains. Landslides have the potential to impact life, property, critical facilities, infrastructure, and environmental, recreational and agricultural features in the jurisdiction. Landslides have the 2nd greatest potential to impact human life and structures with over 870 people and nearly 300 structures at risk, include emergency response facilities.

Steep Slopes. Willard has risk associated with steep slopes within its boundaries. Areas of greatest concern have slopes of over 20%, which are commonly found in areas directly adjacent to mountainous areas of the Wasatch Mountain Range. Areas bordering streams, rivers, and drainages also appear to have some increased exposure to risk. Steep slopes have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction. Thirteen people and 5 structures are estimated to be at risk within the jurisdiction.

Wildfire. Willard is susceptible to moderate-high risk of wildfire in eastern portions of the city such as the benches and hilly areas adjacent to the Wasatch Mountains, as well as some lower lying grassy and shrubby areas in the town. Wildfires have the potential to impact the greatest number of people in the town, with possibly over 1650 people and 550 structures at risk.

Future Development

Future development is expected on the southern portion of Willard in areas both to the east and west of Highway 89, with an expected 150 units on the east side of the highway, and an expected 200+ units on the west of the highway. Future development on the east side of Highway 89 may be exposed to greater risk involving wildfire, earthquake faulting, steep slopes, and landslides. In the case of extreme weather events, flooding may also occur if canyons experience large volumes of rain or snowfall. Development to the west of the Highway 89 may be exposed to greater risk involving liquefaction and landslides, as well as some risk to flooding in the case of severe weather. Care should be taken during the construction of these developments to ensure risks to hazards are mitigated prior to areas becoming populated.

Hazard Mitigation Strategies

Table 48: Willard City Mitigation Strategies

WILLARD - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Willard	Flood	Protect current residents and property	Flood control district to protect and identify areas of high flood plain.	N/A	High	2015	Property Tax	Willard, Willard Flood Control Board, Utah DEM	$6,000	DWQ, Dam Safety
Willard	Wildfire	Protect current residents and property	Certify our Fire Dept. in wild lands fire fighting	N/A	High	2015	$500 per member city budget and grants	Willard, Utah FFSL	$500 per member	Grants
Willard	Landslide	Protect current residents and property	Work with city engineer and flood control to identify areas of high risk.	N/A	High	2016	N/A	Willard, UGS	$5,000	N/A
Willard	Earthquake	Protect current residents and property	CERT Training program for residence	N/A	High	2015	Participant fee	Willard	$600	Utah State Govt
Willard	Steep Slopes	Protect current residents and property	Identify areas with Engineer and classify as sensitive zones	N/A	Medium	2016	City Budget	Willard, UGS	$200	City Budget

WILLARD - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Willard	Flood	Protect future residents and property	Keep Willard flood control running and included in future development.	N/A	High	2016	Future property taxes and building permit fees	Willard, Willard Flood Control Board, Utah DEM	$10,000	Property tax
Willard	Wildfire	Protect future residents and property	Annual wild lands firefighting training for new fire fighters	N/A	High	2016	Grants	Willard, Utah FFSL	$500 per member	County of Box Elder and State of Utah
Willard	Landslide	Protect future residents and property	Once high risk areas are identified put them in the sensitivity zone for protection from development.	N/A	High	2016	City budget	Willard, UGS	$200	City budget
Willard	Earthquake	Protect future residents and property	Ongoing CERT Training scheduled semi annually	N/A	High	2015 and for next 5 years	Participant fee	Willard	$600	State Emergency Fund
Willard	Steep Slopes	Protect future residents and property	Discourage development of sensitive zones by ordinance	N/A	High	2016	City Budget	Willard, UGS	$200	City budget

SECTION 6: CACHE COUNTY RISK ASSESSMENT & COMMUNITY SECTIONS

History and Background of Natural Hazards in Cache County

Flooding

Portions of Cache County are at threat from both riverine and flash flooding. The Bear River flows through Cache Valley, which is located on the western side of the County, and is where the majority of residents live. Many small drainages feed the Bear River, with most streams converging at Cutler Marsh before exiting the valley via Cutler Dam, and into Box Elder County. The two main tributaries of the Bear River located in Cache County are the Logan and Blacksmith Fork Rivers. The Logan River is the largest tributary of the Bear. Other tributaries of the Bear that generally enter the valley through the eastern part of the county are Summit Creek, Little Bear River, Spring Creek, Cherry Creek, High Creek and the Cub River. All of these streams and rivers, to some degree, have had some history of flooding.

Phase II of the National Pollutant Discharge Elimination System (NPDES) administered by EPA has requirements for communities to more carefully manage their storm water discharge. While driven more by water quality concerns, this provides an important opportunity for communities to better manage their storm water systems. This is critically important because for many communities an ever increasing threat to residents comes from the potential for man-made canal failure flooding. As more development has occurred, existing irrigation canals have been increasingly relied on to accommodate storm water discharge. Irrigation officials are quick to point out that the canals were never designed for such use. Most canals have lower capacities and a narrowing channel the further you go down the canal. While this design makes sense for irrigation use, it is exactly the opposite of how you would design a canal to accommodate storm water discharge. The positions of many canals in Cache County also make them susceptible to blockage by debris or ice that can result in canal failure outflows. Cache County has had a couple of near misses in this regard. Another consideration is the connection between floods and landslides. As water saturation increases, mud/sediment/debris flows can be catastrophic.

In terms of potential damage to developed residential, commercial and industrial areas, the Logan & Blacksmith Fork Rivers pose the most significant threat for residents of Cache County. Both of these rivers drain large areas and have steep well defined stream channels. Flood level flows are produced when high temperatures occur during the early spring and accelerate the watershed snow melt rate. Often this threat can be escalated when combined with early spring rains.

A number of dams are located on the Logan River in the canyon upstream of the City of Logan. Due to their relatively small size, they do little to moderate flood potential for downstream development.

The Bear River enters Cache County on the north near Preston, Idaho. Winding through the valley it eventually enters Cutler Reservoir. The risk from rising flood waters of the Bear River through Cache County is relatively minor. Land located in the Bear River flood plain has a high water table which makes development difficult. Most of adjacent land near the Bear is used for agricultural purposes. Farmers and ranchers have seemingly adapted their agricultural activities to mitigate the cyclical high flows effects of the Bear River. Much of the adjacent agricultural uses along the Bear are operated under lease agreements with PacifiCorp who owns most of Cutler Reservoir.

In terms of historical flooding impact on development, most events have been documented on streams and rivers that drain the mountainous eastern portion of Cache County and flow into western Cache Valley. Most of the significant flooding that has historically impacted developed land has occurred on the Logan and Blacksmith Fork Rivers. However, noteworthy flooding has occurred on some of the smaller streams and creeks that enter the valley near the towns of Providence, Smithfield, and Richmond.

Localized flooding has been fairly common for many years. Damage from flooding has been relatively minor overall, but devastating to individual home and property owners. The majority of flooding in Cache County has occurred on agricultural land.

Following a development pattern like many other Utah and western communities, many early European settlements in Cache County were located near the mouths of canyons. Early settlers located there for easy access to water that could be diverted for irrigation of crops and pastures as well as fertile soils well suited for agriculture. Richmond, Smithfield, Logan, Providence Millville and Hyrum are all located near the mouths of canyons that drain some portion of the adjacent Bear River Range. The Logan River has the largest drainage basin next to the Bear at 524 square miles. The Blacksmith Fork drainage basin is the next largest at roughly 287 square miles.

Analysis of areas of Cache County mapped by FEMA for communities that participate in the National Flood Insurance Program indicate some conflict related to existing development located in what has been determined to be the 100-year floodplain. These delineated and digitized floodplains were overlaid onto current county parcel data. In this way, parcels with structures in the floodplain could be identified and tallied, and potential losses to life and property could be estimated.

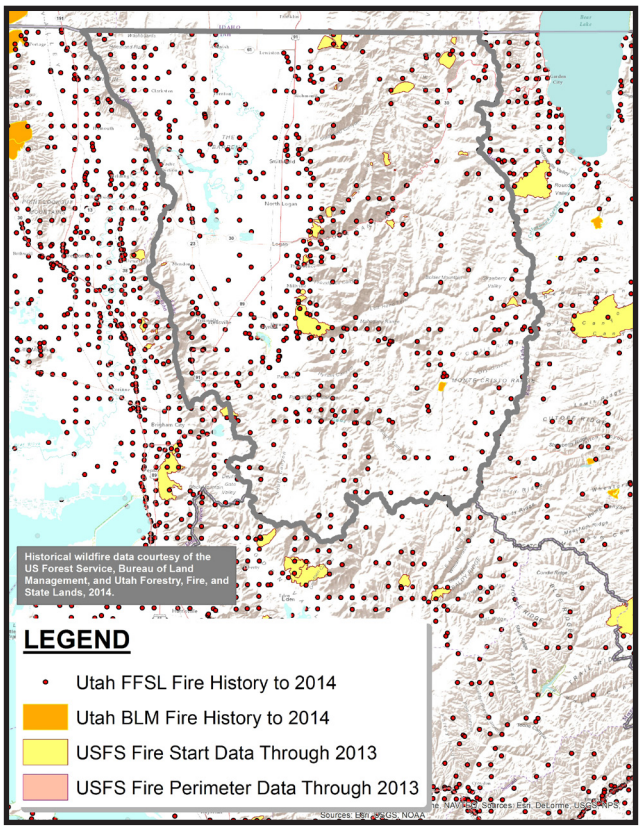
While FEMA floodplains are a great planning tool for hazard mitigation, there is much of Cache County that has never been mapped by FEMA. An August 2003 report entitled Flood Hazard Identification Study: Bear River Association of Governments by the US Army Corps of Engineers was completed to help communities without floodplain data. This study generally identified areas of flooding concern for municipalities lacking data (See Appendix B for the full report). However, this report was only intended to give communities very general estimates of where flood risk may exist. Also, many flooding events happen outside of the FEMA 100-year floodplain delineations (around 40%). There are other ways that flooding occurs as well, such as canals, reservoirs/ponds, wildfire, incorrect grading, and plugged sewer and storm water systems (Scott Stoddard, personal communication, 11/13/08). FEMA is currently updating Cache County's floodplain data, which will be useful for communities in identifying their risk to floods. Below is a discussion of flooding risks for communities in Cache County. Only those communities thought to be at risk for flooding have been included.

Wildfires

Wildfire has always had an impact on Cache County inhabitants. In August of 2007, four wildfires burned hillsides east of Providence, River Heights, and Logan City fueled by dry grasses and juniper. Some people were evacuated from their homes while others were told to be ready just in case. Luckily, no homes were lost. To a certain extent, living with wildfires will always be a part living in Cache County.

Many of the communities in Cache County are located along the base of the Bear River Mountains in Cache Valley. Paradise, Millville, Providence, River Heights, Logan, North Logan, Hyde Park City, and Richmond all have wild land-urban interface or potential interface with wildfire high risk areas. Wellsville and Mendon on the east side of the valley have potential wildfire-urban conflict for development along the base of the Wellsville Mountains.

Below is a map showing historic wildfire locations in Cache County:



Landslides/Steep Slopes

Landslide occurrences are common for portions of Cache County. The most frequent problems are associated with debris flows on alluvial fans in many of the canyon drainages. Also important to consider is the link between flooding and landslides. Saturated soils only add to the problems associated with landslides, and a combination of the flooding and landslides can be very destructive.

During the wet years of 1982 & 1983 an abnormally high numbers of landslides occurred in Cache County. A rather large land mass slid into the Porcupine Reservoir upstream of the right abutment. A slide near Nibley Road east of Hyrum occurred in the back yard of a residential home. A slide on College Hill below Utah State University blocked the Logan and Northern Irrigation Canal causing some limited flooding. The road up Millville Canyon was displaced 4 feet by a slide. A debris flow from Dry Creek above Smithfield reached the Logan, Hyde Park and Smithfield Canal (south of 300 South).

Debris flows present a significant threat for development located in the mouths of the many steep canyons located in Cache County. The dynamics of this threat changes depending on the upslope drainage conditions. Wildfire that removes sediment stabilizing vegetation can dramatically increase the risk of debris flows. The other indirect threat comes from canal flooding caused by debris flow blockage.

While there is no data that can predict landslide potential completely, the Utah Geological Survey created a landslide susceptibility map for the entire state in 2007. This is the most accurate data set to date, and was used for this analysis. However, the Utah Geological Survey is in the process of finalizing a more accurate geological hazards study specifically for Cache County. In the next update of this plan, the newer data could provide a more accurate potential loss analysis for geological hazards.

Earthquakes

Cache County is located in a seismically active region within the Intermountain Seismic Belt. The most damaging earthquake in Utah's post-European settlement history occurred near Richmond City. In 1962 a 5.7 magnitude earthquake damaged nearly three-fourths of the homes in the town. Damage to homes and buildings occurred in many surrounding areas of Cache Valley (Christenson, 1992). Some geological evidence suggests that an earthquake of seven plus magnitude has occurred in recent geological history on the West Cache Fault Zone. Logan City also suffered from a smaller earthquake of a 3.7 magnitude on July 21, 1950.

Three important fault zones exist in Cache County. The East Cache Fault bounding the eastern portion of Cache Valley, the West Cache Fault bounding the western valley, and the nearby Wasatch Fault. The majority of Cache County's population is located near the Eastern Cache Fault. Evidence points to the Temple Fork Fault as the most active in Cache County. Although miles away from the epicenter, this fault is thought to be associated with the 1962 Richmond Earthquake.

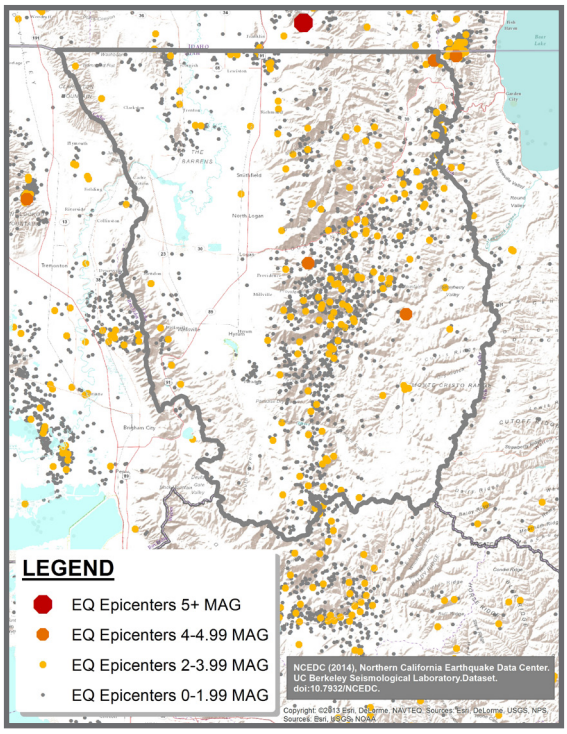
While a geological fault may not be very wide physically, damage around the fault can be detrimental. This is often referred to as the "damage zone (Susanne Janecke, personal communication, 9/25/08)." This damage zone is now thought to be much larger than recognized previously. While geologists used to recommend a general fault buffer of fifty feet on either side of the fault, they now recognize a much larger damage zone. According to the Utah Geological Survey, up thrown sides of well defined quaternary faults require planning for a 250 foot damage zone; while down thrown sides of well defined faults require planning for a 500 foot damage zone. For those faults not well defined, a general 1,000 foot damage zone should be considered (Richard Giraud, personal communication, 10/6/08; Christopher Duross, personal communication, 10/30/08; Christensen et al., 2003). Because of data inaccuracies in geologic fault data, a standard 1,000 foot damage zone was analyzed for all quaternary faults in the region.

Liquefaction is also a major concern for Cache County, as well as much of the Bear River Region. During an earthquake, soils susceptible to liquefaction such as those containing current

or historical stream and lake sandy deposits can threaten lives and damage homes and infrastructure (Utah Geological Survey, 2008). These soils can lift structures, tilt foundations, and cause major damage to infrastructure. Generally speaking, liquefaction susceptible areas in Cache County are along stream drainages and marsh/wetland areas. For this plan, two liquefaction studies were used for determining potential losses. One study was done by Utah State University and the Utah Geological Survey in 1994, and was digitized in 2001, which covered the entire county. The other was done in 2001 by the Utah Geological Survey at a more detailed scale, and only encompassed the more populated areas of the county.

The latter study is titled "Seismic-Hazard Mapping of the Central Cache Valley, Utah - A Digital Pilot Project" by McCalpin and Solomon. It provides more recent analysis and mapping of earthquake hazards for the Newton, Smithfield, Wellsville and Logan 7.5-minute USGS quadrangles. The information contained in this report is considered more accurate and the delineations more defensible.

Below is a map showing historic earthquake locations in Cache County:



Dam Failure

There are 249 regulated dams located in Cache County. Most of these dams are small detention ponds, small agricultural reservoirs, or livestock watering facilities and most pose a minimal threat to human safety or property.

Of the 249 regulated dams most are designated as "low hazard" by the State of Utah Division of Water Rights. As defined by state statue, low hazard dams are those dams which, if they fail, would cause minimal threat to human life, and economic losses would be minor or limited to damage sustained by the owner of the structure.

A total of 3 dams have been designated as "moderate hazard" by the State of Utah in Cache County. Moderate Hazard dams which, if they fail, have a low probability of causing loss of human life, but would cause appreciable property damage, including damage to public utilities.

The State of Utah has rated 7 dams in Cache County as "high hazard" which means that, if they fail, have a high probability of causing loss of human life or extensive economic loss, including damage to critical public utilities.

Dam failure inundation maps and emergency action plans for each of the high risk dams can be found on the Utah Division of Water Right's website at: http://waterrights.utah.gov/cgi-bin/damview.exe?Startup.

High Hazard Dams

Hyrum Dam

Hyrum Dam and Reservoir are located directly south of Hyrum City on the Little Bear River. The dam is rated as a high hazard facility and the inundation area flows westerly towards Wellsville five miles away, and then into Cutler Marsh.

Logan City – Dry Canyon

This dam was newly constructed to mitigate flooding and potential from the Dry Canyon drainage. Many newer homes were constructed at the bottom of this canyon which can become flooded in the spring months. It is high risk, and many homes west of the dam could be damaged if

the dam was breached.

Logan First Dam

This facility located near the mouth of Logan Canyon has a high hazard rating. The inundation area consists of most of the Island area, much of the landscape around the Logan River Golf Course and County Fairgrounds, and continuing west towards Cutler Reservoir. There is a significant population as well as large numbers of homes and businesses within the inundation area.

Porcupine Dam

Porcupine Dam is located about eight miles upriver from the town of Paradise on the east fork of the Little Bear River. The dam has a high hazard rating. There is no inundation map associated with this dam. This dam was recently drained and some reinforcement work performed.

Newton Dam

Newton dam was constructed by the Bureau of Reclamation on Clarkston Creek three miles north of the town of Newton. This facility has a high hazard rating. There is no inundation map associated with this dam.

Tony Grove Lake Dam

This dam was renovated several years ago for seismic retrofitting and inlet/outlet construction. It has a high hazard rating, but would not likely affect any residential or commercial structures in the event of a failure.

Blacksmith Fork Upper Dam

No information available

Natural Hazard Profiles

Table 49: Cache County Flood Hazard Profile

Frequency	Some flooding occurs nearly every year in Cache County
Severity	Moderate
Location	Generally along rivers, streams, and canals.
Seasonal Pattern	Spring flooding as a result of snowmelt. Mid-late summer cloudburst events.
Duration	A few hours or up to three weeks for snowmelt flooding
Speed of Onset	1-6 hours
Probability of Future Occurrences	High - for delineated floodplains there is a 1% chance of flooding in any given year.

Table 50: Cache County Wildfire Hazard Profile

Frequency	Annually (to some extent)
Severity	Severe
Location	Mostly along the Bear River Mountains east of Cache Valley or the Wellsville Mountains west of Cache Valley.
Seasonal Pattern	Generally the worst from early July to mid September (depends on drought conditions)
Duration	A few hours to two weeks
Speed of Onset	1-12 hours
Probability of Future Occurrences	High (Based on data from 1973-2008, there is an 11.4% chance a fire of at least 1,000 acres will occur every year)

Table 51: Cache County Landslide/Steep Slopes Hazard Profile

Frequency	Periodic
Severity	Moderate
Location	Generally located in areas with steeper slopes. Debris flows mostly occur at the mouth of canyon drainages.
Seasonal Pattern	Generally the worst in the wetter spring months.
Duration	Up to two weeks
Speed of Onset	No warning
Probability of Future Occurrences	High

Table 52: Cache County Earthquake Hazard Profile

Frequency	Low magnitude events occur frequently. Larger magnitude events are rare (although not necessarily on geological time).
Severity	Potentially Catastrophic
Location	Entire county with highest frequency in the Bear River Mountain Range. Surface fault rupture is likely to occur in fault zones, and liquefaction would impact large areas of land in the lower elevations
Seasonal Pattern	None
Duration	A few minutes with potential aftershocks
Speed of Onset	No warning
Probability of Future Occurrences	Based on 1962-2001 data, there is a 20.5% chance every year of an earthquake of 3.0 magnitude or greater.

Table 53: Cache County Dam Failure Hazard Profile

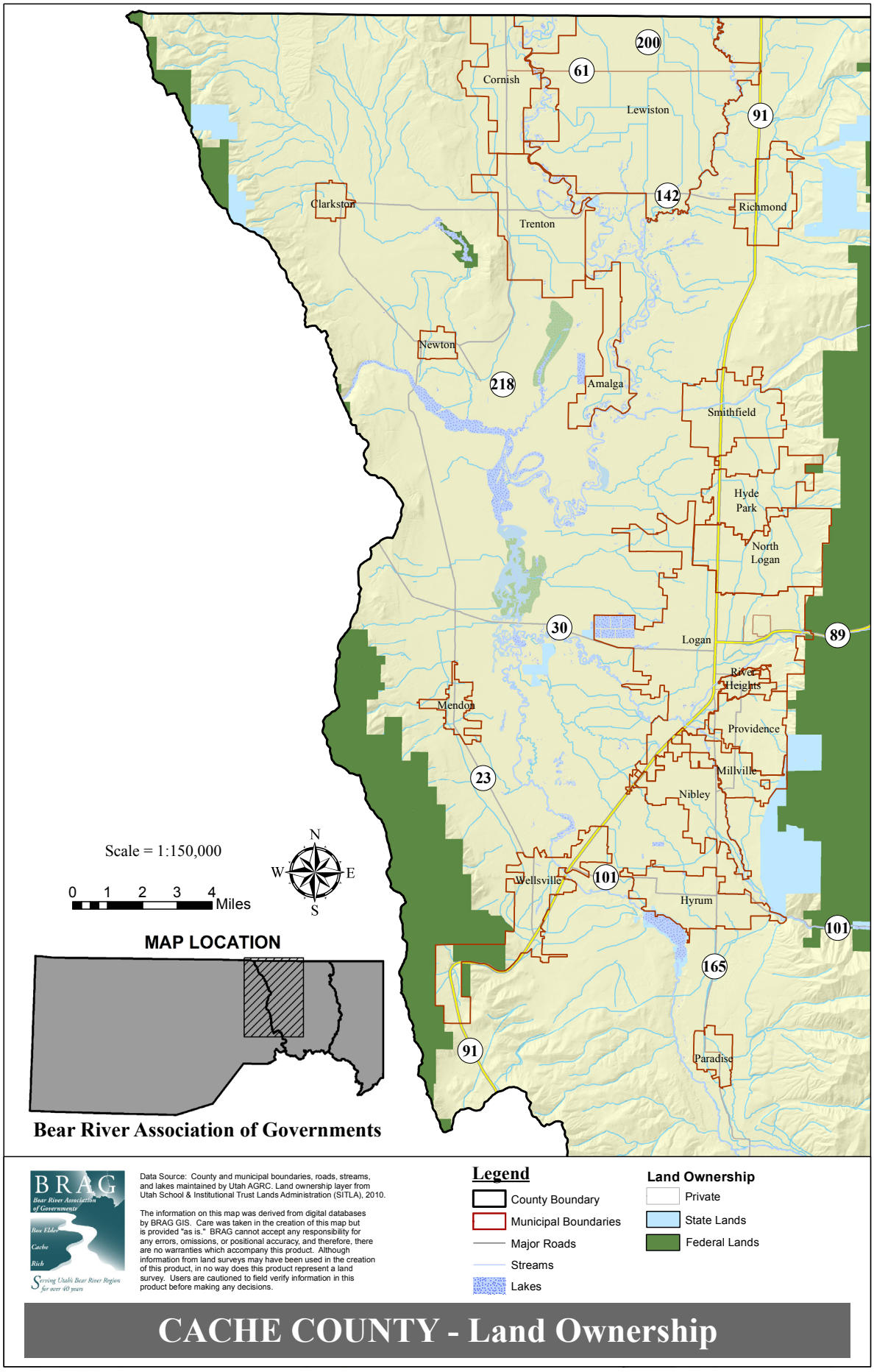
Frequency	Rare
Severity	Potentially Catastrophic
Location	Areas downstream of failed dam.
Seasonal Pattern	Anytime. Highest risk in spring during snowmelt.
Duration	A few hours
Speed of Onset	No warning
Probability of Future Occurrences	Low

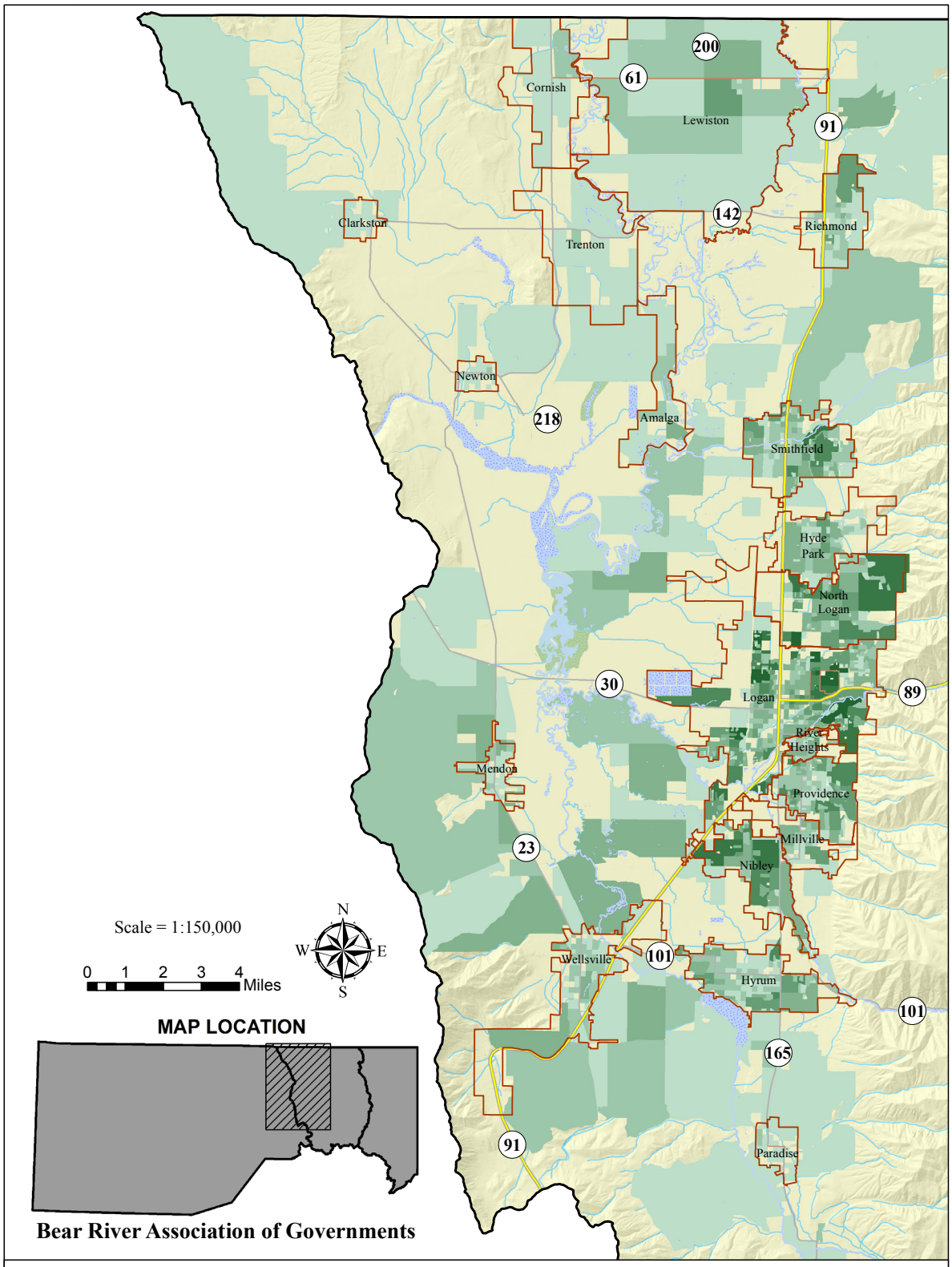
Repetitive Loss Properties

As of February 4, 2015, there were seven repetitive loss properties in the unincorporated area of Cache County, five of which were BCX Claims (FEMA, 2015). Type of losses?

COUNTY-WIDE NATURAL HAZARD MAPS

(Please see pages 6-140 to 6-148)


200
61
Cornish
Lewiston
91
142
Clarkston
Richmond
Trenton
Newton
218
Amalga
Smithfield
Hyde Park
North Logan
30
Logan
89
River Heights
Mendon
Providence
Millville
23
Nibley
Scale = 1:150,000
0 1 2 3 4 Miles
N
W
E
S
Wellsville
101
Hyrum
101
165
91
Paradise
MAP LOCATION
Bear River Association of Governments
BRAG
Bear River Association of Governments
Box Elder
Cache
Rich
Serving Utah's Bear River Region for over 40 years
Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Land ownership layer from Utah School & Institutional Trust Lands Administration (SITLA), 2010.
The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.
Legend
County Boundary
Municipal Boundaries
Major Roads
Streams
Lakes
Land Ownership
Private
State Lands
Federal Lands
CACHE COUNTY - Land Ownership



BRAG
Bear River Association of Governments
Box Elder
Cache
Rich
Serving Utah's Bear River Region for over 40 years

Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. County population was derived from US Census Bureau, 2010.

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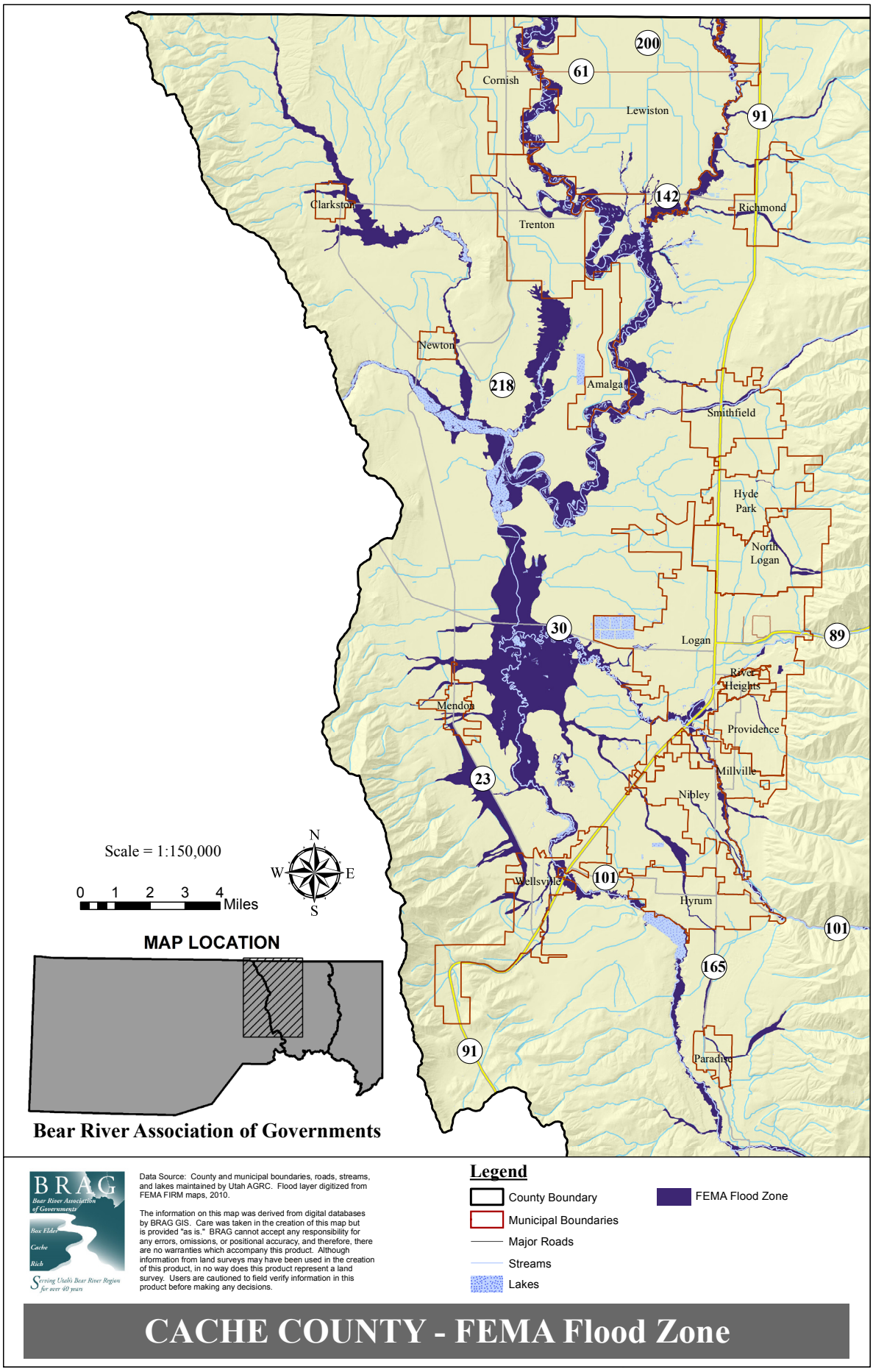
Legend

- County Boundary
- Municipal Boundaries
- Major Roads
- Streams
- Lakes

Population Density
*Persons per census block

- 0 - 15
- 15 - 44
- 44 - 83
- 83 - 143
- 143 - 229
- 229 - 357
- 357 - 605
- 605 - 1067

CACHE COUNTY - Population Density


200
61
Cornish
Lewiston
91
142
Clarkston
Richmond
Trenton
Newton
218
Amalga
Smithfield
Hyde Park
North Logan
30
Logan
89
River Heights
Mendon
Providence
Millville
23
Nibley
Scale = 1:150,000
0 1 2 3 4 Miles
N
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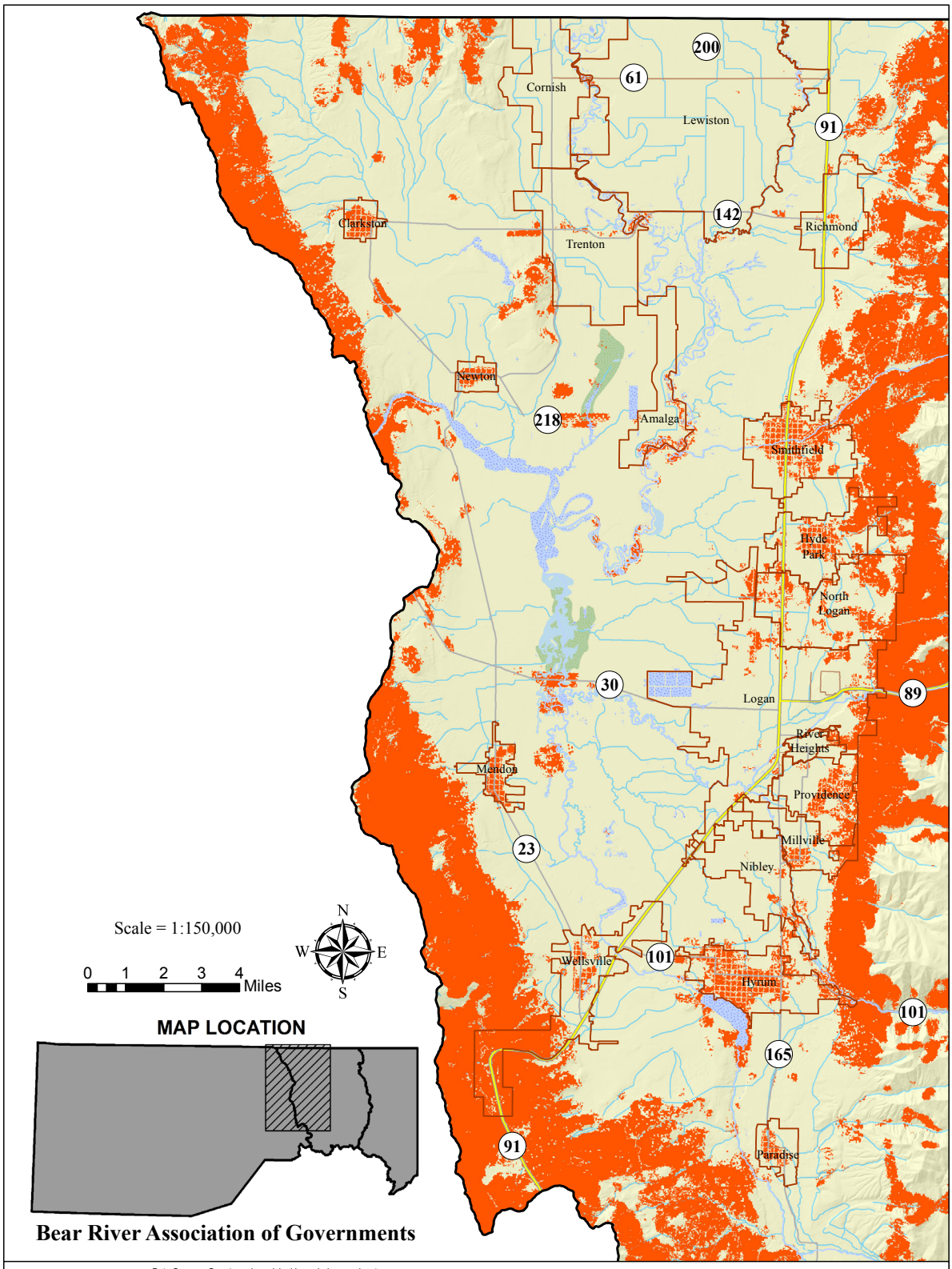
Wellsville
101
Hyrum
101
165
91
Paradise
MAP LOCATION
Bear River Association of Governments
BRAG
Bear River Association of Governments
Box Elder
Cache
Rich
Serving Utah's Bear River Region for over 40 years
Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Flood layer digitized from FEMA FIRM maps, 2010.
The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.
Legend
County Boundary
Municipal Boundaries
Major Roads
Streams
Lakes
FEMA Flood Zone
CACHE COUNTY - FEMA Flood Zone



BRAG
Bear River Association of Governments
Box Elder
Cache
Rich
Serving Utah's Bear River Region for over 40 years

Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Fire hazard data from the Oregon Department of Forestry study "West Wide Wildfire Risk Assessment, 2013". Combines moderate to high wildfire risk based on the Fire Risk Index (FRI).

The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.

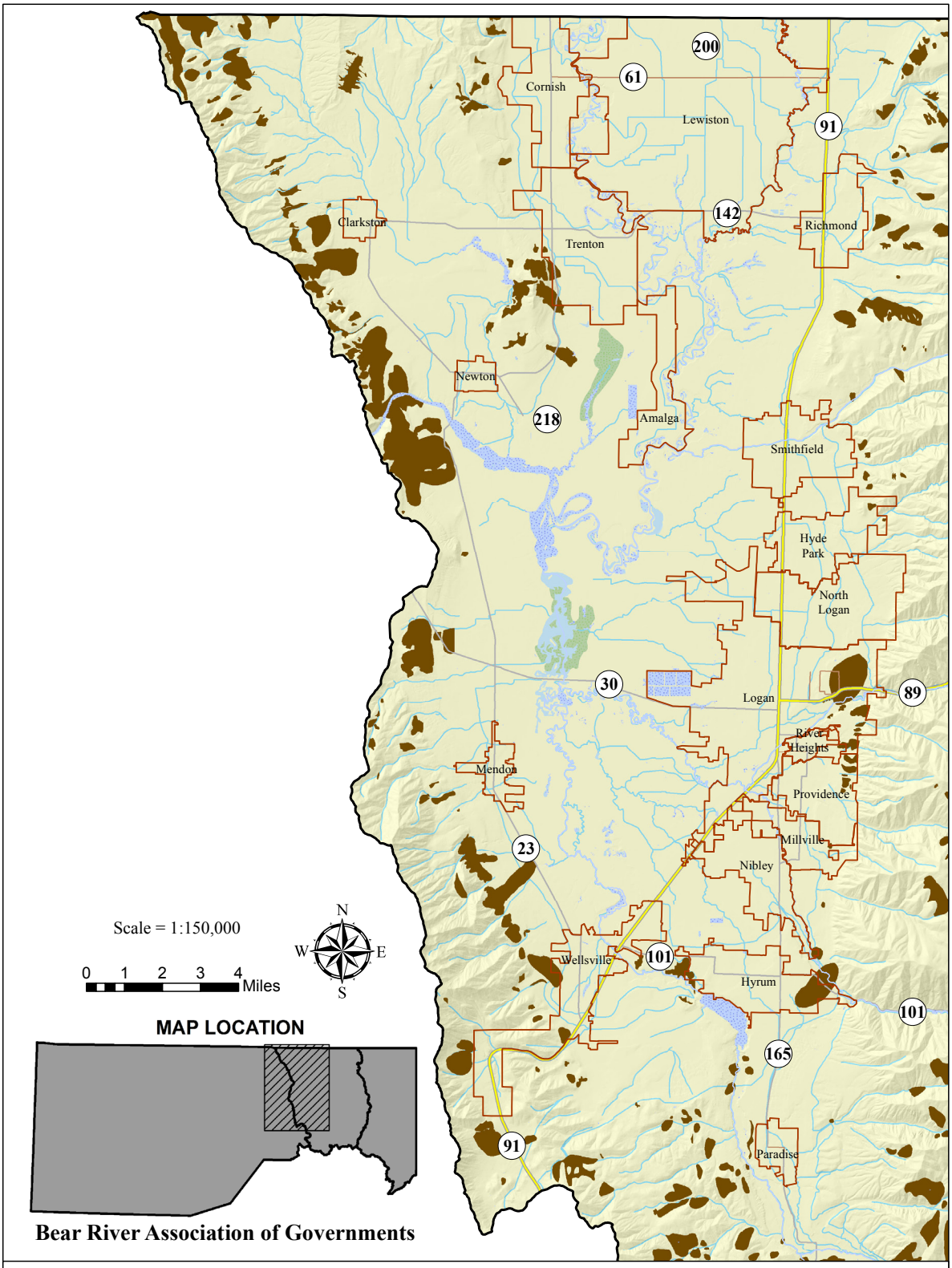
Legend

- County Boundary
- Municipal Boundaries
- Major Roads
- Streams
- Lakes

Fire Risk

- Moderate to High

CACHE COUNTY - Wildfire Hazard



BRAG
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Cache
Rich
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Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Data obtained from the Utah Geological Survey showing landslide deposits, landslide scarps, and debris-flow travel paths, 2010.

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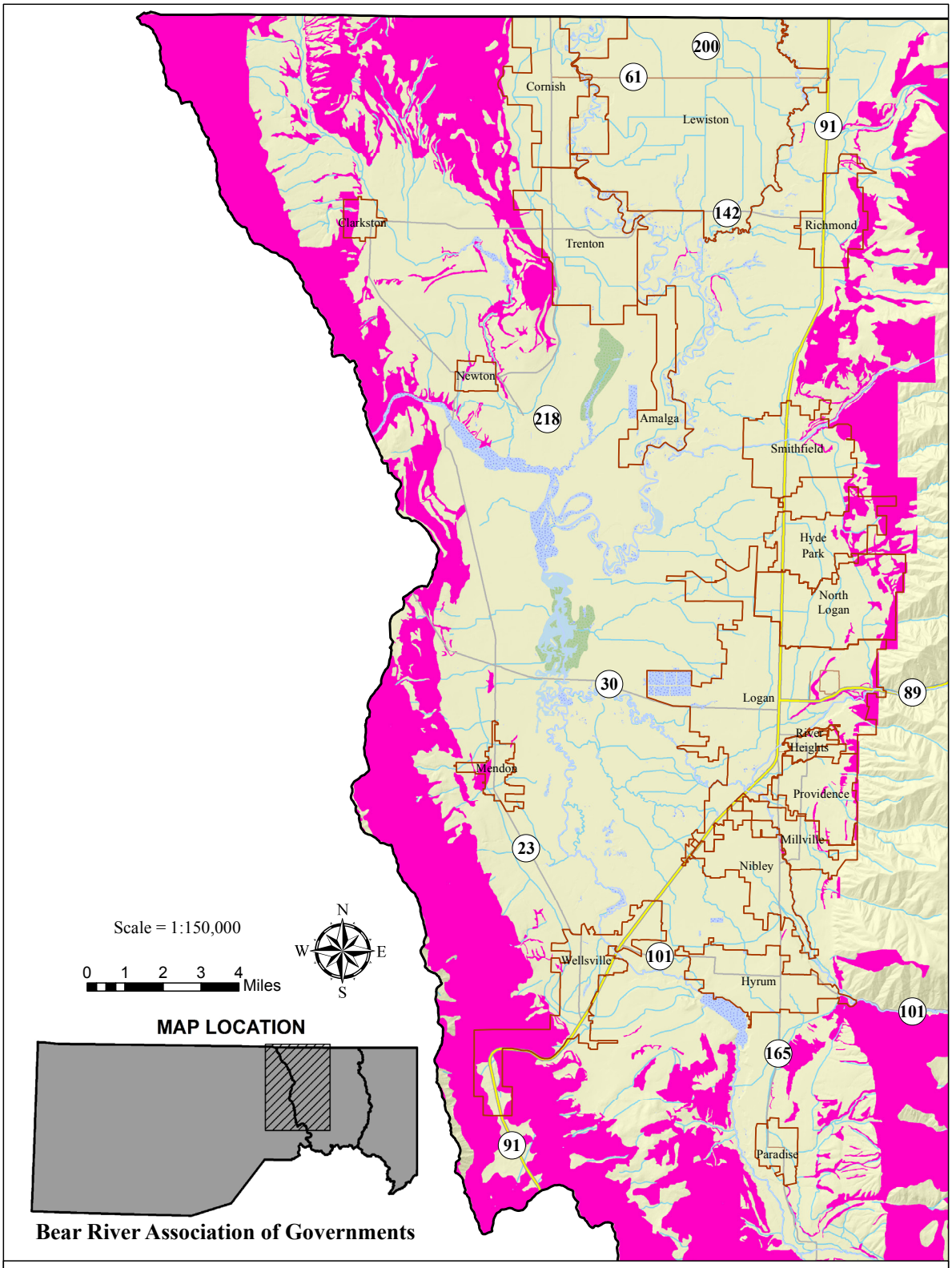
Legend

- County Boundary
- Municipal Boundaries
- Major Roads
- Streams
- Lakes

Landslides

- Deposits, scarps, and debris-flow travel paths

CACHE COUNTY - Landslides



BRAG
Bear River Association of Governments
Box Elder
Cache
Rich
Serving Utah's Bear River Region for over 40 years

Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Steep slopes derived from NRCS SSURGO Soils Database 2013 - 20% slope and higher.

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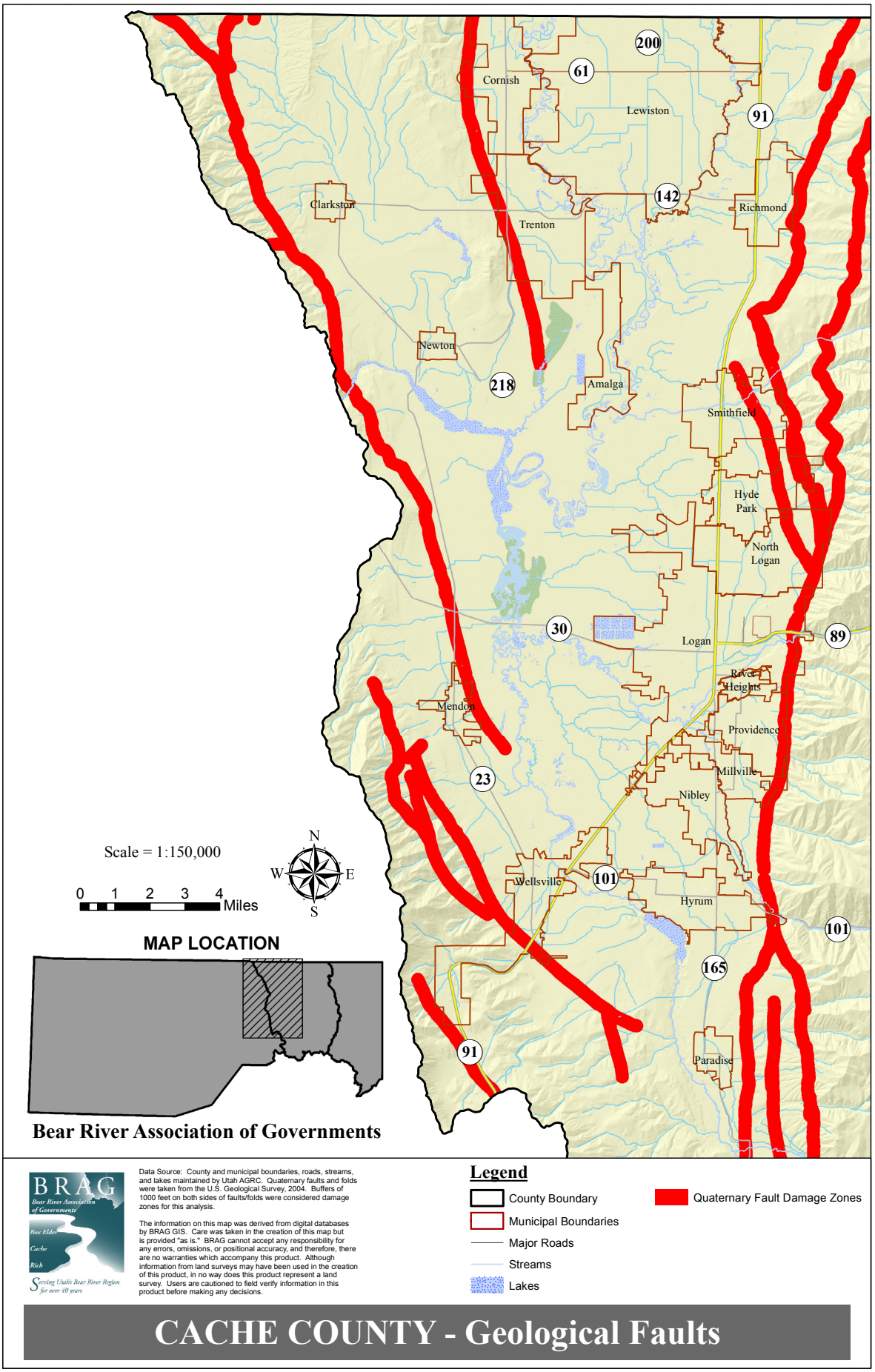
Legend

- County Boundary
- Municipal Boundaries
- Major Roads
- Streams
- Lakes

Steep Slopes

- 20% slope and higher

CACHE COUNTY - Steep Slopes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Cornish
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Smithfield
Hyde Park
North Logan
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Logan
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River Heights
Mendon
Providence
Millville
23
Nibley
Scale = 1:150,000
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Wellsville
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Hyrum
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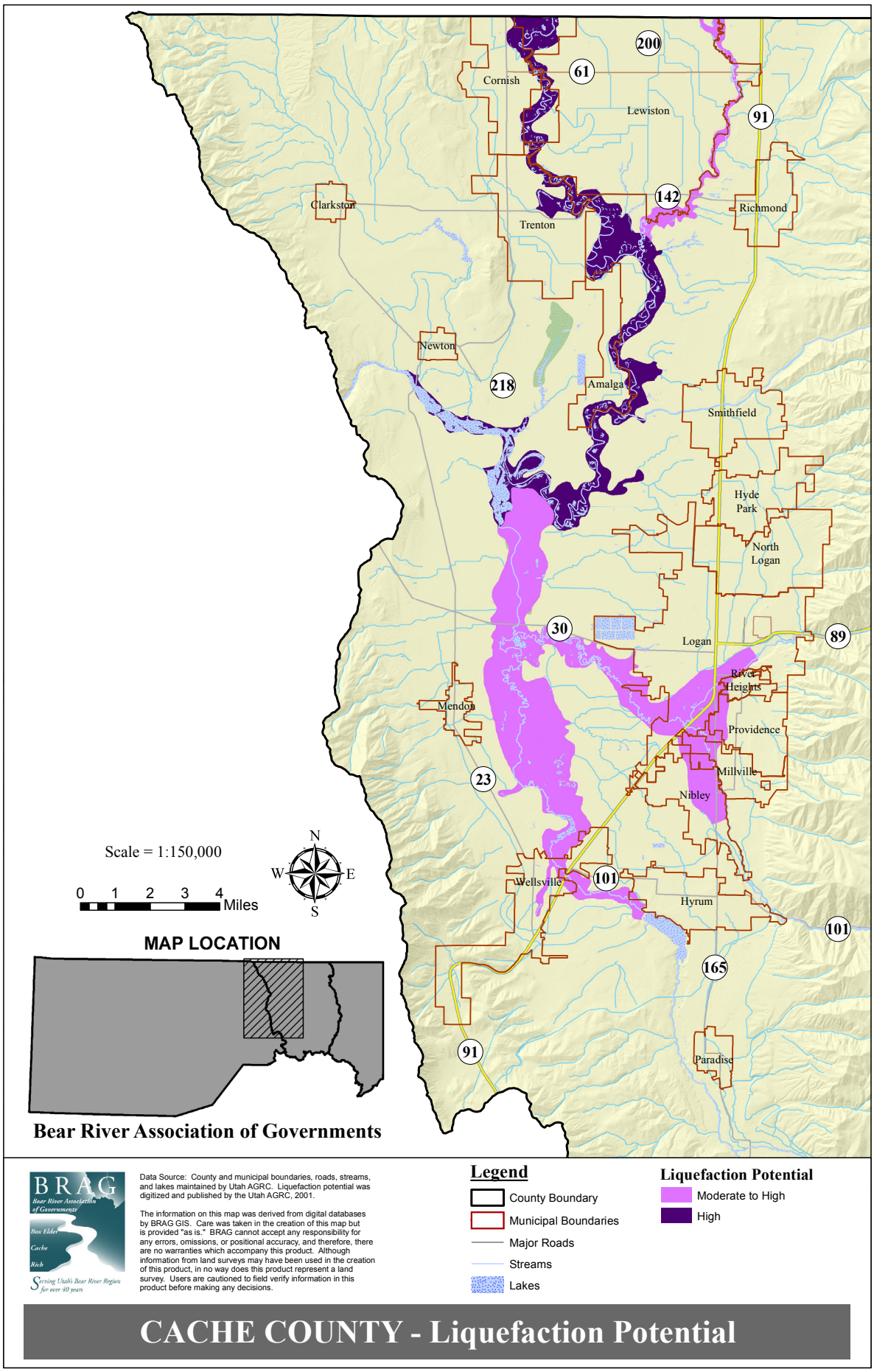
165
91
Paradise
MAP LOCATION
Bear River Association of Governments
BRAG
Bear River Association of Governments
Box Elder
Cache
Rich
Serving Utah's Bear River Region for over 40 years
Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Quaternary faults and folds were taken from the U.S. Geological Survey, 2004. Buffers of 1000 feet on both sides of faults/folds were considered damage zones for this analysis.
The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.
Legend
County Boundary
Municipal Boundaries
Major Roads
Streams
Lakes
Quaternary Fault Damage Zones
CACHE COUNTY - Geological Faults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North Logan
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Logan
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River Heights
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Providence
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0 1 2 3 4 Miles
Wellsville
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Hyrum
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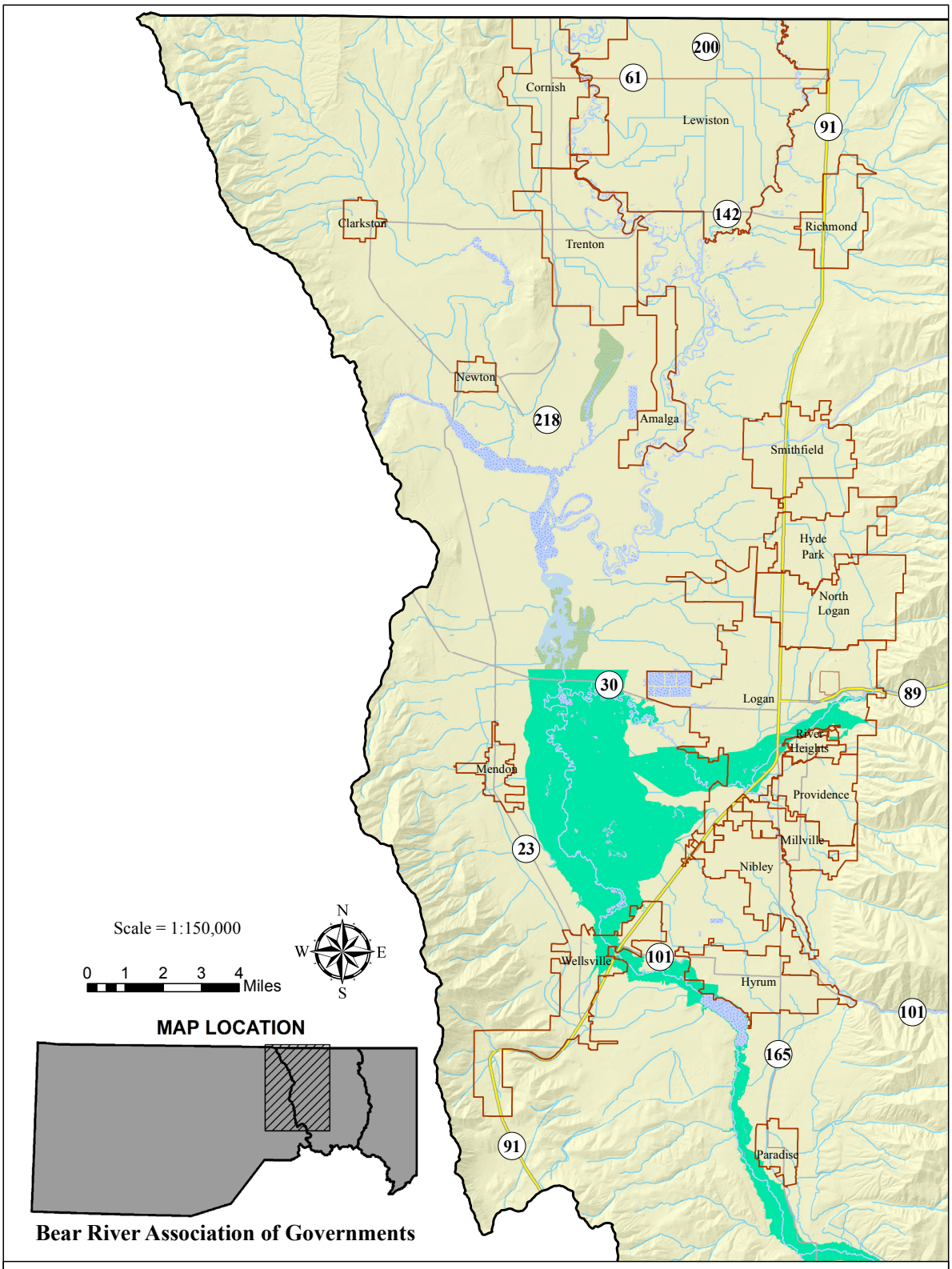
165
91
Paradise
MAP LOCATION
Bear River Association of Governments
BRAG
Bear River Association of Governments
Box Elder
Cache
Rich
Serving Utah's Bear River Region for over 40 years
Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Liquefaction potential was digitized and published by the Utah AGRC, 2001.
The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.
Legend
County Boundary
Municipal Boundaries
Major Roads
Streams
Lakes
Liquefaction Potential
Moderate to High
High
CACHE COUNTY - Liquefaction Potential



BRAG
Bear River Association of Governments
Box Elder
Cache
Rich
Serving Utah's Bear River Region for over 40 years

Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Dam inundation areas provided by Utah Division of Water Rights, 2008.

The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.

Legend

- County Boundary
- Municipal Boundaries
- Major Roads
- Streams
- Lakes

Dam Inundation Areas

- Probable Maximum Flood area resulting from complete dam failure.

CACHE COUNTY - Dam Failure

COMMUNITY SECTIONS: NATURAL HAZARDS, POTENTIAL LOSSES, AND MITIGATION STRATEGIES

AMALGA

Analysis of hazard risk involving the community of Amalga revealed that there is potential risk resulting from **flood, liquefaction, and wildfire**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and environmental features within the municipal boundary. Currently, liquefaction and wildfire hazards have the greatest potential to impact the community based on potential loss values. See ***the following tables*** for more detailed descriptions of potential losses associated with each natural hazard analyzed in the risk assessment.

Natural Hazards

Current Development

Flood. Hazard mapping identifies flood risk areas along the northern, eastern, and southern municipal boundary, adjacent to the Bear River.

Liquefaction. Hazard mapping identifies high liquefaction risk along the northern, eastern, and southern municipal boundary, adjacent to the Bear River.

Wildfire. Hazard mapping identifies moderate-to-high wildfire risk along the southern and southeastern municipal boundary.

Future Development

No concerns involving potential future development within Amalga were reported by town representatives.

Table 54: Amalga Potential Loss Figures

Amalga, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	81	25	6,435,339	2	9,628,847	1,377,434
Flood	49	15	2,218,090	3	9,725,007	2,066,151
Liquefaction	94	29	7,348,420	4	9,740,432	2,754,868
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Cache County from 2013 American Community Survey, which is 3.24.
** Current Market Value per parcel, including building and land values. Data was provided by Cache County IT personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($688,717 per firm). Derived from 2007 Survey of Business Owners for Cache County, US Census Bureau.

Amalga, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0	0	0	0	0.2	25,400	0.43	225,750	0.04	60,000
Flood	0	0	0.15	210,000	0.3	38,100	0.3	157,500	0	0
Liquefaction	0	0	0.16	224,000	0.59	74,930	11.66	6,121,500	1.06	1,590,000
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Amalga, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					
Wildfire					1 Broadband Anchor
Flood					1 Bridge
Liquefaction	1 Fire Station			1 Place of Worship	1 Bridge, 2 Dams, 2 Broadband Anchors
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

Amalga, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	0	0	0	0	0
Wildfire	115.87	126.01	0	0	0
Flood	282.28	261.97	0	0	0
Liquefaction	344.68	353.37	0	0	0
Landslide	0	0	0	0	0
Slope	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Amalga, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	71.89	24.83	0.94	0.8	0	0
Flood	174.63	0	2.19	0	0	0
Liquefaction	179.77	64.09	3.57	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land and miles of streams and trails were identifed using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

Hazard Mitigation Strategies

**Amalga Town did not provide mitigation strategies for this plan update.*

CACHE COUNTY (UNINCORPORATED)

Analysis of hazard risk in the unincorporated portions of Cache County revealed that there is potential risk resulting from all hazards analyzed in the risk assessment that includes **dam failure, earthquake, flood, landslides, liquefaction, steep slopes and wildfire**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and environmental features in the unincorporated areas of the county. See ***the following tables*** for more detailed descriptions of potential losses associated with each natural hazard analyzed in the risk assessment.

Table 55: Cache County Potential Loss Figures

Natural Hazards

Current Development

Dam Failure. Hazard mapping identifies dam failure risk in the Logan River drainage west of Logan City, The East Fork of the Little Bear River drainage and areas surrounding Avon and along the west side of Paradise to Hyrum Reservoir, below Hyrum Dam in the Little Bear River drainage above and below Wellsville, and almost all of the low elevation areas in between Logan, Nibley, Wellsville, and Mendon north to Valley View Highway.

Earthquake. Hazard mapping identifies several structures and businesses at risk from surface fault rupture. Areas of concern are generally the fol-

Cache County, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	1,322	408	113,248,277	52	18,028,129	35,813,284
Faults	868	268	86,159,991	48	15,489,782	33,058,416
Wildfire	1,623	501	142,234,489	99	89,400,821	68,182,983
Flood	1,626	502	166,902,523	85	46,168,990	58,540,945
Liquefaction	1,047	323	83,138,583	70	50,248,603	48,210,190
Landslide	804	248	68,481,217	48	15,350,996	33,058,416
Slope	1,649	509	137,370,489	66	21,395,491	45,455,322
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Cache County from 2013 American Community Survey, which is 3.24.
** Current Market Value per parcel, including building and land values. Data was provided by Cache County IT personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($688,717 per firm). Derived from 2007 Survey of Business Owners for Cache County, US Census Bureau.

Table -- : Cache County, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	2.07	3,105,000	1.47	2,058,000	0.1	12,700	62.37	32,744,250	20.1	30,150,000
Faults	2.97	4,455,000	6.65	9,310,000	11.02	1,399,540	102.2	53,644,500	18.82	28,230,000
Wildfire	4.14	6,210,000	5.4	7,560,000	8.19	1,040,130	90.27	47,391,750	10.04	15,060,000
Flood	1.6	2,400,000	3.07	4,298,000	2.97	377,190	49	25,725,000	22	33,000,000
Liquefaction	43.17	64,755,000	12.23	17,122,000	43.97	5,584,190	687.9	361,168,500	14.46	21,690,000
Landslide	1.69	2,535,000	8.26	11,564,000	5.81	737,870	211	110,754,000	2.67	4,005,000
Slope	2.21	3,315,000	15.57	21,798,000	12.94	1,643,380	309.2	162,351,000	11.98	17,970,000
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Cache County, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement[1]	Schools/Public Facilities[2]	Health Care Facilities[3]	Places of Worship[4]	Infrastructure[5]
Dam Failure				1 place of worship	13 bridges, 1 broadband anchor, 7 dams
Faults					4 bridges, 1 broadband anchor, 10 dams
Wildfire					
Flood					27 bridges, 1 broadband anchor, 9 dams
Liquefaction		JBS Hyrum City, Uinta Academy	Dignified Living CV	4 places of worship	Hyrum sewer plant, 1 electrical substation, 33 bridges, 6 broadband anchors, 81 dams
Landslide					40 dams
Slope					1 bridge, 19 dams
Poorly Drained Soils		JBS Hyrum City		1 place of worship	6 bridges, 19 dams, 1 electrical substation

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

Table -- : Cache County, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	12,275.74	14,415.26	68.42	4.00	0.00
Faults	10,805.24	10,199.03	7,877.60	1.00	0.00
Wildfire	6,234.60	5,904.18	17,505.05	2.00	2.00
Flood	12,495.13	14,966.97	77.81	2.00	2.00
Liquefaction	12,219.20	14,615.41	0.00	2.00	1.00
Landslide	5,348.90	3,153.56	55,683.71	2.00	1.00
Slope	18,587.52	0.00	30,295.83	1.00	1.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Table -- : Cache County, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	7,451.87	679.03	139.68	60.53	6.36	3.00
Faults	744.53	63.43	185.17	2.76	80.66	2.00
Wildfire	1,917.97	178.13	392.90	78.77	124.36	21.00
Flood	16,814.74	0.00	301.15	119.83	3.17	4.00
Liquefaction	13,917.80	1,988.15	182.56	49.42	0.00	0.00
Landslide	420.33	118.97	356.33	4.15	302.66	5.00
Slope	470.10	56.79	665.00	74.62	139.13	2.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00	0.00

Note: Total acres of land and miles of streams and trails were identifed using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

lowing: Southeast of Wellsville almost in a straight line to Paradise, southeast and northeast of Paradise, east of Smithfield and Richmond, northeast of Richmond, west of Newton and north of Mendon, southwest of Mendon, and scattered cabins and homes in Ant Flats and in various other unincorporated areas.

Flood. The unincorporated areas of Cache County have many structures located in the 100-year floodplain. Generally, as can be expected, these structures are located in drainage areas along the Little Bear, Blacksmith Fork, Logan, Bear, and Cub Rivers. Susceptible structures along the Little Bear River can be found from Hyrum Reservoir, to Paradise Town, and south along both the South and East Forks of the river. There are also structures at risk below Hyrum Dam, and in the lower drainages of the river north of Wellsville and east of Mendon. Structures are also at risk along the Hyrum Canal north of Paradise, and east of the town below Green Canyon.

Landslides. Hazard mapping identifies risk from landslides in unincorporated Cache County in the following areas: Northeast of Hyrum City in the Blacksmith Fork River drainage, west of Paradise Town near the Little Bear River drainage, between Mendon and Wellsville along the western bench, surrounding and south of Avon on the western and eastern hillsides, west of Newton near the county line, and a few scattered homes along the east bench from Smithfield to the Idaho State line.

Liquefaction. Hazard mapping identifies moderate-to-high and high liquefaction risk to low elevation areas near the Bear, Cub, Logan, Blacksmith Fork, and Little Bear River's. There is a significant amount of development and infrastructure along river corridors from the Idaho-Utah border, south to Wellsville City and Hyrum Dam with high potential losses to railroad lines.

Steep Slopes. Hazard mapping identifies significant risk from steep slopes in much of the unincorporated jurisdiction. Due to the characteristic northeast to southwest trending mountain ranges, much of the county's eastern and western boundaries slope upwards beyond 20%, and experience significant development pressure due to the desirable vistas these areas provide to home owners.

Wildfire. Hazard mapping identifies moderate-to-high wildfire risk areas along nearly the entire eastern and western boundary of the jurisdiction. There is significant development pressure along the eastern bench of the county with much of the higher value homes located in these areas. There are also a number of cabins and secondary homes at risk in the Scare Canyon and Hardware Park developments, and in Logan Canyon along U.S. 89; many in the Birch Glen area.

Future Development

No concerns involving potential future development within Cache County were reported by county representatives.

Hazard Mitigation Strategies

Table 56: Cache County Mitigation Strategies

CACHE COUNTY- COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Cache County	Dam Failure	Protect current residents and property	Evaluate existing notification systems to ensure they are adequate to implement emergency plans developed with the FERC license process	N/A	Medium	2016	County	Cache County, Bureau of Rec., Utah Dam Safety	Minimal	County, FERC, State
Cache County	Earthquake	Protect current residents and property	Review, revise, develop land-use ordinances that require site specific geo-technical studies prior to development is areas of high risk.	N/A	High	2016	County, FEMA, State	Cache County, UGS	Minimal	USGS, UGS, BRAG, Utah League of Cities & Towns
Cache County	Flood	Protect current residents and property	Coordinate with Utah Geological Survey for landslide response procedures and strategies, update response plans	N/A	Medium	2016	County, State, FEMA	Cache County, UGS	Minimal	USGS, UGS, USU
Cache County	Flood	Protect current residents and property	Identify, assess, and inventory potential flooding areas.	N/A	High	2016	County, FEMA, Army Corps	Cache County, Utah DEM	TBD	County, FEMA, Army Corps, State, Canal Companies, UDOT
Cache County	Steep Slopes	Protect current residents and property	Review, revise, develop land-use ordinances that require site specific geo-technical studies prior to development is areas of high risk.	N/A	Medium	2016	County	Cache County, UGS	Minimal	County Planning, UGS, USGS, APA

CACHE COUNTY - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Cache County	Dam Failure	Protect future residents and property	Public education, evacuation planning, emergency response planning and exercises.	Assess potential flooding and vulnerability areas within identified main flow areas.	Medium	2016	County	Cache County, Bureau of Rec., Utah Dam Safety	Minimal	County, FERC, State
Cache County	Earthquake	Protect future residents and property	Continue to promote earthquake safety and preparedness	N/A	High	Ongoing	County, FEMA, State	Cache County, UGS	Minimal	Cache County, USGS, UGS, Utah DEM
Cache County	Flood	Protect future residents and property	Provide public education to residents in areas that might be susceptible to possible landslides. Update response plans.	N/A	Medium	2016-2017	County, Private Sources	Cache County, UGS	TBD	County, Army Corps, Division of NR., USFS
Cache County	Flood	Protect future residents and property	Coordinate with canal companies to keep canal gates staffed and free from debris	N/A	High	2016	County, Canal Companies	Cache County, canal companies	Minimal	County, Local, FEMA, State ESHS
Cache County	Steep Slopes	Protect future residents and property	Review, revise, develop land-use ordinances that require site specific geo-technical studies prior to development is areas of high risk.	N/A	Medium	2016	County	Cache County, UGS	Minimal	County Planning, UGS, USGS, APA

CLARKSTON

Analysis of hazard risk involving the community of Clarkston revealed that there is potential risk resulting from **flood, steep slopes and wildfire**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and environmental features within the municipal boundary. See ***the following tables*** for more detailed descriptions of potential losses associated with each natural hazard analyzed in the risk assessment.

Table 57: Clarkston Potential Loss Figures

Natural Hazards

Current Development

Flood. Hazard mapping identifies flood risk areas along City Creek, Myler Creek, and Clarkston-Creek drainages.

Steep Slopes. Hazard mapping identifies significant risk from steep slopes along the entire western boundary of the jurisdiction.

Clarkston, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	1	113,406	688,717
Wildfire	667	206	28,080,624	8	381,440	5,509,736
Flood	126	39	5,306,048	3	131,145	2,066,151
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	259	80	10,758,883	6	196,095	4,132,302
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Cache County from 2013 American Community Survey, which is 3.24.
** Current Market Value per parcel, including building and land values. Data was provided by Cache County IT personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($688,717 per firm). Derived from 2007 Survey of Business Owners for Cache County, US Census Bureau.

Clarkston, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0	2.8	1,470,000	0	0
Flood	0	0	0	0	0	0	0.72	378,000	0	0
Liquefaction	0	0	0	0	0	0	9.26	4,861,500	0	0
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	3.02	1,585,500	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Clarkston, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					
Wildfire	1 EMS station			1 place of worship	2 broadband anchors
Flood					
Liquefaction	1 EMS station, 1 fire station			1 place of worship	4 broadband anchors
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

Clarkston, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	0	0	0	0	0
Wildfire	49.8	143.44	0	1	0
Flood	43.29	65.68	0	0	0
Liquefaction	0	0	0	0	0
Landslide	0	0	0	0	0
Slope	100.52	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Clarkston, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	0.64	0	0.57	1.51	0	0
Flood	4.19	0	1.42	0	0	0
Liquefaction	0	0	0.3	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land and miles of streams and trails were identifed using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

Wildfire. Hazard mapping identifies moderate-to-high wildfire risk in much of the developed portions of the jurisdiction with significant potential losses to homes and commercial structures.

Future Development

No concerns involving potential future development within Clarkston were reported by town representatives.

Hazard Mitigation Strategies

Table 58: Clarkston Mitigation Strategies

CLARKSTON- COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Clarkston	Flood	Protect current residents and property	Increase awareness of floodplain and erosion risk areas within the city.	Community training on NFIP program and current status.	High	2015	County, Local	Clarkston, Utah DEM	Minimal	Local, County, BRAG , FEMA, State
Clarkston	Wildfire	Protect current residents and property	Make sure all fire fighters and emergency response crews have the proper training to defend against wildfires.	N/A	High	2015	Local	Clarkston, Utah FFSL	Minimal	Local, County, BRAG , FEMA, Utah FFSL
Clarkston	Earthquake	Protect current residents and property	Training in earthquake emergency planning and response for residents, and coordination between local and county fire, police, and EMT crews.	N/A	High	2015	Local	Clarkston, UGS, Utah DEM	Minimal	Local, County, BRAG , FEMA, Utah APA, Utah ASLA, UGS, USGS
Clarkston	Steep Slopes	Protect current residents and property	Map and document steep slope areas.	N/A	Low	2015	Local	Clarkston, UGS	Minimal	Local, County, BRAG , FEMA, Utah APA, Utah ASLA, UGS, USGS
Clarkston	Liquefaction	Protect current residents and property	Education of city and county emergency response personnel.	N/A	Low	2015	Local	Clarkston, UGS	Minimal	Local, County, BRAG

CLARKSTON - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Clarkston	Flood	Protect future residents and property	Increase awareness of floodplain and erosion risk areas within the city. Gather geographic floodplain data.	Community training on NFIP program and current status.	High	2015	County, Local	Clarkston, Utah DEM	Minimal	Local, County, BRAG , FEMA, State
Clarkston	Wildfire	Protect future residents and property	Work with the county and BRAG to obtain geographic wildfire data and explore better ordinances.	N/A	High	2015	Local	Clarkston, Utah FFSL, BRAG	Minimal	Local, County, BRAG , FEMA, Utah FFSL
Clarkston	Earthquake	Protect future residents and property	Work with the county and BRAG to obtain geographic earthquake data and explore better ordinances.	N/A	High	2015	Local	Clarkston, UGS, Utah DEM, BRAG	Minimal	Local, County, BRAG , FEMA, Utah APA, Utah ASLA, UGS, USGS
Clarkston	Steep Slopes	Protect future residents and property	Explore possiblity of steep slope ordinance.	N/A	Low	2015	Local	Clarkston, UGS	Minimal	Local, County, BRAG , FEMA, Utah APA, Utah ASLA, UGS, USGS
Clarkston	Liquefaction	Protect future residents and property	Education of city and county emergency response personnel.	N/A	Low	2015	Local	Clarkston, UGS	Minimal	Local, County, BRAG

CORNISH

Analysis of hazard risk involving the community of Cornish revealed that there is potential risk resulting from **earthquake, flood, liquefaction, steep slopes and wildfire**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and environmental features within the municipal boundary. See ***the following tables*** for more detailed descriptions of potential losses associated with each natural hazard analyzed in the risk assessment.

Table 59: Cornish Potential Loss Figures

Cornish, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	13	4	1,732,768	0	0	0
Wildfire	6	2	380,739	0	0	0
Flood	19	6	1,678,917	4	808,732	2,754,868
Liquefaction	26	8	1,950,554	8	1,145,024	5,509,736
Landslide	0	0	0	0	0	0
Slope	3	1	1,000,513	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Cache County from 2013 American Community Survey, which is 3.24.
** Current Market Value per parcel, including building and land values. Data was provided by Cache County IT personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($688,717 per firm). Derived from 2007 Survey of Business Owners for Cache County, US Census Bureau.

Natural Hazards

Current Development

Earthquake. Hazard mapping identifies structures, utilities and agricultural land at risk from surface fault rupture. Areas of concern are focused at the fault running along the eastern boundary of the jurisdiction.

Flood. Hazard mapping identifies several

Cornish, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	2.13	270,510	1.86	976,500	0.54	810,000
Wildfire	0	0	0	0	0	0	0	0	0	0
Flood	0	0	0	0	0	0	0	0	0	0
Liquefaction	4.31	6,465,000	0	0	2.41	306,070	13.31	6,987,750	0.54	810,000
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0.57	72,390	0.18	94,500	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Cornish, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency	Schools/Public	Health Care	Places of	Infrastructure
Dam Failure					
Faults					2 dams
Wildfire					
Flood					
Liquefaction					1 bridge, 1 broadband anchor, 4 dams
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

Cornish, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	305.49	286.5	0	0	0
Wildfire	5.35	5.47	0	0	0
Flood	133.58	155.83	0	0	0
Liquefaction	221.68	249.95	0	0	0
Landslide	0	0	0	0	0
Slope	22.79	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Cornish, UT, Environmental & Recreational Features at Risk						
Hazard Type				Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
			# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	0	0	0.78	0	0	0
Wildfire	3.08	0.9	0.05	0	0	0
Flood	86.56	0	2.63	0	0	0
Liquefaction	90.29	8.91	4.14	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land and miles of streams and trails were identifed using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

structures in the 100 year floodplain adjacent to the Bear River, which meanders in and out of the eastern boundary of the jurisdiction.

Liquefaction. Hazard mapping identifies high liquefaction risk adjacent to the Bear River, which meanders in and out of the eastern boundary of the jurisdiction. There are several homes at risk, along with critical facilities and infrastructure.

Steep Slopes. Hazard mapping identifies some risk from steep slopes to housing and infrastructure along the jurisdictions western boundary.

Wildfire. Hazard mapping identifies moderate-to-high wildfire risk to some residential structures along the jurisdictions eastern boundary.

Future Development

No concerns involving potential future development within Cornish were reported by town representatives.

Hazard Mitigation Strategies

Table 60: Cornish Mitigation Strategies

CORNISH - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Cornish	Faults	Protect current residents and property	Gather existing fault and earthquake data.	N/A	Medium	2017	UGS, USGS	Cornish, UGS	Minimal	UGS, USGS, BRAG
Cornish	Wildfire	Protect current residents and property	Determine wildfire risk areas and coordinate with other jurisdictions on better response.	N/A	High	2016	Local, Utah FFSL	Cornish, Utah FFSL	Minimal	Utah FFSL, Cache County, BRAG
Cornish	Flood	Protect current residents and property	Work with state floodplain manager on educating officials and the public on flood safety issues.	Work with state floodplain manager to update NFIP compliance.	Medium	2017	Local, Utah DEM, FEMA	Cornish, Utah DEM	Minimal	Utah DEM, FEMA, BRAG
Cornish	Liquefaction	Protect current residents and property	Community education and outreach regarding risk areas.	N/A	High	2016	UGS, USGS	Cornish	Minimal	UGS, USGS, BRAG
Cornish	Slope	Protect current residents and property	Hazard area identification and resident eduction.	N/A	Low	2018	UGS, USGS	Cornish	Minimal	UGS, USGS, BRAG
Cornish	Severe Weather	Protect current residents and property	County and state coordination on emergency and maintenance	N/A	High	2016	NOAA	Cornish, NOAA, Utah DEM	Minimal	NOAA, BRAG

CORNISH - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Cornish	Faults	Protect future residents and property	Explore more strict ordinances in hazard areas.	N/A	Medium	2017	UGS, USGS	Cornish, UGS	Minimal	UGS, USGS, BRAG
Cornish	Wildfire	Protect future residents and property	Explore more strict ordinances in hazard areas.	N/A	High	2016	Local, Utah FFSL	Cornish, Utah FFSL	Minimal	Utah FFSL, Cache County, BRAG
Cornish	Flood	Protect future residents and property	Work with state floodplain manager on educating officials and the public on flood safety issues related to future development.	Work with state floodplain manager to update NFIP compliance.	Medium	2017	Local, Utah DEM, FEMA	Cornish, Utah DEM	Minimal	Utah DEM, FEMA, BRAG
Cornish	Liquefaction	Protect future residents and property	Education and public outreach on potential effects from liquefaction.	N/A	High	2016	UGS, USGS	Cornish	Minimal	UGS, USGS, BRAG
Cornish	Slope	Protect future residents and property	Explore more strict ordinances in hazard areas.	N/A	Low	2018	UGS, USGS	Cornish	Minimal	UGS, USGS, BRAG
Cornish	Severe Weather	Protect future residents and property	Organize communication and deployment drills to practice.	N/A	High	2016	NOAA	Cornish, Cache County	Minimal	NOAA, BRAG

HYDE PARK

Analysis of hazard risk involving the community of Hyde Park revealed that there is potential risk resulting from **earthquake, flood, liquefaction, steep slopes and wildfire**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and environmental features within the municipal boundary. See ***the following tables*** for more detailed descriptions of potential losses associated with each natural hazard analyzed in the risk assessment.

Table 61: Hyde Park Potential Loss Figures

Natural Hazards

Current Development

Earthquake. Hazard mapping identifies several structures and businesses at risk from surface fault rupture. There are two fault lines running north to south along the eastern boundary of the jurisdiction with several homes and infrastructure in the damage zone.

Flood. The jurisdiction has a number of

Hyde Park, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	395	122	39,311,608	1	24,300	688,717
Wildfire	2,748	848	15,892,243	33	185,394,777	22,727,661
Flood	55	17	5,191,187	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	279	86	27,910,860	1	24,300	688,717
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Cache County from 2013 American Community Survey, which is 3.24.
** Current Market Value per parcel, including building and land values. Data was provided by Cache County IT personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($688,717 per firm). Derived from 2007 Survey of Business Owners for Cache County, US Census Bureau.

Hyde Park, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	0	0	4.74	2,488,500	1.2	1,800,000
Wildfire	0	0	0	0	0	0	7.74	4,063,500	2.1	3,150,000
Flood	0	0	0	0	0	0	0.03	15,750	0.11	165,000
Liquefaction	0	0	0	0	0	0	34.73	18,233,250	0	0
Landslide	0	0	0	0		0	0	0	0	0
Slope	0	0	0	0	0	0	3.28	1,722,000	0.81	1,215,000
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Hyde Park, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					
Wildfire				2 places of worship	
Flood					
Liquefaction	Smithfield Fire and EMS	Hyde Park City Office, Cedar Ridge Middle School	Instacare-Hyde Park	5 places of worship	1 dam, 1 bridge, 4 broadband anchors
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

Hyde Park, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	320.03	207.47	0	0	0
Wildfire	254.95	618.39	0	1	0
Flood	2.78	3.71	0	0	0
Liquefaction	0	0	0	0	0
Landslide	15.78	14.44	0	0	0
Slope	214.18	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Hyde Park, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	0.27	0	3.03	0	1.14	7
Wildfire	2.77	0	4.16	4.59	0.94	9
Flood	0	0	0.43	0	0	0
	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	0.02	0	2.04	1.76	1.3	8
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land and miles of streams and trails were identifed using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

existing homes located in the 100 year flood plain along the stream that drains Hyde Park Canyon. In addition, development near the Logan Northern and

Hyde Park Canals is a potential risk for flooding. The 2003 Cache County Storm Water Analysis report concluded that these canals through Hyde Park have deficient capacity to carry predicted flows resulting from a 10-year storm event of 3 hour duration. The problem areas predicted by this model are where the canal intersects 200 South, Center Street and 300 North in Hyde Park City (JUB Engineering, 2003).

Landslides. Hazard mapping identifies minimal risk from landslides to agricultural land in the eastern bench of the jurisdiction.

Steep Slopes. Hazard mapping identifies significant risk from steep slopes along the jurisdictions eastern bench. There are significant risks to residential and commercial structures, including critical infrastructure and utilities.

Wildfire. Hazard mapping identifies moderate-to-high wildfire risk to a significant number of homes and infrastructure in the jurisdiction.

Future Development

No concerns involving potential future development within Hyde Park were reported by city representatives.

Hazard Mitigation Strategies

Table 62: Hyde Park Mitigation Strategies

HYDE PARK - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Hyde Park	Earthquake	Protect current residents and property	Training with citizens core council, officials, and citizens	N/A	High	2015	City, State	Hyde Park	$5,000	EMT, LDS Church, Red Cross
Hyde Park	Flood	Protect current residents and property	Coordinate to get and keep canal gates free from debris.	Coordinate between cities to keep canal gates staffed and free from debris	High	2015	Canal Company, City	Hyde Park, canal companies	Minimal	Canal Company, City
Hyde Park	Wildfire	Protect current residents and property	Educate residents and enforce mow able ordinances.	Letters and Fines	High	2015	City, County Fire Dept.	Hyde Park, Utah FFSL	Minimal	City, County, Fire Dept.
Hyde Park	Steep Slopes	Protect current residents and property	No building above 5100' in elevation.	N/A	Low	2015	N/A	Hyde Park, Cache County	N/A	City

HYDE PARK - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Hyde Park	Earthquake	Protect future residents and property	Avoid development in fault areas. Also require study by developers.	N/A	High	2015	N/A	Hyde Park, UGS	N/A	City
Hyde Park	Flood	Protect future residents and property	Coordinate to get and keep canal gates free from debris.	Coordinate between cities to keep canal gates staffed and free from debris	High	2015	Canal Company, City	Hyde Park, canal companies	Minimal	Canal Company, City
Hyde Park	Wildfire	Protect future residents and property	Educate residents and enforce mow able ordinances.	Letters and Fines	High	2015	City, County Fire Dept.	Hyde Park, Utah FFSL	Minimal	City, County Fire Dept.
Hyde Park	Steep Slopes	Protect future residents and property	No building above 5100' in elevation.	N/A	Low	2015	N/A	Hyde Park, Cache County	N/A	City

HYRUM

Analysis of hazard risk involving the community of Hyrum revealed that there is potential risk resulting from **dam failure, earthquake, flood, landslides, liquefaction, steep slopes and wildfire**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and environmental features within the municipal boundary. See ***the following tables*** for more detailed descriptions of potential losses associated with each natural hazard analyzed in the risk assessment.

Table 63: Hyrum City Potential Loss Figures

Natural Hazards

Current Development

Dam Failure. Hyrum Dam and Reservoir are located directly south of Hyrum City on the Little Bear River. The dam is rated as a high hazard facility and the inundation area flows westerly towards Wellsville five miles away, and then into Cutler Marsh.

Earthquake. Hazard mapping identifies several structures at risk from surface fault rupture in the damage zone located on the eastern boundary

Hyrum, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	156	48	11,311,308	1	133,395	688,717
Faults	39	12	4,243,430	1	298,374	688,717
Wildfire	4,889	1,509	248,499,198	71	27,060,849	48,898,907
Flood	165	51	11,730,433	5	1,307,580	3,443,585
Liquefaction	3	1	392,968	0	0	0
Landslide	512	158	25,267,783	10	2,692,770	6,887,170
Slope	3	1	563,104	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Cache County from 2013 American Community Survey, which is 3.24.
** Current Market Value per parcel, including building and land values. Data was provided by Cache County IT personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($688,717 per firm). Derived from 2007 Survey of Business Owners for Cache County, US Census Bureau.

Hyrum, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	1.62	850,500	0.53	795,000
Faults	0	0	0	0	0	0	0.71	372,750	0	0
Wildfire	0.32	480,000	0	0	0	0	9.97	5,234,250	1.05	1,575,000
Flood	0.1	150,000	0	0	0	0	0.76	399,000	1.98	2,970,000
Liquefaction	0.86	1,290,000	0	0	0	0	47.58	24,979,500	0.71	1,065,000
Landslide	0	0	0	0	0	0	4.84	2,541,000	0.18	270,000
Slope	0	0	0	0	0	0	0.14	73,500	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Hyrum, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure	Hyrum State Park Ranger Station				1 bridge, 1 broadband anchor
Faults					Hyrum water storage
Wildfire		South Cache Center School, Mountain Crest High School, Lincoln Elementary	Cache Valley community Health Center South	3 places of worship	1 bridge, 3 broadband anchors, 1 natural gas pump station, Hyrum water storage
Flood					
Liquefaction	Hyrum fire and EMS, Hyrum City Fire Dept., Hyrum State Park Ranger Station	Lincoln Elementary School, Mountain Crest High School, South Cache Center school, Hyrum City office, Hyrum City shop		8 places of worship	1 bridge, 12 broadband anchors, Hyrum City water storage, natural gas pump station, phone switching station
Landslide					
Slope					Hyrum water storage
Poorly Drained Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

Hyrum, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	54.11	143.20	0.00	0.00	1.00
Faults	5.62	34.27	0.00	0.00	0.00
Wildfire	228.34	1,114.12	0.00	0.00	3.00
Flood	28.93	79.91	0.00	0.00	1.00
Liquefaction	21.23	30.20	0.00	0.00	0.00
Landslide	194.68	328.37	0.00	0.00	0.00
Slope	0.00	0.00	0.00	0.00	0.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Hyrum, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	72.49	8.62	0.64	0	0	0
Faults	27.16	0	0.53	0	0	0
Wildfire	115.06	1.28	2.66	13.2	0	0
Flood	73.91	0	3.23	0.06	0	0
Liquefaction	20.69	0	0.35	0	0	0
Landslide	11.82	0	0	0	0	0
Slope	1.27	0	0.25	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land and miles of streams and trails were identifed using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

of the jurisdiction. These structures are located in the Black Smith Fork drainage at the bottom of the canyon where the fault parallels the north/south trending Cache-Wasatch National Forest.

Flood. Hazard mapping identifies several structures at risk from flooding in the jurisdiction. Several of those structures are along the banks of the Blacksmith Fork River, at the base of the canyon, and several are in floodplains below Hyrum Dam on the Little Bear River edges. However, the majority of structures at risk can be found along the Hyrum Canal which runs north and south between 200 and 300 East on the south of Main Street, and between 100 and 200 East north of Main Street.

Landslides. Hazard mapping identifies risk from landslides along the jurisdiction's eastern boundary at the mouth of Blacksmith Fork Canyon.

Liquefaction. Hazard mapping identifies moderate-to-high liquefaction risk to several critical facilities and infrastructure below Hyrum Dam in the jurisdiction's western boundary.

Steep Slopes. Hazard mapping identifies minimal risk from steep slopes within the jurisdiction. Primary threats include Hyrum water storage, and some municipal infrastructure.

Wildfire. Hazard mapping identifies moderate-to-high wildfire risk throughout much of the jurisdiction. This is primarily due to the high amount of urban canopy within the jurisdiction, with additional threats to property, life, and infrastructure at the mouth of Blacksmith Fork Canyon.

Future Development

No concerns involving potential future development within Hyrum were reported by city representatives.

Hazard Mitigation Strategies

Table 64: Hyrum City Mitigation Strategies

HYRUM - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Hyrum	Flood	Protect current residents and property	Maintain supply of Sand Bags- Keep Canals cleaned	Current Emergency Prep Plan- Organized CERT program	Medium	2016	City, Canal Company, State	Hyrum	Minimal	City, Canal Company, State
Hyrum	Earthquake	Protect current residents and property	Keep emergency preparedness plan current	N/A	Medium	2016	City	Hyrum, UGS	Minimal	City, County, State
Hyrum	Wildfire	Protect current residents and property	Education- Encourage fire breaks to be created around property.	N/A	Medium	2016	City	Hyrum, Utah FFSL	Minimal	City, County, State
Hyrum	Landslide/ Steep Slopes	Protect current residents and property	Require engineering review for steep slopes and landslide risk areas.	N/A	Medium	2016	City, Private	Hyrum, UGS	Minimal	City, County, State, Federal
Hyrum	Dam Failure	Protect current residents and property	Make this a component of emergency preparedness plan.	N/A	Medium	2016	City	Hyrum, Cache County	Minimal	City, State, Federal

HYRUM - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Hyrum	Flood	Protect future residents and property	Enforce Flood Plain Ordinances- Sand Bags available- Canals cleaned and monitored regularly	N/A	Medium	2016	City, Canal Company	Hyrum	Minimal	City, County, State, Canal Company
Hyrum	Earthquake	Protect future residents and property	Require engineering study in higher risk areas- More specific emergency preparedness plan dealing with maintaining city services after an earthquake.	N/A	Medium	2016	City	Hyrum, UGS	Minimal	City, County, State
Hyrum	Wildfire	Protect future residents and property	Add and update necessary fire fighting equipment	N/A	Medium	2020	City, State, Federal	Hyrum, Utah DEM	$100,000	City, County, State, Federal
Hyrum	Landslide/ Steep Slopes	Protect future residents and property	Maintain an emergency response plan as well as education.		Low	2015	City	Hyrum, UGS	Minimal	City, County, State, Federal
Hyrum	Dam Failure	Protect future residents and property	Education and implementing FERC requirements.	N/A	Medium	2016	City	Hyrum, Cache County, Utah Dam Safety	N/A	City, State, Federal

LEWISTON

Analysis of hazard risk involving the community of Lewiston revealed that there is potential risk resulting from **flood, liquefaction, and wildfire**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and environmental features within the municipal boundary. See ***the following tables*** for more detailed descriptions of potential losses associated with each natural hazard analyzed in the risk assessment.

Table 65: Lewiston Potential Loss Figures

Natural Hazards

Current Development

Flood. Hazard mapping identifies several residential structures and some commercial facilities at risk in the 100 year floodplain. These threats are located along the Cub River in the eastern portion of the jurisdiction, and along the Bear River that meanders in and out of the jurisdiction's western boundary. There are also several smaller drainages into these rivers that pose threats as well.

Lewiston, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	29	9	1,255,353	1	3,863,200	688,717
Flood	16	5	1,222,860	4	1,581,974	2,754,868
Liquefaction	23	7	1,952,344	3	934,774	2,066,151
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Cache County from 2013 American Community Survey, which is 3.24.
** Current Market Value per parcel, including building and land values. Data was provided by Cache County IT personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($688,717 per firm). Derived from 2007 Survey of Business Owners for Cache County, US Census Bureau.

Lewiston, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0.06	90,000	0	0	0	0	0.02	10,500	0	0
Flood	0.03	45,000	0.12	168,000	0	0	0.63	330,750	0	0
Liquefaction	2.03	3,045,000	0.12	168,000	0	0	55.48	29,127,000	0	0
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Lewiston, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency	Schools/Public	Health Care	Places of	Infrastructure
Dam Failure					
Faults					
Wildfire					1 bridge
Flood					3 bridges, 2 dams
Liquefaction	Lewiston City Fire Department,	Lewiston School, Sunrise Park, The		2 places of worship	4 bridges, 8 broadband, 9 dams
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

Lewiston, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	0	0	0	0	0
Wildfire	15.67	25.91	0	0	0
Flood	572.91	524.26	0	0	0
Liquefaction	616.85	503.17	0	0	0
Landslide	0	0	0	0	0
Slope	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Lewiston, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	26.42	2.2	0.36	0	0	0
Flood	518.92	0	15.62	0	0	0
Liquefaction	416.24	35.6	8.67	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land and miles of streams and trails were identifed using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

Liquefaction. Hazard mapping identifies moderate-to-high liquefaction risk along the Cub River in the eastern portion of the jurisdiction. Liquefaction risk is high along the Bear River along the western boundary of the jurisdiction.

Wildfire. Hazard mapping identifies moderate-to-high wildfire risk in a few areas around the municipal boundary, mainly to the east along Cub River.

Future Development

No concerns involving potential future development within Lewiston were reported by town representatives.

Hazard Mitigation Strategies

Table 66: Lewiston Mitigation Strategies

LEWISTON - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Lewiston	Flood	Protect current residents and property	Coordinate between cities to keep canal gates staffed and free from debris	Coordinate between cities to keep canal gates staffed and free from debris	Medium	2015	Local	Lewiston, canal companies	Minimal	Local, County, FEMA, State
Lewiston	Wildfire	Protect current residents and property	Work with Utah FFSL to determine risk to current residents and educate local officials and the public.	N/A	Medium	2016	Local, Utah FFSL	Lewiston, Utah FFSL	Minimal	Utah FFSL, Utah DEM, BRAG
Lewiston	Earthquake	Protect current residents and property	Emergency training planning and response for residents and coordination between local, county fire, police, EMT crews.	N/A	High	2015	Local, County, Homeland Security	Lewiston, Cache County	$500	Cache County/ Fire, Logan Fire, Lewiston Fire

LEWISTON - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Lewiston	Flood	Protect future residents and property	Encourage the use of floodplains for parks, trails, and other recreational uses.	Encourage the use of floodplains for parks, trails, and other recreational uses.	Medium	2018	Local, County, FEMA, State	Lewiston, Cache County, BRAG	Minimal	County, BRAG, FEMA
Lewiston	Wildfire	Protect future residents and property	Review local ordinances and explore more strict develoment requirements for homes being built in wildfire areas.	N/A	Medium	2016	Local, Utah FFSL	Lewiston, Utah FFSL	Minimal	Utah FFSL, Utah DEM, BRAG
Lewiston	Earthquake	Protect future residents and property	Emergency training planning and response for residents and coordination between local, county fire, police, EMT crews.	N/A	High	2015	Local, County, Homeland Security	Lewiston, Cache County	$500	Cache County/ Fire, Logan Fire, Lewiston Fire

LOGAN

Analysis of hazard risk involving the community of Logan revealed that there is potential risk resulting from **dam failure, earthquake, flood, landslides, liquefaction, steep slopes and wildfire**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and environmental features within the municipal boundary. See ***the following tables*** for more detailed descriptions of potential losses associated with each natural hazard analyzed in the risk assessment.

Table 67: Logan City Potential Loss Figures

Natural Hazards

Current Development

Dam Failure. Hazard mapping identifies dam failure risk to several structures below First Dam, particularly in "The Island" area of town, and west along the Logan River drainage to and past 1000 West. A dam breach in this area would likely fill the entire valley bottom of "The Island" that has several structures, critical facilities and municipal infrastructure.

Table -- : Logan, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	7,653	2,362	450,733,610	100	138,212,345	68,871,700
Faults	927	286	95,951,688	1	3,314,300	688,717
Wildfire	2,411	744	218,643,420	140	328,459,827	96,420,380
Flood	674	208	51,441,021	31	75,900,333	21,350,227
Liquefaction	8,097	2,499	373,244,552	158	218,504,478	108,817,286
Landslide	2,735	844	187,254,417	11	5,254,164	7,575,887
Slope	975	301	111,181,098	4	247,080	2,754,868
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Cache County from 2013 American Community Survey, which is 3.24.
** Current Market Value per parcel, including building and land values. Data was provided by Cache County IT personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($688,717 per firm). Derived from 2007 Survey of Business Owners for Cache County, US Census Bureau.

Table -- : Logan, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	1.17	1,755,000	1.57	2,198,000	0.28	35,560	34.18	17,944,500	4.21	6,315,000
Faults	0	0	0	0	2.38	302,260	6.41	3,365,250	1.28	1,920,000
Wildfire	0.72	1,080,000	0	0	2.21	280,670	12.94	6,793,500	1.48	2,220,000
Flood	0.2	300,000	0.31	434,000	0	0	2.15	1,128,750	0.57	855,000
Liquefaction	6.81	10,215,000	1.9	2,660,000	2.83	359,410	193.5	101,598,000	6.57	9,855,000
Landslide	0	0	0	0	2.37	300,990	22.64	11,886,000	3.75	5,625,000
Slope	0	0	0	0	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Table -- : Logan, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure	Logan Fire and EMS Station	Riverside Preschool, Wilson Elementary, Riverwood		6 places of worship	9 bridges, 5 broadband anchors, 2 dams
Faults					3 dams
Wildfire	UWCNF Logan Ranger District Office	Logan River Academy	USU Student Health Services, Logan Regional Hospital Transitional Care, Logan Nursing and Rehab Center		10 broadband anchors, 1 dam
Flood					4 bridges
Liquefaction	4 fire stations, 3 EMS stations, 3 correctional facilities,1 law enforcement station	33 schools, 1 heliport, Riverwood Conference Center, CVTD Transit Center	26 health care centers	39 places of worship	22 bridges, 79 broadband anchors, 7 dam, 1 airport
Landslide	Logan Fire and EMS Station, UWCNF-Logan Ranger District Office	Edith Bowen Laboratory School, Hillcrest School		4 places of worship	9 broadband anchors, 1 dam
Slope				2 places of worship	2 bridges, 3 dams
Poorly Drained Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

Table -- : Logan, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	163.48	1,534.38	0.00	2.00	0.00
Faults	21.58	306.01	0.00	0.00	1.00
Wildfire	77.75	540.41	0.00	0.00	0.00
Flood	62.66	329.56	0.00	0.00	0.00
Liquefaction	225.27	1,871.10	0.00	2.00	0.00
Landslide	28.49	591.34	0.00	0.00	0.00
Slope	33.03	0.00	0.00	0.00	0.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Table -- : Logan, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	254.86	25.90	10.39	150.78	0.22	3
Faults	7.99	8.00	2.99	20.71	2.5	5
Wildfire	10.54	3.35	4.30	29.26	2.32	6
Flood	163.58	0	7.92	61.20	0.05	1
Liquefaction	261.06	13.80	10.53	141.99	0	0
Landslide	5.16	2.38	6.22	36.57	0.88	6
Slope	0.00	0.00	0.00	17.86	1.98	6
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land and miles of streams and trails were identifed using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

Earthquake. Hazard mapping identifies several residential structures and infrastructure at risk from surface fault rupture. Areas of concern are located along the fault damage zone which runs north/south along the jurisdiction's eastern boundary.

Flood. Hazard mapping identifies several residential and commercial structures at risk from flooding. There are a number of older homes located in the 100 year floodplain of the Logan River. In addition a number of newer (post 1970) homes have been constructed near the river in the floodplain (along Sumac and Thrushwood Drives). Some homes in the Country Manor Subdivision along the Blacksmith Fork River are located in the 100 year floodplain as well. The Logan City Golf Course is also located in the 100 year floodplain. The golf course can accommodate flooding with a flood water storage device and is designed to moderate flooding downstream.

Landslides. Hazard mapping identifies significant risk from landslides within the jurisdiction. Large portions of the "Island" area and the Utah State University campus are located in potential landslide areas. Landslides on these Lake Bonneville sediments are fairly common, as is evident in the landslide history chart for Cache County. Logan also has several drainages north and south of Dry Canyon where landslides could damage many structures. Some of the largest landslides and those that pose the greatest threat to human life and property in Cache County are the following: Utah State University (USU) and the Island area have a large landslide area which could threaten human life and cause damage to homes and infrastructure. Particularly in the Island area of Logan City, historical landslides have covered roads and damaged homes. On July 11, 2009 a landslide occurred on the hillside along which the Logan and Northern Canal runs, which destroyed a home downhill and took the lives of three individuals. According to USU campus planning, the section of campus at the top of the large landslide prone area at the base of Logan Canyon has not had any major landslide activity throughout most of the Universities history. Edith Bowen and Hillcrest Elementary Schools are both located on the upper end of this slide. While they are listed as potential losses in Table 8-11, they are not thought by USU campus planning to be at great risk. Logan also has several large landslide areas on the southeast, where homes are being built on the foothills at the base of several small drainages.

Liquefaction. Hazard mapping identifies significant risk in the moderate-to-high liquefaction zone within the jurisdiction. There are several structures, critical facilities, infrastructure and other environmental/recreational amenities in liquefaction prone areas that pose a significant threat to homes and people.

Steep Slopes. Hazard mapping identifies significant risk from steep slopes along much of the jurisdiction's eastern boundary. There are several hundred residential structures in steep slope areas throughout the jurisdiction, primarily located along the eastern boundary, and also running parallel to the Logan River, along the northern edge of "The Island" and leading up to the USU Campus that rests on a high bluff.

Wildfire. Hazard mapping identifies moderate-to-high wildfire risk to a significant number of homes along the jurisdiction's eastern bench that parallels the Cache-Wasatch National Forest.

Future Development

No concerns involving potential future development within Logan were reported by city representatives.

Hazard Mitigation Strategies

Table 68: Logan City Mitigation Strategies

LOGAN - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Logan	Wildfire	Protect current residents and property	Develop educational program for homeowners regarding risk and defensible space.	N/A	High	2016	Federal, State, Local	Logan, Utah FFSL:	$5,000	Utah FFSL
Logan	Flood	Protect current residents and property	Improve flood risk assessment by revising and updating regulatory floodplain maps.	N/A	Medium-high	2017	Local	Logan, Utah DEM	$100,000	City has retained consultant to model river through Logan
Logan	Landslide	Protect current residents and property	Improve data and mapping on specific landslide prone areas to assess vulnerability	N/A	Medium	2015-2020	Local	Logan, UGS	$50,000	Use consultant
Logan	Dam Failure	Protect current residents and property	Educate residents located with dam failure impact areas regarding notifications and emergency actions.	N/A	Low	2015-2020	Local	Logan, Utah Dam Safety	$10,000	City staff
Logan	Earthquake	Protect current residents and property	Protect critical facilities and infrastructure by replacing 100 North Logan River Bridge	N/A	High	2015-2020	Local	Logan, Utah DEM	$2,000,000	City will Use Consultants and Contractors

LOGAN - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Logan	Wildfire	Protect future residents and property	Develop educational program for homeowners regarding risk and defensible space.	N/A	High	2016	Federal, State, Local	Logan, Utah FFSL:	$5,000	Utah FFSL
Logan	Flood	Protect future residents and property	Limit or restrict development in floodplain areas.	N/A	High	2015-2020	Local,	Logan, Utah DEM	$250,000	City staff through development reviews
Logan	Landslide	Protect future residents and property	Improve data and mapping on specific landslide prone areas to assess vulnerability	N/A	Medium	2015-2020	Local	Logan, UGS	$50,000	Use consultant
Logan	Dam Failure	Protect future residents and property	Educate residents located with dam failure impact areas regarding notifications and emergency actions.	N/A	Low	2015-2020	Local	Logan, Utah Dam Safety	$10,000	City staff
Logan	Earthquake	Protect future residents and property	Conduct outreach to builders, architects, engineers, and inspectors about seismic code provisions.	N/A	Medium	2015-2020	Local, FEMA	Logan, UGS	$10,000	International Code Council

MENDON

Analysis of hazard risk involving the community of Mendon revealed that there is potential risk resulting from **earthquake, flood, steep slopes, and wildfire**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and environmental features within the municipal boundary. See ***the following tables*** for more detailed descriptions of potential losses associated with each natural hazard analyzed in the risk assessment.

Table 69: Mendon Potential Loss Figures

Natural Hazards

Current Development

Earthquake. Hazard mapping identifies several structures and infrastructure at risk from surface fault rupture. Areas of concern are located in the northeast section of the jurisdiction along Mendon Road and 600 North.

Flood. Hazard mapping identifies several residential structures at risk from flooding. Small streams that drain a portion of the eastern slope

Mendon, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	198	61	14,432,874	1	135,009	688,717
Wildfire	855	264	54,716,612	8	1,387,669	5,509,736
Flood	262	81	18,232,893	1	44,530	688,717
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	104	32	8,267,793	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Cache County from 2013 American Community Survey, which is 3.24.
** Current Market Value per parcel, including building and land values. Data was provided by Cache County IT personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($688,717 per firm). Derived from 2007 Survey of Business Owners for Cache County, US Census Bureau.

Mendon, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0.15	225,000	0	0	0	0	1.17	614,250	0	0
Wildfire	0	0	0	0	0	0	3.1	1,627,500	0.33	495,000
Flood	0	0	0	0	0	0	2.39	1,254,750	0.29	435,000
Liquefaction	0.2	300,000	0	0	0	0	14.19	7,449,750	0	0
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	1.56	819,000	0.66	990,000
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Mendon, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults		Mountainside elementary			
Wildfire				1 place of worship	1 broadband anchor
Flood				1 place of worship	
Liquefaction	Mendon Fire Department, Mendon Fire and EMS	Mountainside Elementary		2 places of worship	5 broadband anchors
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

Mendon, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	31.06	79.93	0	0	0
Wildfire	59.79	258.09	0	0	1
Flood	37.38	108.28	0	0	0
Liquefaction	0	0	0	0	0
Landslide	0	0	0	0	0
Slope	40.92	0	0	0	1
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Mendon, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	3.68	0	0.09	2.76	0	0
Wildfire	14.45	0	0.87	5.58	0	0
Flood	11.25	0	2.12	2.07	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	0.81	0	0.8	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land and miles of streams and trails were identifed using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

of the Wellsville Mountains flow through Mendon. Several steep drainages on the west which could pose threats are Deep Canyon, Thimbleberry Canyon, and Bird Canyon. Bird canyon drainages particularly pose the greatest threat to residents and property.

Steep Slopes. Hazard mapping identifies significant risk from steep slopes to residential structures and infrastructure in the central portion of the jurisdiction west of S.R. 23/100 West.

Wildfire. Hazard mapping identifies moderate-to-high wildfire risk throughout much of the jurisdiction. This is primarily due to the high amount of urban canopy within the jurisdiction surrounding residential structures.

Future Development

No concerns involving potential future development within Mendon were reported by city representatives.

Hazard Mitigation Strategies

Table 70: Mendon City Mitigation Strategies

MENDON - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Mendon	Flood	Protect current residents and property	Landscape city owned properties to divert flood waters to proper ditching and urge homeowners to do the same. Landscape and ditch areas to not only help yourself but help others and the city.	N/A	High	2016	For City Property, and 2016-2016 storm water budget	Mendon, Utah DEM	$5,000	N/A
Mendon	Liquefaction/ Faults	Protect current residents and property	Enforce current building codes	N/A	High	2015	N/A	Mendon	N/A	N/A
Mendon	Drought	Protect current residents and property	Understand effects to Mendon, ask USU for study of effects	N/A	Low	2020	Federal, State, Local	Mendon, USU	Unknown	USU
Mendon	Severe Weather	Protect current residents and property	Develop plan to reduce threats to community	N/A	High	2015	FEMA, State, County	Mendon, NOAA, Utah Climate Center	Unknown	FEMA, State, County

MENDON - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Mendon	Flood	Protect future residents and property	Require swales and ditches to carry excess water. Landscape properly as to not be a liability to selves or neighbors and city.	N/A	Medium	2020	N/A	Mendon, Utah DEM	N/A	N/A
Mendon	Faults/ Liquefaction	Protect future residents and property	Help citizens prepare. Check existing city buildings to see if they meet earthquake structure code.	N/A	Medium	N/A	N/A	Mendon	N/A	N/A
Mendon	Drought	Protect future residents and property	Understand effects to Mendon, ask USU for study of effects	N/A	Low	2020	Federal, State, Local	Mendon, USU	Unknown	USU
Mendon	Severe Weather	Protect future residents and property	Develop plan to reduce threats to community	N/A	High	2015	FEMA, State, County	Mendon, NOAA, Utah Climate Center	Unknown	

MILLVILLE

Analysis of hazard risk involving the community of Millville revealed that there is potential risk resulting from **earthquake, flood, landslides, liquefaction, steep slopes and wildfire**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and environmental features within the municipal boundary. See ***the following tables*** for more detailed descriptions of potential losses associated with each natural hazard analyzed in the risk assessment.

Table 71: Millville City Potential Losses

Natural Hazards

Current Development

Earthquake. Hazard mapping identifies residential structures and infrastructure at risk from surface fault rupture. Areas of concern are located in the fault that runs parallel to the Cache-Wasatch Mountains along the jurisdiction's eastern boundary.

Flood. Hazard mapping identifies several structures and infrastructure at risk from potential flooding. The Lower Millville Providence Canal was demonstrated to have deficient capacities to accom-

Millville, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Fault	32	10	2,134,116	1	22,550	688,717
Wildfire	716	221	43,671,956	8	2,483,333	5,509,736
Flood	26	8	2,228,832	8	10,263,680	5,509,736
Liquefaction	10	3	770,046	16	25,551,317	11,019,472
Landslide	6	2	742,664	0	0	0
Slope	117	36	9,469,596	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Cache County from 2013 American Community Survey, which is 3.24.
** Current Market Value per parcel, including building and land values. Data was provided by Cache County IT personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($688,717 per firm). Derived from 2007 Survey of Business Owners for Cache County, US Census Bureau.

Millville, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Fault	0	0	0	0	1.23	156,210	1.67	876,750	0	0
Wildfire	0	0	0	0	1.13	143,510	2.4	1,260,000	0.45	675,000
Flood	0	0	0	0	0	0	0.18	94,500	0.03	45,000
Liquefaction	0.53	795,000	0	0	1.51	191,770	17.39	9,129,750	0.01	15,000
Landslide	0	0	0	0	0	0	0.06	31,500	0	0
Slope	0	0	0	0	0	0	0.76	399,000	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Millville, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					
Wildfire					
Flood					
Liquefaction		New Millville High School, Milleville Elementary		2 places of worship	5 broadband anchors
Landslide					
Slope					
Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

Millville, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	12.05	47.56	0	0	0
Wildfire	35.1	172.38	0	0	0
Flood	46.37	58.86	0	0	0
Liquefaction	242.11	289.83	0	0	0
Landslide	4.69	4.7	0	0	0
Slope	19.6	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Millville, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Fault	0.01	0	0.6	0	1.34	1
Wildfire	14.12	0	1.07	0	0.76	1
Flood	42.06	0	1.79	0.16	0	0
Liquefaction	77.23	0	1.7	0	0	0
Landslide	0	0	0	0	0	0
Slope	0.01	0	0	0.00	0.08	1
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land and miles of streams and trails were identifed using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

modate a 10 year, 3 hour duration storm event as it flows though Millville City; when it was modeled for the Cache County Storm Water Analysis report. Channel capacity for the canal was found to be deficient at 50 North, 150 North, 400 North and 2200 South in Millville City. In 2003, Millville, along with Nibley, experienced flooding from the Blacksmith Fork River. This section of river is not a natural waterway, but has a form similar to a canal, with banks built up on either side with past breach of high water flows. Potential losses can also be found on the northwest section of municipal boundaries, near the confluence of the Blacksmith Fork River and the Logan River. There are also several structures at risk on the very south end of the municipal boundaries where the Millville Canyon drainage empties into the Blacksmith Fork River. Millville floodplain analysis reveals at least 7 residential structures that intersect the delineated floodplain.

Landslides. Hazard mapping identifies risk from landslides to some residential structures and infrastructure east of the Millville Cemetery.

Liquefaction. Hazard mapping identifies moderate-to-high liquefaction risk to several structures and infrastructure west of S.R. 165/Main Street.

Steep Slopes. Hazard mapping identifies several residential structures at risk from steep slopes north of the Millville Cemetery along the jurisdiction's eastern boundary.

Wildfire. Hazard mapping identifies moderate-to-high wildfire risk areas along the jurisdiction's eastern bench and in the southwest section of town where much of the urban canopy is located.

Future Development

No concerns involving potential future development within Millville were reported by city representatives.

Hazard Mitigation Strategies

Table 72: Millville Town Mitigation Strategies

MILLVILLE - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Millville	Earthquake, Faults, Liquefaction	Protect current residents and property	Train residents as a CERT community emergency response team. Install ham radio station.	N/A	High	2015	Millville City, Cache County, NRCS	Millville, Utah DEM	$7,000	Millville City
Millville	Flood	Protect current residents and property	Tree Removal, sediment removal, and bank restoration/ stabilization was addressed.	Work with state floodplain manager to assure community is complying with NFIP	High	Completed	Millville City, Cache County, NRCS	Millville, Utah DEM	$190,000	Millville City, Cache County, NRCS
Millville	Wildfire	Protect current residents and property	Notice to restrict fireworks east of 500 East. Educate homeowners with handouts.	N/A	High	2015	Local	Millville	$100	Millville City
Millville	Landslide/ Steep Slopes	Protect current residents and property	Landslide areas and steep slopes are identified as open space no development	N/A	High	Completed	Local	Millville, UGS	$0	Millville City

MILLVILLE - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Millville	Earthquake, Faults, Liquefaction	Protect future residents and property	Train residents as a CERT community emergency response team. Install ham radio station.	N/A	High	2015	Millville City, Cache County, NRCS	Millville, Utah DEM	$7,000	Millville City
Millville	Flood	Protect future residents and property	Tree Removal, sediment removal, and bank restoration/ stabilization was addressed.	Work with state floodplain manager to assure community is complying with NFIP	High	Completed	Millville City, Cache County, NRCS	Millville, Utah DEM	$190,000	Millville City, Cache County, NRCS
Millville	Wildfire	Protect future residents and property	Notice to restrict fireworks east of 500 East. Educate homeowners with handouts.	N/A	High	2015	Local	Millville	$100	Millville City
Millville	Landslide/ Steep Slopes	Protect future residents and property	Landslide areas and steep slopes are identified as open space no development	N/A	High	Completed	Local	Millville, UGS	$0	Millville City

NEWTON

Analysis of hazard risk involving the community of Newton revealed that there is potential risk resulting from **flood, steep slopes and wildfire**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and environmental features within the municipal boundary. See ***the following tables*** for more detailed descriptions of potential losses associated with each natural hazard analyzed in the risk assessment.

Table 73: Newton Potential Loss Figures

Natural Hazards

Current Development

Flood. Hazard mapping identifies several structures at risk from flooding in the 100 year floodplain located along the jurisdiction's eastern boundary, adjacent to Newton Creek.

Steep Slopes. Hazard mapping identifies risk from steep slopes to several residential structures in the western portion of the jurisdiction.

Newton, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	473	146	23,113,822	7	586,677	4,821,019
Flood	52	16	3,759,174	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	52	16	2,573,234	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Cache County from 2013 American Community Survey, which is 3.24.
** Current Market Value per parcel, including building and land values. Data was provided by Cache County IT personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($688,717 per firm). Derived from 2007 Survey of Business Owners for Cache County, US Census Bureau.

Newton, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0	2.15	1,128,750	0	0
Flood	0	0	0	0	0	0	0.05	26,250	0	0
Liquefaction	0	0	0	0	0	0	10.45	5,486,250	0	0
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0.53	278,250	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Newton, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					
Wildfire	Newton Fire Department and EMS			1 place of worship	3 broadband anchors
Flood					
Liquefaction					
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

Newton, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	0	0	0	0	0
Wildfire	4.51	156.4	0	1	1
Flood	9.61	13.78	0	0	0
Liquefaction	0	0	0	0	0
Landslide	0	0	0	0	0
Slope	7.06	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Newton, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	0.02	0	0.48	2.95	0	0
Flood	1.02	0	0	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0.45	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land and miles of streams and trails were identifed using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

Wildfire. Hazard mapping identifies moderate-to-high wildfire risk areas throughout much of the jurisdiction, due to the high amount of urban canopy within city limits.

Future Development

No concerns involving potential future development within Newton were reported by town representatives.

Hazard Mitigation Strategies

Table 74: Newton Mitigation Strategies

NEWTON - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Newton	Steep Slopes	Protect current residents and property	Work with state and other groups to determine risk at local level.	N/A	Low	2017	State, Local	Newton, UGS	Minimal	State, Local
Newton	Flood	Protect current residents and property	Making sure Fire Department and EMT's are Trained in the occurrence of a flood hazard event.	Work with State floodplain manager to determing NFIP compliance and work to update.	Medium	2015	County, Local	Newton, Utah DEM, Cache County	Minimal	County, local, FEMA, State ESHS
Newton	Earthquake	Protect current residents and property	Evaluate town for areas and infrastructure that could be effected. If the funding did come, retrofitting some infrastructure would be a possibility	N/A	Medium	2020	Local	Newton, UGS, BRAG	Minimal	Local
Newton	Wildfire	Protect current residents and property	Make sure all Fire fighters and Emergency response crews have the proper training for wildfires.	N/A	Medium	2017	Local, County	Newton, Cache County	Minimal	Local, County

NEWTON - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Newton	Steep Slopes	Protect future residents and property	Review current ordinances to see if improvements can be made to protect future residents from effects of steep slope.	N/A	Low	2017	State, Local	Newton, UGS	Minimal	State, Local
Newton	Flood	Protect future residents and property	Making sure Fire Department and EMT's are trained in the occurrence of a flood hazard event.	Work with State floodplain manager to determing NFIP compliance and work to update.	Medium	2015	County, Local	Newton, Utah DEM, Cache County	Minimal	County, local, FEMA, State ESHS
Newton	Earthquake	Protect future residents and property	Evaluate town for areas and infrastructure that could be effected. If the funding did come, retrofitting some infrastructure would be a possibility	N/A	Medium	2020	Local	Newton, UGS, BRAG	Minimal	Local
Newton	Wildfire	Protect future residents and property	Creating fire breaks or vegetation setback from infrastructure in wildfire prone areas.	N/A	High	2017	Local, County	Newton, Cache County	Minimal	Local, County

NIBLEY

Analysis of hazard risk involving the community of Nibley revealed that there is potential risk resulting from **flood, landslides, liquefaction, steep slopes and wildfire**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and environmental features within the municipal boundary. See ***the following tables*** for more detailed descriptions of potential losses associated with each natural hazard analyzed in the risk assessment.

Table 75: Nibley Potential Loss Figures

Nibley, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	573	177	46,236,677	5	3,902,933	3,443,585
Flood	528	163	49,841,244	2	1,371,078	1,377,434
Liquefaction	1,571	485	92,305,887	10	6,254,210	6,887,170
Landslide	6	2	818,333	0	0	0
Slope	62	19	3,229,538	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Cache County from 2013 American Community Survey, which is 3.24.
** Current Market Value per parcel, including building and land values. Data was provided by Cache County IT personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($688,717 per firm). Derived from 2007 Survey of Business Owners for Cache County, US Census Bureau.

Natural Hazards

Current Development

Flood. Hazard mapping identifies several structures and infrastructure at risk from flooding in the 100 year floodplain. There are two floodplain segments that enter the city from the southeast. One segment extends north along the Blacksmith Fork River drainage to the northern boundary of the city limit. The other extends southeast to northwest to 3200 South St. This is especially true where flooding occurred in 2003 at the confluence of Highway 165

Nibley, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0	1.23	645,750	1.92	2,880,000
Flood	0	0	0	0	0	0	1.6	840,000	3.56	5,340,000
Liquefaction	1.72	2,580,000	0	0	0	0	34.09	17,897,250	4.95	7,425,000
Landslide	0	0	0	0	0	0	0	0	0.16	240,000
Slope	0	0	0	0	0	0	0.15	78,750	0.04	60,000
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Nibley, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					
Wildfire					
Flood					2 bridges
Liquefaction	Millville and Nibley First Responders	Heritage School, Nibley School, Thomas Edison-South, Nibley City Office		6 places of worship	3 bridges, 7 broadband anchors
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

Nibley, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	0	0	0	0	0
Wildfire	40.52	125.96	0	0	0
Flood	94.53	156.15	0	0	0
Liquefaction	438.53	825.59	0	0	0
Landslide	14.11	11.58	0	0	0
Slope	4.06	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Nibley, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	31.26	0	2.6	1.45	0	0
Flood	65.82	0	5.23	6.15	0	0
Liquefaction	66.35	0	2.43	8.26	0	0
Landslide	0.1	0	0	0	0	0
Slope	4.89	0	0.04	2.15	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land and miles of streams and trails were identifed using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

and the Canal. The Canal also flanks the municipality on the northwest which could affect several structures closer to Highway 89-91 in the event of a flood.

Landslides. Hazard mapping identifies minimal risk to residential structures from landslides in the southeast corner of the jurisdiction.

Liquefaction. Hazard mapping identifies moderate-to-high liquefaction risk to a significant number of residential structures in the eastern half of the jurisdiction.

Steep Slopes. Hazard mapping identifies risk from steep slopes to structures and infrastructure in the northeast section of the jurisdiction, east of S.R. 165/Main Street.

Wildfire. Hazard mapping identifies moderate-to-high wildfire risk areas along the jurisdiction's eastern bench, below the Cache-Wasatch Mountains.

Future Development

No concerns involving potential future development within Nibley were reported by city representatives.

Hazard Mitigation Strategies

Table 76: Nibley City Mitigation Strategies

NIBLEY - COMMUNITY MITIGATION STRATEGIES

Protecting Current Residents and Property

Jurisdiction	Hazard	Goal	Action	Action (For NFIP Compliance, if Applicable)	Priority (High, Medium, Low)	Time-frame (Year)	Potential Funding Sources	Responsible Entity	Estimated Cost	Resources
Nibley	Dam Failure	Protect current residents and property	Educate residents located with dam failure impact areas regarding notifications and emergency actions.	N/A	Low	2015-2020	Local	Nibley, Utah Dam Safety	$10,000	City staff
Nibley	Wildfire	Protect current residents and property	Require or encourage fire resistant construction techniques	Use fire resistant building materials	Medium	2020	County, Local, State	Nibley, Utah FFSL	N/A	County, Local, State
Nibley	Landslide	Protect current residents and property	Update city ordinances to mitigate development in landslide hazard areas.	N/A	Medium	2020	CIB, City	Nibley, UGS	$1,500	Geologic Survey, Utah State University, State of Utah
Nibley	Severe Weather	Protect current residents and property	Emergency response planning	N/A	Medium	2020	County, FEMA, State	Nibley	Minimal	Local, County, State
Nibley	Flood	Protect current residents and property	Develop and improve culinary water source	N/A	Medium	2017	County, Local	Nibley, Utah DEM	N/A	County, local, FEMA, State ESHS
Nibley	Flood	Protect current residents and property	2600 East new construction of a retention basin.	N/A	N/A	2020	N/A	Nibley, Utah DEM	N/A	N/A
Nibley	Earthquake	Protect current residents and property	Training in earthquake emergency planning and response for residents, and coordination between local and county fire, police, and EMT crews.	N/A	High	2017	County, Homeland Security	Nibley, UGS, Cache County	$100,000	Cache County Fire, Logan Fire

NIBLEY - COMMUNITY MITIGATION STRATEGIES

Protecting Future Residents and Property

Jurisdiction	Hazard	Goal	Action	Action (For NFIP Compliance, if Applicable)	Priority (High, Medium, Low)	Time-frame (Year)	Potential Funding Sources	Responsible Entity	Estimated Cost	Resources
Nibley	Dam Failure	Protect future residents and property	Education and implementing FERC requirements.	N/A	Medium	2016	City	Nibley, Utah Dam Safety	N/A	City, State, Federal
Nibley	Wildfire	Protect future residents and property	Develop a wild land urban interface code	N/A	Medium	2020	Local, State, County	Nibley, Utah FFSL	N/A	Local, State, County
Nibley	Landslide	Protect future residents and property	Improve data and mapping of landslide areas located in the city.	N/A	Medium	2020	City, State of Utah, CIB	Nibley, UGS	$10,000	Geologic Survey, Utah State University, State of Utah
Nibley	Severe Weather	Protect future residents and property	Adopt and enforce building codes.	Enforcement of building codes	Medium	2020	City, State of Utah, CIB	Nibley	N/A	City, State of Utah, CIB
Nibley	Flood	Protect future residents and property	Review current ordinance regarding flood, fire, etc.	N/A	Medium	2020	Local, BRAG, County	Nibley, Utah DEM	Minimal	Local, County, BRAG,
Nibley	Flood	Protect future residents and property	2600 East new construction of a retention basin.	N/A	N/A	2020	N/A	Nibley, Utah DEM	N/A	N/A
Nibley	Earthquake	Protect future residents and property	Seismic retrofit of public works buildings	N/A	Medium	2020	County, FEMA, State	Nibley, UGS, Utah DEM	Minimal	USGS, Utah GS, BRAG, Utah League of Cities & Towns, APA

NORTH LOGAN

Analysis of hazard risk involving the community of North Logan revealed that there is potential risk resulting from **earthquakes, flood, steep slopes and wildfire**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and environmental features within the municipal boundary. See ***the following tables*** for more detailed descriptions of potential losses associated with each natural hazard analyzed in the risk assessment.

Table 77: North Logan Potential Loss Figures

North Logan, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	561	173	69,075,839	2	639,530	1,377,434
Wildfire	2,692	831	283,175,908	111	178,707,789	76,447,587
Flood	133	41	12,649,599	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	619	191	74,404,937	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Cache County from 2013 American Community Survey, which is 3.24.
** Current Market Value per parcel, including building and land values. Data was provided by Cache County IT personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($688,717 per firm). Derived from 2007 Survey of Business Owners for Cache County, US Census Bureau.

Natural Hazards

Current Development

Earthquake. Hazard mapping identifies several residential structures and infrastructure at risk from surface fault rupture. There are two forks of the damage zone that run through the jurisdiction; one zone runs along the jurisdiction's eastern boundary, and the other is parallel to the Logan, Hyde Park, and Smithfield Canal.

Flood. Hazard mapping identifies several

North Logan, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	0.55	69,850	7	3,675,000	1.55	2,325,000
Wildfire	0	0	0	0	0.61	77,470	14	7,350,000	2.02	3,030,000
Flood	0	0	0	0	0.13	16,510	0.5	262,500	0.76	1,140,000
Liquefaction	0	0	0	0	0.7	88,900	57.11	29,982,750	0	0
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0.05	6,350	4.2	2,205,000	0.29	435,000
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

North Logan, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					
Wildfire				1 place of worship	2 broadband anchors, 1 dam
Flood					1 bridge, 1 dam
Liquefaction	North Logan Fire and EMS, North Logan Fire Department Station, North Park Police Department	11 schools	Cache Valley Specialty Hospital, Integrity Hospice, Cache Valley Specialty hospital Mammography	8 places of worship	2 bridges, 1 dam, 18 broadband anchors
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

North Logan, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	502.51	630.72	0	0	0
Wildfire	401.09	978.1	0	0	2
Flood	44.12	110.96	0	0	2
Liquefaction	0	0	0	0	0
Landslide	0	0	0	0	0
Slope	117.37	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

North Logan, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	8.52	0	5.3	25.54	0.67	3
Wildfire	24.6	0.22	6.84	36.94	0.62	5
Flood	0	0	3.24	9.22	0.3	2
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	2.53	0	4.37	33.04	0.35	4
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land and miles of streams and trails were identifed using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

residential structures and infrastructure at risk from flooding in the 100 year floodplain. The floodplain begins at the mouth of Green Canyon and flows northeast through the jurisdiction.

Steep Slopes. Hazard mapping identifies significant risk from steep slopes in much of the east and northeast sections of the jurisdiction. These areas along the bench are popular in the valley for higher value homes and development.

Wildfire. Hazard mapping identifies moderate-to-high wildfire risk areas along the jurisdiction's eastern bench and throughout the developed areas with urban canopy.

Future Development

There is a Canyon Gates Subdivision area that will in the future have 250 newly constructed homes.

Hazard Mitigation Strategies

Table 78: North Logan Mitigation Strategies

NORTH LOGAN - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
North Logan	Earthquake	Protect current residents and property	Meeting existing building codes. Training in earthquake emergency planning and response for residents	N/A	High	2017	Local, County	North Logan, UGS, Cache County	Minimal	Cache County, BRAG
North Logan	Flood	Protect current residents and property	Check for compliance of NFIP	N/A	Low	2017	County, Local	North Logan, Utah DEM	Minimal	County, Brag
North Logan	Wildfire	Protect current residents and property	Work with fire, forestry, and lands, to explore for wild land interface. Install sprinkler systems in new infrastructure.	N/A	Medium	2016	Forestry, Fire, State land	North Logan, Utah FFSL	Minimal	Brag, Local, Forestry, Fire, State land
North Logan	Landslide / Steep Slopes	Protect current residents and property	Explore the possibility of developing a landslide ordinance.	N/A	Low	2017	Local	North Logan, UGS	Minimal	Local, Federal, CIB, FEMA, UGS

NORTH LOGAN - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
North Logan	Earthquake	Protect future residents and property	Meeting existing building codes. Training in earthquake emergency planning and response for residents	N/A	High	2017	Local, County	North Logan, UGS, Cache County	Minimal	Cache County, BRAG
North Logan	Flood	Protect future residents and property	Check for compliance of NFIP	N/A	Low	2017	County, Local	North Logan, Utah DEM	Minimal	County, Brag
North Logan	Wildfire	Protect future residents and property	Work with fire, forestry, and lands, to explore for wild land interface. Install sprinkler systems in new infrastructure.	N/A	Medium	2016	Forestry, Fire, State land	North Logan, Utah FFSL	Minimal	Brag, Local, Forestry, Fire, State land
North Logan	Landslide / Steep Slopes	Protect future residents and property	Explore the possibility of developing a landslide ordinance.	N/A	Low	2017	Local	North Logan, UGS	Minimal	Local, Federal, CIB, FEMA, UGS

PARADISE

Analysis of hazard risk involving the community of Paradise revealed that there is potential risk resulting from **dam break, flood, and wildfire**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and environmental features within the municipal boundary. See ***the following tables*** for more detailed descriptions of potential losses associated with each natural hazard analyzed in the risk assessment.

Table 79: Paradise Town Potential Loss Figures

Natural Hazards

Current Development

Dam Failure. Hazard mapping identifies dam failure risk to some residential structures and infrastructure in the southwest corner of the jurisdiction.

Flood. Hazard mapping identifies several residential structures and infrastructure at risk from flooding in the 100 year floodplain. The floodplain enters the town from Hyrum Canyon to the east and

Paradise, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	26	8	1,804,107	0	0	0
Faults	0	0	0	0	0	0
Wildfire	505	156	27,587,782	7	699,974	4,821,019
Flood	100	31	6,158,907	1	35,813	688,717
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Cache County from 2013 American Community Survey, which is 3.24.
** Current Market Value per parcel, including building and land values. Data was provided by Cache County IT personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($688,717 per firm). Derived from 2007 Survey of Business Owners for Cache County, US Census Bureau

Paradise, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0.26	136,500	0	0
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0	1.68	882,000	0.65	975,000
Flood	0	0	0	0	0	0	0.79	414,750	1.55	2,325,000
Liquefaction	0	0	0	0	0	0	14.71	7,722,750	0	0
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0	0	0.05	75,000
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Paradise, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					
Wildfire	Paradise Fire and EMS, Paradise Fire Department				3 broadband anchors
Flood					
Liquefaction					4 broadband anchors, 2 places of worship, Paradise Fire and EMS, Paradise Fire Department
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

Paradise, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	11.43	25.24	0	0	0
Faults	0	0	0	0	0
Wildfire	39.51	169.24	0	0	1
Flood	14.98	43.63	0	0	0
Liquefaction	0	0	0	0	0
Landslide	0	0	0	0	0
Slope	0.75	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Paradise, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	2.84	0	0.67	5.87	0	0
Flood	10.58	0	1.89	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0.03	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land and miles of streams and trails were identifed using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

flows southeast and northwest along Paradise Canal.

Wildfire. Hazard mapping identifies moderate-to-high wildfire risk in areas along the eastern bench and throughout the jurisdiction's urban canopy.

Future Development

No concerns involving potential future development within Paradise were reported by town representatives.

Hazard Mitigation Strategies

Table 80: Paradise Town Mitigation Strategies

PARADISE - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Paradise	Dam Failure	Protect current residents and property	Implement and communicate existing FERC Plan	N/A	Low	2016	Local	Paradise, Utah Dam Safety	None	Local
Paradise	Flood	Protect current residents and property	Monitor new buildings and subdivisions for mitigation	Help new prior flooding areas by grading.	Low	2020	County, Local	Paradise	N/A	County, local, FEMA, State ESHS
Paradise	Earthquake	Protect current residents and property	Education and EMS Training and certification	N/A	Medium	Ongoing	General Fund	Paradise, UGS, Cache County	2,000 a year	Town Fire Department
Paradise	Wildfire	Protect current residents and property	Education on the subject.	N/A	Medium	Ongoing	None	Paradise, Utah FFSL	TBD	Newsletters, community training
Paradise	Steep Slopes	Protect current residents and property	Limit building and annexation in areas with steep slopes	N/A	Medium	2020	None	Paradise, UGS	None	Not needed

PARADISE - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Paradise	Dam Failure	Protect future residents and property	Limit annexation in the inundation zones.	N/A	Medium	2020	None	Paradise, Utah Dam Safety	None	Not needed
Paradise	Flood	Protect future residents and property	No building in floodplain areas.	same as action	High	2015	Local, state	Paradise, Utah DEM	Minimal	Not needed
Paradise	Earthquake	Protect future residents and property	Add generator capability for 1 or more wells	N/A	Medium	2016	Water Revenue Fund	Paradise, Utah Water Resources	5,000 a well	Water Revenue Funds
Paradise	Wildfire	Protect future residents and property	Limit building in areas of greater risk.	N/A	Medium	2020	None	Paradise, Utah FFSL	None	Not needed
Paradise	Steep Slopes	Protect future residents and property	Limit building and annexation in areas with steep slopes	N/A	Medium	2020	None	Paradise, UGS	None	Not needed

PROVIDENCE

Analysis of hazard risk involving the community of Providence revealed that there is potential risk resulting from **earthquakes, flood, landslides, liquefaction, steep slopes and wildfire**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and environmental features within the municipal boundary. See ***the following tables*** for more detailed descriptions of potential losses associated with each natural hazard analyzed in the risk assessment.

Table 81: Providence Potential Loss Figures

Natural Hazards

Current Development

Earthquake. Hazard mapping identifies several structures and infrastructure at risk from surface fault rupture. Areas of concern are located along the fault that runs along the jurisdiction's eastern boundary.

Flood. Hazard mapping identifies several residential structures and infrastructure at risk from flooding in the 100 year floodplain. The Cache County Storm Water Analysis report suggests that

Providence, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	198	61	25,486,202	2	655,448	1,377,434
Wildfire	2,709	836	225,175,521	6	8,055,898	4,132,302
Flood	233	72	22,424,862	10	7,314,905	6,887,170
Liquefaction	586	181	48,686,729	60	55,109,506	41,323,020
Landslide	275	85	29,313,515	0	0	0
Slope	421	130	42,652,140	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Cache County from 2013 American Community Survey, which is 3.24.
** Current Market Value per parcel, including building and land values. Data was provided by Cache County IT personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($688,717 per firm). Derived from 2007 Survey of Business Owners for Cache County, US Census Bureau.

Providence, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	4.1	520,700	1.57	824,250	0.01	15,000
Wildfire	0	0	0	0	3.87	491,490	7.77	4,079,250	0.56	840,000
Flood	0	0	0	0	0	0	0.35	183,750	0.08	120,000
Liquefaction	0	0	0	0	4.87	618,490	40.89	21,467,250	1.88	2,820,000
Landslide	0	0	0	0	0.91	115,570	1.04	546,000	0	0
Slope	0	0	0	0	1.37	173,990	1.51	792,750	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Providence, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					
Wildfire				2 places of worship	
Flood					
Liquefaction		Providence Elementary, Spring Creek Middle School	Primrose Hospice, CNS Community Hospice, Providence Assisted Living, South Cache Valley Clinic, Cache Valley Assisted Living	7 places of worship	15 broadband anchors
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

Providence, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	161.62	183.83	0	0	0
Wildfire	193.42	514.4	0	0	0
Flood	1.16	24.92	0	0	0
Liquefaction	119.67	285.08	0	0	1
Landslide	9.67	49.57	0	0	0
Slope	57.16	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Providence, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	0.88	0	2.38	0	1.71	4
Wildfire	16.9	0.32	2.9	0.74	0.76	3
Flood	12.18	0	0.64	0.53	0	0
Liquefaction	12.09	0	0.95	0.68	0	0
Landslide	0	0	0.38	0	0.3	1
Slope	0.01	0	0.62	0	1.47	2
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land and miles of streams and trails were identifed using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

capacity deficiency exists on the Lower Millville Providence Canal as the canal nears 500 South, 400 South, 200 South, 100 South and 100 North. Deficiencies also exist on the Upper Millville Providence Canal near 580 South, 300 South, 200 South, Center St., 200 North (JUB Engineering, 2003).

Landslides. Hazard mapping identifies risk from landslides in the northeast bench and drainages of the jurisdiction. There are also areas of concern north of Spring Creek and uphill from the Von Baer Park.

Liquefaction. Hazard mapping identifies moderate-to-high liquefaction risk to several structures and infrastructure in much of the jurisdiction that is west of Main Street.

Steep Slopes. Hazard mapping identifies significant risk from steep slopes to residential structures and infrastructure along the eastern bench of the jurisdiction. This area is popular for high value homes and development.

Wildfire. Hazard mapping identifies moderate-to-high wildfire risk areas along the jurisdiction's eastern bench and throughout the urban canopy that extends west from the Cache-Wasatch Mountains.

Future Development

There is potential development on the east side of the city within the foothills. In this area some possible hazards that could be a potential risk include: flooding, landslide, and wildfires.

Hazard Mitigation Strategies

Table 82: Providence Mitigation Strategies

PROVIDENCE - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Providence	Drought	Protect current residents and property	Educate public about the possibility of a drought. Have water restriction plans in place to implement if a drought occurs.	N/A	Medium	2015-2016	City	Providence, NOAA	N/A	Cache County
Providence	Earthquake	Protect current residents and property	Educate citizens of the hazard of earthquakes and what they can do to prepare for such events.	N/A	Medium	2015-2020	City	Providence, UGS	$55,000	N/A
Providence	Flooding	Protect current residents and property	City needs to continue to upsize all street culvert crossings that spring creek flows through.	Follow rules already in place with the program	Medium	Annually	City, impact fees	Providence	N/A	NFIP, County
Providence	Landslide	Protect current residents and property	Make citizens aware of the potential hazard and prepare them for what to do if it occurs.	N/A	Low	2015	City	Providence, UGS	N/A	County, internet
Providence	Wildfire	Protect current residents and property	Implement actions from previous urban wild land interface.	N/A	Medium	Ongoing	City	Providence, Utah FFSL	N/A	Cache County Fire
Providence	Severe Weather	Protect current residents and property	Education and awareness, participate in emergency preparedness planning	N/A	Medium	2015	Federal, State, Local	Providence, NOAA	$5,000	Federal, State, Local

PROVIDENCE - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Providence	Drought	Protect future residents and property	Assure that all development brings adequate water to assure enough rights to provide for the development.	N/A	Medium	2015-2016	City	Providence, Cache County	N/A	City
Providence	Earthquake	Protect future residents and property	Require future development on the east side of the city to locate the fault and plan accordingly with their developments.	N/A	Medium	2020	City	Providence, UGS	$1,500 annually	County
Providence	Flooding	Protect future residents and property	Assure that all development is aware of and designs and plans for dealing with high run off levels and the probabilities of flooding of spring creek.	Follow rules already in place with the program	Medium	As developmen t occurs	City	Providence, Utah DEM	$30,000	City
Providence	Landslide	Protect future residents and property	Continue to educate citizens.	N/A	Low	Continuing	City	Providence, UGS	N/A	N/A
Providence	Wildfire	Protect future residents and property	Continue to follow actions from existing plan.	N/A	Medium	Ongoing	N/A	Providence, Utah FFSL	N/A	N/A
Providence	Severe Weather	Protect future residents and property	Encourage emergency preparedness, work with local churches to aid in preparation	N/A	Medium	2015	10,000	Providence	N/A	N/A

RICHMOND

Analysis of hazard risk involving the community of Richmond revealed that there is potential risk resulting from **earthquakes, flood, steep slopes and wildfire**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and environmental features within the municipal boundary. See ***the following tables*** for more detailed descriptions of potential losses associated with each natural hazard analyzed in the risk assessment.

Table 83: Richmond City Potential Loss Figures

Natural Hazards

Current Development

Earthquake. Hazard mapping identifies some structures and infrastructure at risk from surface fault rupture. Areas of concern are along the fault that runs along the jurisdiction's eastern boundary.

Flood. Hazard mapping identifies several residential structures and infrastructure at risk from flooding in the 100 year floodplain. The flood threat

Richmond, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	26	8	1,759,394	0	0	0
Wildfire	311	96	15,070,534	12	2,088,811	8,264,604
Flood	156	48	9,678,747	4	21,735,770	2,754,868
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	269	83	18,324,959	3	1,536,814	2,066,151
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Cache County from 2013 American Community Survey, which is 3.24.
** Current Market Value per parcel, including building and land values. Data was provided by Cache County IT personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($688,717 per firm). Derived from 2007 Survey of Business Owners for Cache County, US Census Bureau.

Richmond, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	0	0	0.58	304,500	0.4	600,000
Wildfire	0	0	0	0	0	0	0.53	278,250	0.55	825,000
Flood	0.07	105,000	0.17	238,000	0	0	0.93	488,250	0.16	240,000
Liquefaction	1.45	2,175,000	0	0	0	0	25.91	13,602,750	0	0
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	2.62	1,375,500	0.92	1,380,000
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Richmond, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					
Wildfire					1 broadband anchor
Flood					
Liquefaction	Richmond Fire and EMS, Richmond Fire Department	White Pine Middle School, Park School		2 places of worship	10 broadband anchors
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

Richmond, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	43.49	14.19	0	0	0
Wildfire	21.35	67.49	0	1	2
Flood	36.5	81.64	0	0	0
Liquefaction	0	0	0	0	0
Landslide	0	0	0	0	0
Slope	212.19	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Richmond, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	0	0	0.39	0	0.44	2
Wildfire	0.09	0	0.62	3.52	0.22	1
Flood	12.36	0	2.59	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	5.76	0	2.02	0	0.47	2
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land and miles of streams and trails were identifed using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

comes from City Creek, a small tributary that drains a portion of the fairly steep mountains to the east of Richmond City. Richmond has about 50 structures at risk, mostly along City Creek, and a few more to the north along Cherry Creek. Even though a large portion of the city is identified as being in the 100 year flood plain, no significant flooding has occurred historically on City Creek. A large portion of the stream flow can be diverted into an irrigation canal above Richmond City. This may help to moderate the impacts of high stream flows.

Steep Slopes. Hazard mapping identifies significant risk to residential structures and infrastructure from steep slopes in much of the jurisdiction's eastern bench. This area is popular for high value homes and new development.

Wildfire. Hazard mapping identifies moderate-to-high wildfire risk areas along the eastern bench of the jurisdiction.

Future Development

No concerns involving potential future development within Richmond were reported by city representatives.

Hazard Mitigation Strategies

Table 84: Richmond City Mitigation Strategies

RICHMOND - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Richmond	Earthquake/ Faults	Protect current residents and property	Handout for potential builders listing possible dangers.	N/A	Medium	2015	city budget	Richmond, UGS, BRAG	$2,000	city taxes
Richmond	Earthquake/ Liquefaction	Protect current residents and property	Have potential areas for liquefaction engineered.	N/A	Medium	2016	City Budget	Richmond, UGS	$40,000-$45,000	Will need to coordinate with Richmond City Council
Richmond	Earthquake	Protect current residents and property	Encourage upgrading of older structures.	N/A	Medium	2015	None	Richmond, Utah DEM	None	Articles in established city newsletter.
Richmond	Flood	Protect current residents and property	Education, determine flood risks	Update our NFIP ordinance to reflect the most recent changes.	High	2015	None	Richmond, Utah DEM	N/A	FEMA resources re: NFIP
Richmond	Wildfire	Protect current residents and property	Work with Utah FFSL to improve wildfire planning	N/A	High	2015-ongoing	None	Richmond, Utah FFSL	None	Continue education of citizens
Richmond	Steep Slopes	Protect current residents and property	Prevent erosion in established steep slope residential development.	N/A	Medium	2015	None	Richmond, UGS	None	Articles in city newsletter to remind property owners of the danger.

RICHMOND - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Richmond	Earthquake/ Faults	Protect future residents and property	No practical action - work on determining	N/A	Low	Existing	None	Richmond, UGS, BRAG	None	Known potential faults are contained in the general plan.
Richmond	Earthquake/ Liquefaction	Protect future residents and property	No practical action - work on determining	N/A	Low	Existing	None	Richmond, UGS	None	Known potential faults are contained in the general plan.
Richmond	Earthquake	Protect future residents and property	Ensure potential development is aware of earthquake potential.	N/A	High	Ongoing	None	Richmond, Utah DEM	None	Incorporate data in building clearance form to alert prospective builders.
Richmond	Flood	Protect future residents and property	Education, determine flood risks	Continued coordination between Richmond City and the Richmond Irrigation Company	High	Constant	None	Richmond, Utah DEM	None	Coordinate FEMA instructions with the Richmond Irrigation company
Richmond	Wildfire	Protect future residents and property	Work with Utah FFSL to improve wildfire planning	N/A	High	2015-ongoing	None	Richmond, Utah FFSL	None	Continue education of citizens
Richmond	Steep Slopes	Protect future residents and property	Restrict construction in steep slope areas per existing city code.	N/A	High	2015-ongoing	None	Richmond, UGS	None	Enforce building clearance requirements to comply with existing city code.

RIVER HEIGHTS

Analysis of hazard risk involving the community of River Heights revealed that there is potential risk resulting from **dam break, flood, liquefaction, steep slopes and wildfire**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and environmental features within the municipal boundary. See ***the following tables*** for more detailed descriptions of potential losses associated with each natural hazard analyzed in the risk assessment.

Table 85: River Heights Potential Loss Figures

Natural Hazards

Current Development

Dam Failure. Hazard mapping identifies dam failure risk to several residential structures and infrastructure below First Dam. This threat is located on the south side of the Logan River in low elevation areas throughout the jurisdiction.

Flood. Hazard mapping identifies some residential structures and infrastructure at risk from flooding in the 100 year floodplain. This threat is

River Heights, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	165	51	29,479,465	0	0	0
Faults	0	0	0	0	0	0
Wildfire	136	42	14,521,972	0	0	0
Flood	32	10	2,561,785	0	0	0
Liquefaction	227	70	33,517,176	3	1,453,693	2,066,151
Landslide	0	0	0	0	0	0
Slope	110	34	13,007,114	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Cache County from 2013 American Community Survey, which is 3.24.
** Current Market Value per parcel, including building and land values. Data was provided by Cache County IT personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($688,717 per firm). Derived from 2007 Survey of Business Owners for Cache County, US Census Bureau.

River Heights, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0.6	315,000	0.04	60,000
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0	0.31	162,750	0	0
Flood	0	0	0	0	0	0	0.02	10,500	0	0
Liquefaction	0	0	0	0	0	0	9.71	5,097,750	0.91	1,365,000
Landslide	0	0	0	0	0	0	0	0		0
Slope	0	0	0	0	0	0	0.37	194,250	0.16	240,000
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

River Heights, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					
Wildfire					
Flood					
Liquefaction		River Heights Elementary School, Private School, Home School		1 place of worship	3 broadband anchors
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

River Heights, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	9.68	27.64	0	0	0
Faults	0	0	0	0	0
Wildfire	6.52	19.27	0	0	0
Flood	0.28	3.49	0	0	0
Liquefaction	26.83	54.81	0	0	0
Landslide	0	0	0	0	0
Slope	0.02	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

River Heights, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	4.12	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	0	0.29	0	0	0	0
Flood	1.22	0	0.22	0.02	0	0
Liquefaction	11.34	0	0.04	0.03	0	0
Landslide	0	0	0	0	0	0
Slope	0.14	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land and miles of streams and trails were identifed using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

from Dry Canyon/Spring Creek that enters the jurisdiction from the south and flow along its southern boundary to the west.

Liquefaction. Hazard mapping identifies moderate-to-high liquefaction risk to several structures and infrastructure extending west through the boundary of the jurisdiction around 400 West.

Steep Slopes. Hazard mapping identifies some risk from steep slopes to residential structures and infrastructure in the northeast portion of the jurisdiction's eastern bench. There are also some areas leading down to "The Island" north of the jurisdiction.

Wildfire. Hazard mapping identifies moderate-to-high wildfire risk areas along the jurisdiction's eastern bench and extending west into the urban canopy.

Future Development

No concerns involving potential future development within River Heights were reported by city representatives.

Hazard Mitigation Strategies

Table 86: River Heights Mitigation Strategies

RIVER HEIGHTS - COMMUNITY MITIGATION STRATEGIES

Protecting Current Residents and Property

Jurisdiction	Hazard	Goal	Action	Action (For NFIP Compliance, if Applicable)	Priority (High, Medium, Low)	Time-frame (Year)	Potential Funding Sources	Responsible Entity	Estimated Cost	Resources
River Heights	Wildfire	Protect current residents and property	Maintain fire hydrants, protect water supply for adequate fire fighting (shut off pumps), reduce fire hazards through city ordinances	N/A	High	2017	City general fund	River Heights	TBD	Local, Utah FFSL, County
River Heights	Earthquake	Protect current residents and property	New building codes, develop EOP, new water lines (avoid breakage), neighborhood block captains/area specialists, CERT training, disaster assistance flags	N/A	Medium	Ongoing	City general fund	River Heights, Cache County	TBD	Local, County EOC
River Heights	Dam Failure	Protect current residents and property	Work with the Utah Division of Water Rights and other groups to utilize Emergency Action Plans on a local level.	N/A	Low	2020	Utah Division of Water Rights, Local	River Heights, Utah Dam Safety	Minimal	Utah Division of Water Rights, Local
River Heights	Drought	Protect current residents and property	Protect water supply to ensure adequate water for consumption and fire protection, monitor water use/supply, encourage water conservation, higher rates for overages, electronic meters, rations if needed	N/A	High	Ongoing	City general fund	River Heights, NOAA, Utah Climate Center	Minimal	Local, County
River Heights	Severe Weather	Protect current residents and property	Services to keep roads open, water/sewer working, EP/BC, CERT training, maintain snow plows, disaster assistance flags in every home	N/A	Medium	Ongoing	City general fund	River Heights	TBD	Local, County
River Heights	Flood	Protect current residents and property	Work with Utah DEM and others to determine local flood risk and specific flood hazard areas in town.	Work with state floodplain manager to assure ongoing compliance with NFIP.	Medium	2017	City, FEMA, Utah DEM	River Heights, Utah DEM, BRAG	Minimal	City, FEMA, Utah DEM
River Heights	Slope	Protect current residents and property	Determine where steep slopes are and site specific risk to homes and residences.	N/A	Medium	2017	City, UGS, USGS	River Heights, UGS	Minimal	City, UGS, USGS
River Heights	Power Outage	Protect current residents and property	Encourage residents to prepare for long-term outages, education, EP specialists, CERT training, emergency generator for water system, write EOP with designated shelter	N/A	Medium	2018	FEMA, City	River Heights, Cache County	$100,000	FEMA, City

RIVER HEIGHTS - COMMUNITY MITIGATION STRATEGIES

Protecting Future Residents and Property

Jurisdiction	Hazard	Goal	Action	Action (For NFIP Compliance, if Applicable)	Priority (High, Medium, Low)	Time-frame (Year)	Potential Funding Sources	Responsible Entity	Estimated Cost	Resources
River Heights	Wildfire	Protect future residents and property	Maintain fire hydrants, protect water supply for adequate fire fighting (shut off pumps), reduce fire hazards through city ordinances	N/A	High	2017	City general fund	River Heights	TBD	Local, Utah FFSL, County
River Heights	Earthquake	Protect future residents and property	New building codes, develop EOP, new water lines (avoid breakage), neighborhood block captains/area specialists, CERT training, disaster assistance flags	N/A	Medium	Ongoing	City general fund	River Heights, Cache County	TBD	Local, County EOC
River Heights	Dam Failure	Protect future residents and property	Work with the Utah Division of Water Rights and other groups to utilize Emergency Action Plans on a local level.	N/A	Low	2020	Utah Division of Water Rights, Local	River Heights, Utah Dam Safety	Minimal	Utah Division of Water Rights, Local
River Heights	Drought	Protect future residents and property	Protect water supply to ensure adequate water for consumption and fire protection, monitor water use/supply, encourage water conservation, higher rates for overages, electronic meters, rations if needed	N/A	High	Ongoing	City general fund	River Heights, NOAA, Utah Climate Center	Minimal	Local, County
River Heights	Severe Weather	Protect future residents and property	Services to keep roads open, water/sewer working, EP/BC, CERT training, maintain snow plows, disaster assistance flags in every home	N/A	Medium	Ongoing	City general fund	River Heights	TBD	Local, County
River Heights	Flood	Protect future residents and property	Review current floodplain ordinance and see where improvements can be made.	Work with state floodplain manager to assure ongoing compliance with NFIP.	Medium	2017	City, FEMA, Utah DEM	River Heights, Utah DEM, BRAG	Minimal	City, FEMA, Utah DEM
River Heights	Slope	Protect future residents and property	Review current slope ordinances and determine how improvements can be made.	N/A	Medium	2017	City, UGS, USGS	River Heights, UGS	Minimal	City, UGS, USGS
River Heights	Power Outage	Protect future residents and property	Encourage residents to prepare for long-term outages, education, EP specialists, CERT training, emergency generator for water system, write EOP with designated shelter	N/A	Medium	2018	FEMA, City	River Heights, Cache County	$100,000	FEMA, City

SMITHFIELD

Analysis of hazard risk involving the community of Smithfield revealed that there is potential risk resulting from **earthquakes, flood, steep slopes and wildfire**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and environmental features within the municipal boundary. See ***the following tables*** for more detailed descriptions of potential losses associated with each natural hazard analyzed in the risk assessment.

Table 87: Smithfield Potential Loss Figures

Smithfield, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	1,160	358	85,751,065	2	386,861	1,377,434
Wildfire	6,600	2,037	371,562,670	40	14,372,411	27,548,680
Flood	632	195	38,263,597	11	2,309,198	7,575,887
Liquefaction	0	0	0	0	0	0
Landslide	19	6	1,705,658	0	0	0
Slope	382	118	29,701,233	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Cache County from 2013 American Community Survey, which is 3.24.
** Current Market Value per parcel, including building and land values. Data was provided by Cache County IT personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($688,717 per firm). Derived from 2007 Survey of Business Owners for Cache County, US Census Bureau.

Natural Hazards

Current Development

Earthquake. Hazard mapping identifies several structures and infrastructure at risk from surface fault rupture. There are two forks of the fault damage zone that run parallel along the eastern bench of the Cache-Wasatch Mountains. This threatens development along the jurisdiction's far eastern boundary, and also along the secondary fault line that bisects the area between U.S. 91/Main Street and the eastern boundary of the jurisdiction.

Smithfield, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	0	0	7.51	3,942,750	1.61	2,415,000
Wildfire	0.55	825,000	0	0	0.02	2,540	13.68	7,182,000	7.89	11,835,000
Flood	0.15	225,000	0.09	126,000	0	0	3.99	2,094,750	3.42	5,130,000
Liquefaction	2.86	4,290,000	0	0	0.42	53,340	63.91	33,552,750		0
Landslide	0	0	0	0	0	0	0.07	36,750	0	0
Slope	0	0	0	0	0.09	11,430	1.07	561,750	0.51	765,000
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Smithfield, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults				1 place of worship	
Wildfire	Smithfield Fire and EMS, Smithfield Fire Department, Smithfield Police		Smithfield Clinic, Summit Clinic	1 place of worship	7 broadband anchors
Flood					
Liquefaction	Smithfield Police Department, Smithfield Fire and EMS, Smithfield Fire Department	Birch Creek Elementary, Sunrise School, Sky View High, Summit School	Smithfield Health Clinic, Summit Clinic	9 places of worship	15 broadband anchors, 1 dam
Landslide					
Slope					1 dam
Poorly Drained Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

Smithfield, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	105.82	396.17	0	0	0
Wildfire	56.03	888.8	0	0	1
Flood	14.93	156.9	0	0	0
Liquefaction	0	0	0	0	0
Landslide	0	1.68	0	0	0
Slope	54.44	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Smithfield, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	1.25	1.25	2.38	14.23	0	0
Wildfire	2.4	1.14	3.71	66.62	0	0
Flood	5.28	0	3.57	0	0	0
Liquefaction	0	0	0	63.37	0	0
Landslide	0	0	0.06	0	0	0
Slope	0	0.3	0.67	14.24	0.03	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land and miles of streams and trails were identifed using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

Flood. Hazard mapping identifies several residential structures and infrastructure at risk from flooding in the 100 year floodplain. There are over 200 structures in the floodplain, with the majority in the Summit Creek drainage through the middle of town. However, in post-settlement history the impacts to Smithfield residences have been minimal from Summit Creek. During the 1983 flooding that impacted nearly the whole state; Smithfield did experience some rising flows in Summit Creek that were contained by sandbagging. There are also some structures in the floodplain in the drainage north of Saddleback Road.

Steep Slopes. Hazard mapping identifies significant risk from steep slopes in much of the jurisdiction's eastern bench area. There are also steep slope risks that extend into the jurisdiction on both sides of the Smithfield Canyon/Summit Creek drainage.

Wildfire. Hazard mapping identifies moderate-to-high wildfire risk areas along the jurisdiction's eastern bench and extending into the urban canopy.

Future Development

No concerns involving potential future development within Smithfield were reported by city representatives.

Hazard Mitigation Strategies

Table 88: Smithfield City Mitigation Strategies

SMITHFIELD - COMMUNITY MITIGATION STRATEGIES

Protecting Current Residents and Property

Jurisdiction	Hazard	Goal	Action	Action (For NFIP Compliance, if Applicable)	Priority (High, Medium, Low)	Time-frame (Year)	Potential Funding Sources	Responsible Entity	Estimated Cost	Resources
Smithfield	Wildfire	Protect current residents and property	Identify, map, and assess potential wildfire hazard areas.	N/A	Medium	2020	CIB, City	Smithfield, Utah FFSL	$3,000	City Fire Agency, State Fire Marshal, FEMA
Smithfield	Flooding	Protect current residents and property	Increase awareness of floodplain and erosion risk areas within the city.	N/A	High	2017	City	Smithfield, Utah DEM	$2,000	City, Geologic Survey, USU
Smithfield	Earthquake	Protect current residents and property	Update ordinances, planning and city codes to reduce earthquake risks.	N/A	Medium	2018	City	Smithfield, UGS	$1,000	City, FEMA, ICC
Smithfield	Landslide	Protect current residents and property	Update city ordinances to mitigate development in landslide hazard areas.	N/A	Medium	2020	CIB, City	Smithfield, UGS	$1,500	Geologic Survey, Utah State University, State of Utah
Smithfield	Drought	Protect current residents and property	Update city ordinance to encourage drought tolerant landscaping	N/A	Medium	2018	City, DWQ, CIB	Smithfield, Utah Climate Center, USU	$2,000	City, DWQ,RWAU
Smithfield	Drought	Protect current residents and property	Monitoring the water supply and its functions can save water in the long run through creating a drought ordinance.	N/A	High	2017	City, CIB or DWQ	Smithfield, Utah Climate Center, USU	$2,000	City RWAU, CIB, DWQ

SMITHFIELD - COMMUNITY MITIGATION STRATEGIES

Protecting Future Residents and Property

Jurisdiction	Hazard	Goal	Action	Action (For NFIP Compliance, if Applicable)	Priority (High, Medium, Low)	Time-frame (Year)	Potential Funding Sources	Responsible Entity	Estimated Cost	Resources
Smithfield	Wildfire	Protect future residents and property	Update city ordinances to create a wildfire overlay zone including special conditions for developments in these areas.	N/A	Medium	2025	CIB, City, FEMA	Smithfield, Utah FFSL	$2,000	FEMA, City, State Fire Marshal, City Fire Department
Smithfield	Flooding	Protect future residents and property	Update, enforce and follow the cities general plan to reduce development in the flood plain.	N/A	High	2016	CIB, City	Smithfield, Utah DEM	$40,000	CIB, City
Smithfield	Earthquake	Protect future residents and property	Adopt and enforce building codes to reduce earthquake damage to structures.	N/A	High	2016	City	Smithfield, UGS	$1,500	City, ICC
Smithfield	Landslide	Protect future residents and property	Improve data and mapping of landslide areas located in the city.	N/A	Medium	2020	City, State of Utah, CIB	Smithfield, UGS	$10,000	Geologic Survey, Utah State University, State of Utah
Smithfield	Drought	Protect future residents and property	Update ordinance and general plan to require a percentage of landscaping to be low water use or xeriscaping.	N/A	High	2020	City, DWQ, RWAU, Irrigation Companies	Smithfield, Utah Climate Center, USU	$5,000	City, CIB, DWQ, RWAU
Smithfield	Drought	Protect future residents and property	Update subdivision regulations to encourage or require new developments to utilize secondary water.	N/A	High	2018	City	Smithfield, Utah Climate Center, USU	$1,500	City, RWAU, DWQ

TRENTON

Analysis of hazard risk involving the community of Trenton revealed that there is potential risk resulting from **earthquakes, flood, landslides, liquefaction, steep slopes and wildfire**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and environmental features within the municipal boundary. See ***the following tables*** for more detailed descriptions of potential losses associated with each natural hazard analyzed in the risk assessment.

Table 89: Trenton Town Potential Loss Figures

Natural Hazards

Current Development

Earthquake. Hazard mapping identifies several structures and infrastructure at risk from surface fault rupture. Areas of concern are located along the fault damage zone that runs north to south along the jurisdiction's western bench. This area is mostly used for agricultural production with railroad and other critical utilities.

Flood. Hazard mapping identifies several residential structures and infrastructure at risk from

Trenton, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	62	19	3,628,922	2	346,985	1,377,434
Wildfire	123	38	5,213,718	3	1,883,341	2,066,151
Flood	49	15	2,810,743	1	439,925	688,717
Liquefaction	42	13	2,288,090	0	0	0
Landslide	16	5	1,252,786	0	0	0
Slope	0	0	0	1	216,710	688,717
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Cache County from 2013 American Community Survey, which is 3.24.
** Current Market Value per parcel, including building and land values. Data was provided by Cache County IT personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($688,717 per firm). Derived from 2007 Survey of Business Owners for Cache County, US Census Bureau.

Trenton UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	1.27	1,905,000	0.28	392,000	0	0	4.52	2,373,000	2.63	3,945,000
Wildfire	0.39	585,000	0	0	0	0	0.89	467,250	0.08	120,000
Flood	0.16	240,000	0.61	854,000	0	0	0.27	141,750	0	0
Liquefaction	5.6	8,400,000	0.46	644,000	0	0	25.15	13,203,750	0	0
Landslide	0	0	0	0	0	0	1.4	735,000	0.63	945,000
Slope	0	0	0	0	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Trenton, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					1 dam
Wildfire	Trenton Fire Department and				2 broadband anchors
Flood					
Liquefaction	Trenton Fire Department and EMS			1 place of worship	4 broadband anchors, 3 dams
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

Trenton, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	596.08	528.11	0	0	0
Wildfire	27.15	61.16	0	0	1
Flood	315.95	412	0	0	0
Liquefaction	411.46	503.77	0	0	0
Landslide	43.48	67.21	0	0	0
Slope	29.48	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Trenton, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	10.97	0	5.47	0	0	0
Wildfire	34.48	1.18	0.43	0	0	0
Flood	410.35	0	7.57	0	0	0
Liquefaction	365.84	58.94	5.96	0	0	0
Landslide	0	0	0.69	0	0	0
Slope	0	0	0.03	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land and miles of streams and trails were identifed using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

flooding in the 100 year floodplain. Areas of concern are focused around the Bear River and low-lying areas around it. Potential flood hazard threats also include flows from Ransom Hollow Creek.

Landslides. Hazard mapping identifies risk from landslides in the southwest section of the jurisdiction; along the western bench and around the small drainages entering the valley.

Liquefaction. Hazard mapping identifies high liquefaction risk to structures and infrastructure in areas adjacent to the Bear River, including a large area of Ransom Hollow.

Steep Slopes. Hazard mapping identifies significant risk from steep slopes in much of the western bench of the jurisdiction.

Wildfire. Hazard mapping identifies moderate-to-high wildfire risk areas along the Bear River and along the western bench of the jurisdiction.

Future Development

No concerns involving potential future development within Trenton were reported by town representatives.

Hazard Mitigation Strategies

Table 90: Trenton Town Mitigation Strategies

TRENTON - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Trenton	Flooding	Protect current residents and property	long run through creating a drought ordinance	N/A	Low	Ongoing	Road funds	Trenton, Utah DEM	Minimal	Local, State
Trenton	Earthquake	Protect current residents and property	Training in earthquake emergency planning and response for residents, and coordination between local and county fire, police, and EMT crews.	N/A	Low	Every few Years	Donated time by residents	Trenton, UGS, Cache County	N/A	Cache County Fire, Logan Fire, Church leaders
Trenton	Landslide / Steep Slopes	Protect current residents and property	No steep slope with in town boundaries, only county land.	N/A	Low	2018	Local, County, State	Trenton, UGS	N/A	Local, County, State
Trenton	Wildfire	Protect current residents and property	Require a safe zone	N/A	Low	2018	Local, County	Trenton, Utah FFSL	$1,000	N/A

TRENTON - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Trenton	Flooding	Protect future residents and property	Not allow building in flood plain	N/A	Low	Ongoing	Local, County	Trenton, Utah DEM	Minimal	Local
Trenton	Earthquake	Protect future residents and property	Require construction codes that meet earthquake standards.	N/A	Low	2017	County, FEMA, State	Trenton, UGS, Cache County	Minimal	County Planning,
Trenton	Landslide / Steep Slope	Protect future residents and property	Not allow building close to steep slopes	N/A	Medium	2018	County	Trenton, UGS	Minimal	County Planning, Local, State
Trenton	Wildfire	Protect future residents and property	Encourage residence to clear up old grass and trees.	N/A	Low	2016	Local,	Trenton, Utah FFSL	Minimal	County Planning

WELLSVILLE

Analysis of hazard risk involving Rich County revealed that there is potential risk resulting from **dam failure, faults, wildfire, flood, Liquefaction, landslide, poor soils, and steep slopes**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and recreational features within municipal boundaries. Currently, liquefaction and wildfire hazards have the greatest potential to impact the community based on potential loss values. Other natural hazard types not mentioned were found to have no potential impacts to Rich County. See ***the following tables*** for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 91: Wellsville City Potential Loss Figures

Natural Hazards

Current Development

Dam failure. Wellsville has a very high risk of being affected by dam failure. Situated below Hyrum dam. If it were to fail the northeastern part of Wellsville would likely experience significant damage to structures, human life, infrastructure, critical facilities, environmental features, and agriculture.

Faults. Wellsville has a great potential for earthquakes. The predominant and most active faulting probability is on the East Cache Fault, and is also near the West Cache Fault. Significant damage would likely affect human life, structures, infrastructure, agriculture and environmental features, and one critical facility.

Wellsville, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	314.28	97	20,581,672	6	2,085,128	4,132,302
Faults	288.36	89	26,255,773	7	2,930,499	4,821,019
Wildfire	1,266.84	391	70,321,964	56	7,064,117	38,568,152
Flood	557.28	172	37,985,381	9	2,352,259	6,198,453
Liquefaction	385.56	119	22,751,711	4	1,762,769	2,754,868
Landslide	45.36	14	3,617,803	2	1,330,265	1,377,434
Slope	71.28	22	7,093,701	44	5,379,160	30,303,548
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Cache County from 2013 American Community Survey, which is 3.24.
** Current Market Value per parcel, including building and land values. Data was provided by Cache County IT personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($688,717 per firm). Derived from 2007 Survey of Business Owners for Cache County, US Census Bureau.

Wellsville, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0.67	1,005,000	1.26	1,764,000	0	0	4.32	2,268,000	0	0
Faults	0	0	0.36	504,000	0.49	62,230	3.84	2,016,000	0.91	1,365,000
Wildfire	0.36	540,000	0	0	0.1	12,700	6.13	3,218,250	0.22	330,000
Flood	0.38	570,000	0.59	826,000	0	0	4.23	2,220,750	0.85	1,275,000
Liquefaction	1.7	2,550,000	0.8	1,120,000	1.1	139,700	44.56	23,394,000	0	0
Landslide	0	0	0	0	0	0	1.46	766,500	0.06	90,000
Slope	0	0	0	0	0	0	3.52	1,848,000	0	0
Poorly Drained Soils	0	0	0	0	0	0		0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Wellsville, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					2 bridges
Faults					1 place of worship
Wildfire					
Flood		Willow Valley Middle School			2 bridges, 1 broadband anchor
Liquefaction	Wellsville Fire and EMS, Wellsville Fire Department Station	Wellsville School, Willow valley Middle,			4 places of worship, 2 bridges, 1 dam, 7 broadband anchors
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

Wildfire. Wellsville has moderate to high risks for wildfire in most of the jurisdiction. Wildfire hazards have varying potential to impact life, property, critical facilities, infrastructure, agriculture, and recreational features.

Flood. A large portion of the northeast corner of Wellsville is located on a flood plain. The majority of the flooding risk comes from Hyrum Reservoir located upstream from Wellsville. If flooding were to happen Wellsville would likely experience significant damage to human life, structures, infrastructure, agriculture and environmental features, as well as critical facilities.

Liquefaction. Wellsville has a moderate to high risk for liquefaction. If an earthquake were to occur, it is likely that there would be a potential impact on human life, structures, infrastructure, critical facilities, environmental and recreational features, as well as some agriculture.

Landslide. Wellsville has the potential risk of landslides in the western part of the city. Landslides have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction.

Steep Slopes. Wellsville has risks associated with steep slopes within its western mountain region. Steep slopes have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction.

Future Development

No concerns involving potential future development within Wellsville were reported by city representatives.

Hazard Mitigation Strategies

Table 92: Wellsville Town Mitigation Strategies

WELLSVILLE - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Wellsville	Dam Failure	Protect current residents and property	Educate residents located with dam failure impact areas regarding notifications and emergency actions.	N/A	Low	2015-2020	Local	Wellsville, Bureau of Reclamation, Utah Dam Safety	$10,000	City staff
Wellsville	Flood	Protect current residents and property	Update ordinances for floods and flood regions.	N/A	Medium	2020	Canal Company, City	Wellsville, Utah DEM	Minimal	Canal Company, City
Wellsville	Wildfire	Protect current residents and property	Coordinate with agencies on response and prevention.	N/A	High	2016	N/A	Wellsville, Utah FFSL	Minimal	FFSL, County
Wellsville	Landslide	Protect current residents and property	Explore possibility of landslide element in geological hazard ordinance	N/A	Medium	2017	Local	Wellsville, UGS	Minimal	Utah GS, BRAG, City
Wellsville	Earthquake	Protect current residents and property	Update ordinances, planning and city codes to reduce earthquake risks.	N/A	Medium	2017	Local, BRAG, State	Wellsville, UGS	Minimal	Local, BRAG, State

WELLSVILLE - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Wellsville	Dam Failure	Protect future residents and property	Make this a component of emergency preparedness plan.	N/A	Medium	2016	City	Wellsville, Bureau of Reclamation, Utah Dam Safety	Minimal	City, State, Federal
Wellsville	Flood	Protect future residents and property	Update ordinances for floods and flood regions.	N/A	Medium	2020	Canal Company, City	Wellsville, Utah DEM	Minimal	Canal Company, City
Wellsville	Wildfire	Protect future residents and property	Coordinate with agencies on response and prevention.	N/A	High	2016	N/A	Wellsville, Utah FFSL	Minimal	FFSL, County
Wellsville	Landslide	Protect future residents and property	Explore possibility of landslide element in geological hazard ordinance		Medium	2017	N/A	Wellsville, UGS	Minimal	Utah GS, BRAG, City
Wellsville	Earthquake	Protect future residents and property	Update ordinances, planning and city codes to reduce earthquake risks.	N/A	Medium	2017	Local, BRAG, State	Wellsville, UGS	Minimal	Local, BRAG, State

SECTION 7: RICH COUNTY RISK ASSESSMENT & COMMUNITY SECTIONS

History and Background of Natural Hazards in Rich County

Flooding

The flood risk for Rich County seems minimal. The county is sparsely populated and the communities are generally not located near a flood source. The Bear River passes through Rich County in an area with some agricultural use. It flows primarily through rural areas with little or no development. However, it is difficult to tell where flood risk exists for the entire county, since only Woodruff currently has a Flood Insurance Rate Map for their community. The Army Corps of Engineers did a study in 2003 which generally defines flood risk for communities that do not participate in the National Flood Insurance Program. This study was also useful in the risk assessment for Rich County communities.

All of the four incorporated cities in Rich County have small streams and drainages that pass through the communities. These communities have historically experienced minimal impacts from flooding.

The southern half of Bear Lake is located in Rich County. A great deal of beach front development has occurred along the shores of Bear Lake. The rising lake level has rarely threatened lakeshore development but some flooding of homes has occurred. PacifiCorp operates a hydroelectric facility on the lake and has purchased some of the flood prone lakeshore properties to mitigate the impact of high lake level flooding.

One other major concern regarding flood hazards in Rich County, as with many other Utah counties, is that of canal breakage flooding. Many of the canals in the region were built a century ago, and if any fail there could be damage to homes and property. Also, the connection between flooding and landslides should be considered. As water saturation levels increase, the potential for mud/sediment/debris flows also increase.

In Rich County, only Woodruff Town has a delineated flood plain. Laketown is listed as being a NSFHA (No Special Flood Hazard Area) which is all Zone C on the FEMA floodplain maps.

While FEMA floodplains are a great planning tool for hazard mitigation, most of Rich County has never been mapped by FEMA. An August 2003 report entitled Flood Hazard Identification Study: Bear River Association of Governments by the U.S. Army Corps of Engineers was completed to help communities without floodplain data. This study generally identified areas of flooding concern for municipalities lacking data (See Appendix B for the full report). However, the report was only intended to give communities very general estimates of where flood risk may exist. Also, many flooding events happen outside of the FEMA 100-year floodplain delineations (around 40%). There are other ways that flooding occurs as well, such as canals, reservoirs/ponds, wildfire, incorrect grading, and plugged sewer and storm water systems (Scott Stoddard, personal communication, 11/13/08). Below is a discussion of flooding risks for communities in Rich County. Only those communities thought to be at risk for flooding have been included.

Wildfires

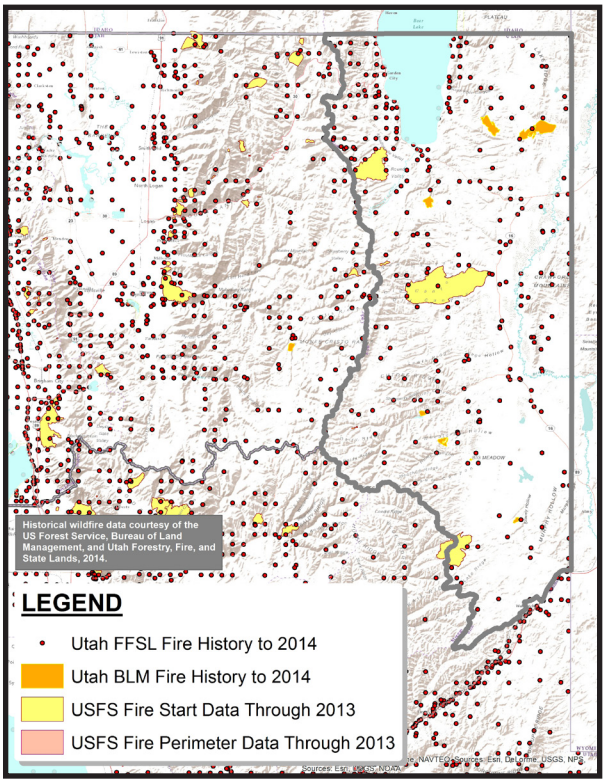
Wildfires occur with some frequency in Rich County. The vast majority occur in areas that are predominately sage and scrub vegetation on Bureau of Land Management (BLM) owned land. Most fires rarely threaten human safety or property and are often allowed to burn. The primary conflict area in terms of threat to property is related to wildfire areas above Garden City town proper, in mostly secondary home developments associated with the Bear Lake Recreation area. Some of these homes are built in heavily timbered areas. Bridger Village and Sweetwater developments are great concerns to local emergency planners in regard to wildfire.

Portions of the Uinta-Wasatch-Cache National Forest are located in western Rich County. Transitioning down slope from the forest into the Bear Lake valley and Garden City, a significant number of cabins are located along hillsides above the town center. Some of these homes are built in heavy vegetation and timber. Many are surrounded by lower sage type vegetation communities.

These areas are at risk from wildfire originating

in the Forest Service managed land to the west and also human caused fire within or below the developments. Much of this development in Bridger Village is bisected by U.S 89 as it makes its rather steep descent into Garden City from Cache County. Sparks caused by overheating brakes on heavy trucks have been known to start fires adjacent to the road. In the right conditions, these types of fires can quickly spread to portions of this development and others.

Below is a map showing historic wildfire locations in Rich County:



Landslides/Steep Slopes

There are really no accounts of landslide activity in the County which has been particularly destructive to infrastructure, structures, or other lands. However, the Utah Geological Survey completed statewide mapping of landslide potential. The Rich County data set includes high landslide risk areas on some of the hillsides north and east of the Sweetwater development, east of the public beaches on the west shore near Rendezvous Beach, northeast of Round Valley, and in South Eden Canyon.

One thing that should be considered regarding landslides, were they to occur in populated places of Rich County, is that flooding can increase the destructiveness of landslides. As saturation levels increase, the chance for mud/sediment/debris flows also increases.

Earthquakes

Although not as seismically active as Box Elder and Cache Counties, Rich County does have recorded seismic activity. The predominant and most active faulting potential is on the East Bear Lake Fault east of the lake. However, there is risk on the west side of the lake also, where the most recent earthquake in the region started from the West Bear Lake Fault in 1884 (Covington, 2008). Another issue to consider when looking at earthquake risk is that of liquefaction potential. While there have not been any studies done to delineate liquefaction potential for Rich County, there is a potential given the right soils and saturation levels during an earthquake event. Also, it is possible that a Tsunami large enough to cause damage could be produced on Bear Lake during an earthquake given the fault locations under the lake. Damage to shoreline residences could happen during such an event.

On November 9, 1884 the Bear Lake valley experienced an estimated 6.3 magnitude earthquake with the epicenter southeast of St. Charles, Idaho followed by aftershocks of 2.3 magnitude. The earthquake was felt as far away as Ogden.

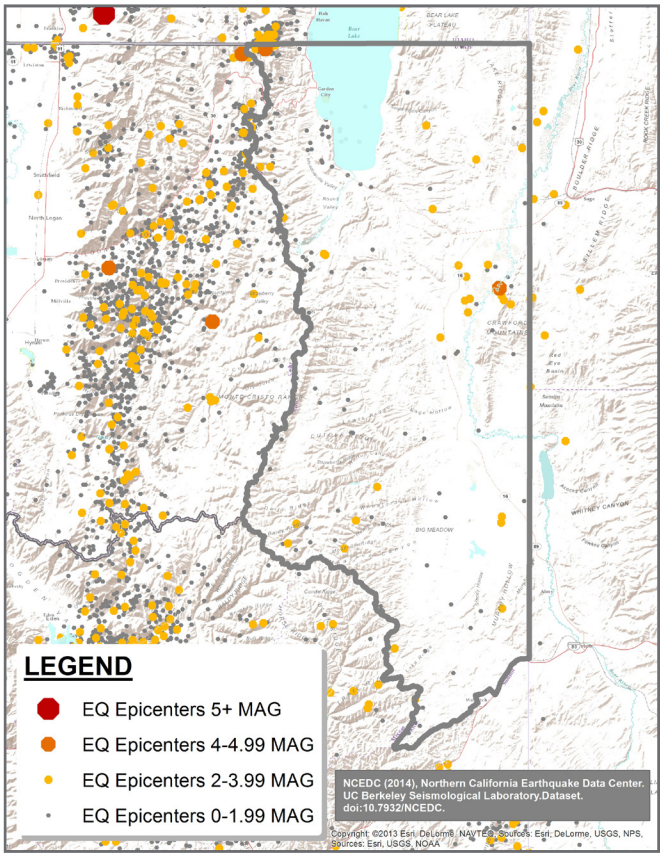
Kaliser indicates that the Bear Lake East Fault is active with evidence of large earthquakes in the recent past. He reports a continuous line of scarplets in recent sediments on the east shore of the lake. In addition, the delta fans at the mouth of North and South Eden Canyons are displaced by faulting (Kaliser, 1969).

Some faulting has been reported by fathograms in the bottom of Bear Lake.

While a geological fault may not be very wide physically, damage around the fault can be detrimental. This is often referred to as the "damage zone (Susanne Janecke, personal communication, 9/25/08)." This damage zone is now thought to be much larger than recognized previously. While geologists used to recommend a

general fault buffer of fifty feet on either side of the fault, they now recognize a much larger damage zone. According to the Utah Geological Survey, up thrown sides of well defined quaternary faults require planning for a 250 foot damage zone; while down thrown sides of well defined faults require planning for a 500 foot damage zone. For those faults not well defined, a general 1,000 foot damage zone should be considered (Richard Giraud, personal communication, 10/6/08; Christopher Duross, personal communication, 10/30/08; Christensen et al., 2003). Because of data inaccuracies in geologic fault data, a standard 1,000 foot damage zone was analyzed for all quaternary faults in the region.

Below is a map showing historic earthquake locations in Rich County:



Dam Failure

There are 541 regulated dams located in Rich County. Most of these dams are small detention ponds, small agricultural reservoirs or livestock watering facilities and most pose a minimal threat to human safety or property.

Of the 541 regulated dams most are designated as "low hazard" by the State of Utah Division of Water Rights. As defined by state statue, low hazard dams are those dams which, if they fail, would cause minimal threat to human life, and economic losses would be minor or limited to damage sustained by the owner of the structure.

A total of 4 dams have been designated as "moderate hazard" by the State of Utah in Rich County. Moderate Hazard dams which, if they fail, have a low probability of causing loss of human life, but would cause appreciable property damage, including damage to public utilities.

The State of Utah has rated 2 dams in Rich County as "high hazard" which means that, if they fail, have a high probability of causing loss of human life or extensive economic loss, including damage to critical public utilities.

Dam failure inundation maps and emergency action plans for each of the high risk dams can be found on the Utah Division of Water Right's website at: http://waterrights.utah.gov/cgi-bin/damview.exe?Startup.

High Risk Dams

Woodruff Narrows Dam

Woodruff Narrows Dam is actually located in Wyoming, east of Woodruff Town and southeast of Randolph Town, the largest town in Rich County. While the dam is in another state, most of the potential losses from dam failure would be in Utah, and specifically in Rich County. There seems to be limited information on the potential effects of dam failure on any local communities. However, since the Bear River flows in and out of the reservoir, it is believed by local residents that a dam failure could result in damage of homes located near the river channel.

Birch Creek No. 2

Birch Creek Reservoir is located west of Woodruff Town. It is utilized for irrigation and is a popular trout fishery. Dam inundation area includes the entire town of Woodruff.

Natural Hazard Profiles

Table 93: Rich County Flood Hazard Profile

Frequency	Infrequent
Severity	Moderate
Location	Generally along rivers, streams, and canals.
Seasonal Pattern	Spring flooding as a result of snowmelt. Mid-late summer cloudburst events.
Duration	A few hours or up to three weeks for snowmelt flooding
Speed of Onset	1-6 hours
Probability of Future Occurrences	Moderate - there is a 1% chance of flooding in any given year in the 100-year floodplain.

Table 94: Rich County Wildfire Hazard Profile

Frequency	Annually (to some extent)
Severity	Moderate
Location	Dispersed throughout the whole county
Seasonal Pattern	Generally the worst from early July to mid September (depends on drought conditions)
Duration	A few hours to two weeks
Speed of Onset	1-6 hours
Probability of Future Occurrences	High (Based on data from 1973-2008, there is a 22.9% chance a fire of at least 1,000 acres will occur every year)

Table 95: Rich County Landslide/Steep Slopes Hazard Profile

Frequency	Infrequent
Severity	Moderate
Location	The hillsides north and east of the Sweetwater development, east of the public beaches on the west shore near Rendezvous Beach, northeast of Round Valley, and in South Eden Canyon.
Seasonal Pattern	Generally the worst in the wetter spring months.
Duration	Up to two weeks
Speed of Onset	No warning
Probability of Future Occurrences	Low

Table 96: Rich County Earthquake Hazard Profile

Frequency	Occasional
Severity	Moderate
Location	Entire County with highest frequency in the Bear River Mountain Range. Surface fault ruptures are likely to occur in fault zones on the east shore of Bear Lake.
Seasonal Pattern	None
Duration	A few minutes with potential aftershocks
Speed of Onset	No warning
Probability of Future Occurrences	Based on 1962-2001 data, there is a 7.7% chance every year of an earthquake of 3.0 magnitude or greater.

Table 97: Rich County Dam Failure Hazard Profile

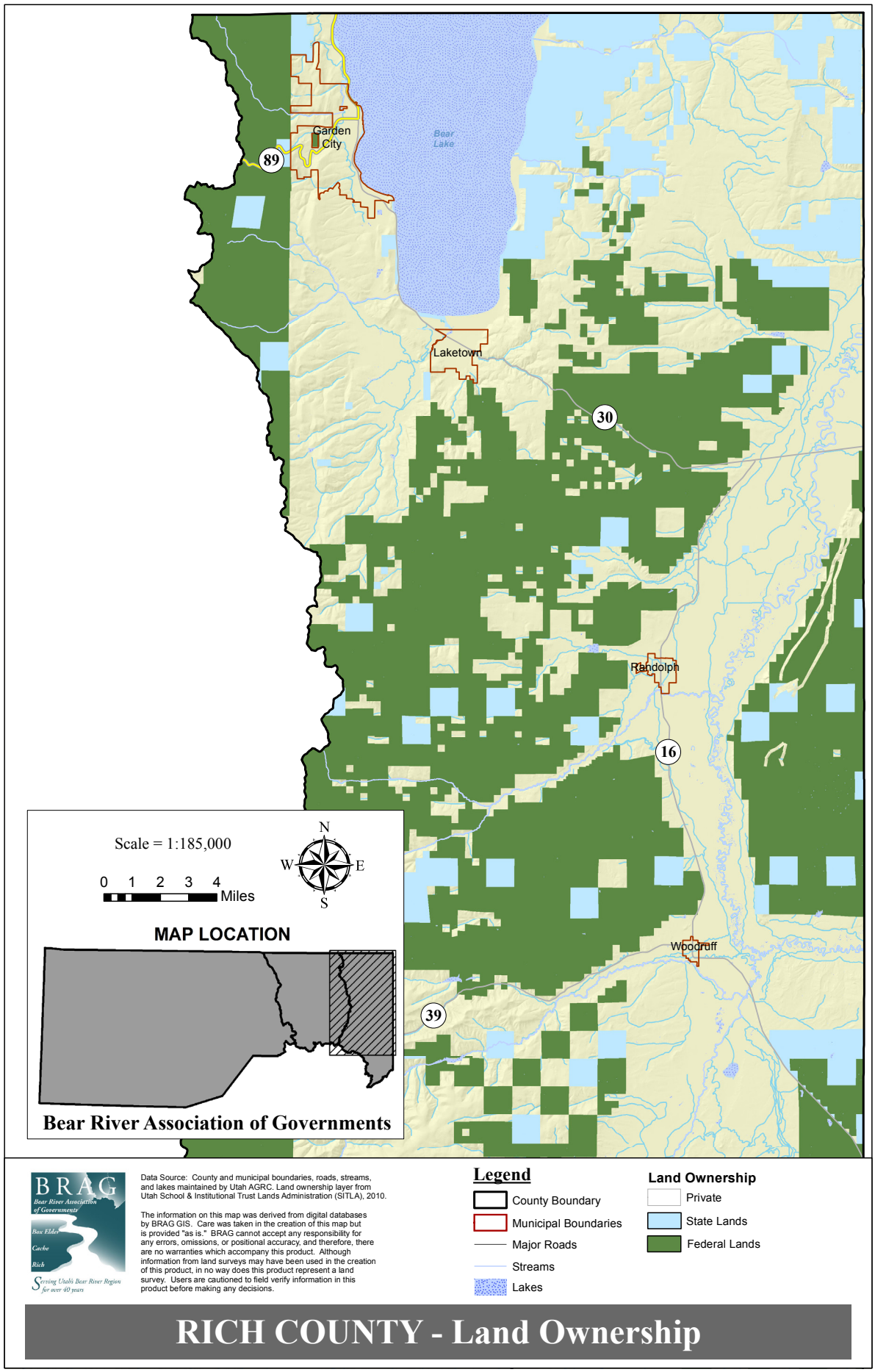
Frequency	Rare
Severity	Potentially Catastrophic
Location	Areas downstream of failed dam.
Seasonal Pattern	Anytime. Highest risk in spring during snowmelt.
Duration	A few hours
Speed of Onset	No warning
Probability of Future Occurrences	Low

Repetitive Loss Properties

There are no repetitive loss properties in Rich County (FEMA, 2015).

COUNTY-WIDE NATURAL HAZARD MAPS

(Please see pages 7-251 to 7-258)


Garden City
Bear Lake
89
Laketown
30
Randolph
16
Woodruff
39
Scale = 1:185,000
0 1 2 3 4 Miles
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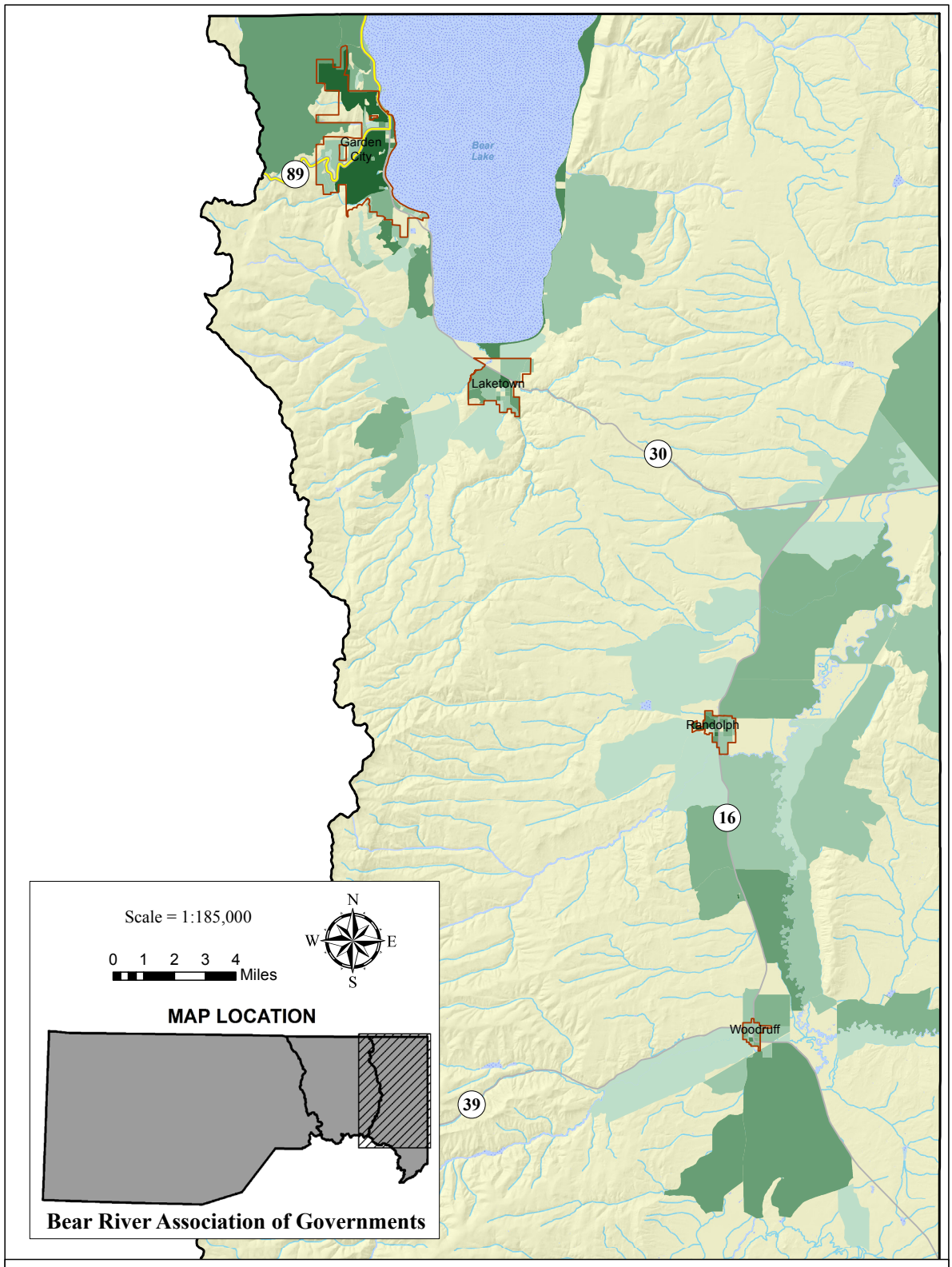
E
S
MAP LOCATION
Bear River Association of Governments
BRAG
Bear River Association of Governments
Box Elder
Cache
Rich
Serving Utah's Bear River Region for over 40 years
Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Land ownership layer from Utah School & Institutional Trust Lands Administration (SITLA), 2010.
The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.
Legend
County Boundary
Municipal Boundaries
Major Roads
Streams
Lakes
Land Ownership
Private
State Lands
Federal Lands
RICH COUNTY - Land Ownership



BRAG
Bear River Association of Governments
Box Elder
Cache
Rich
Serving Utah's Bear River Region for over 40 years

Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. County population was derived from US Census Bureau, 2010.

The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.

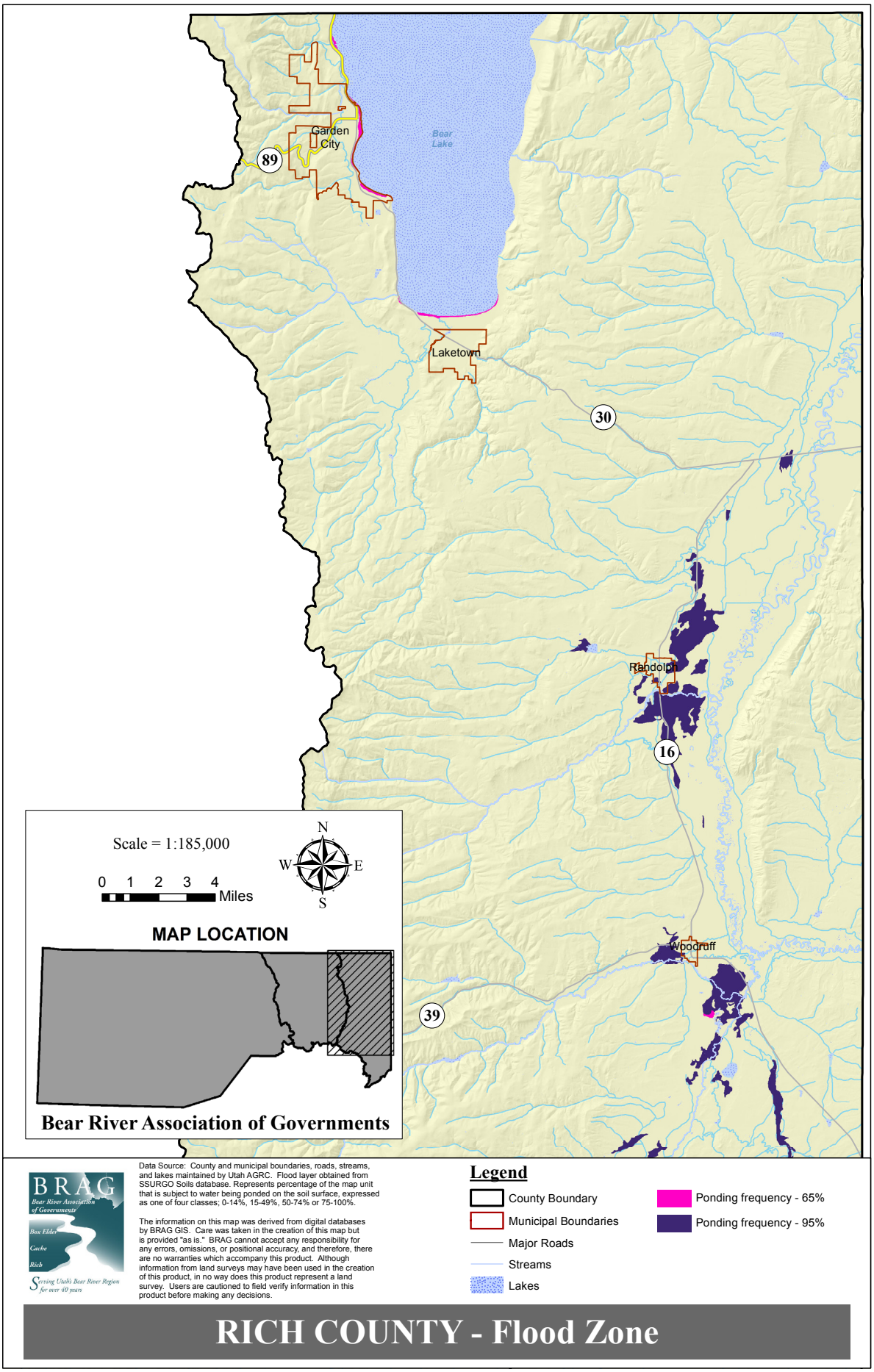
Legend

- County Boundary
- Municipal Boundaries
- Major Roads
- Streams
- Lakes

Population Density
*Persons per census block

- 0 - 2
- 2 - 6
- 6 - 11
- 11 - 19
- 19 - 29
- 29 - 38
- 38 - 61
- 61 - 144

RICH COUNTY - Population Density


Garden City
Bear Lake
89
Laketown
30
Randolph
16
Woodruff
39
Scale = 1:185,000
0 1 2 3 4 Miles
N
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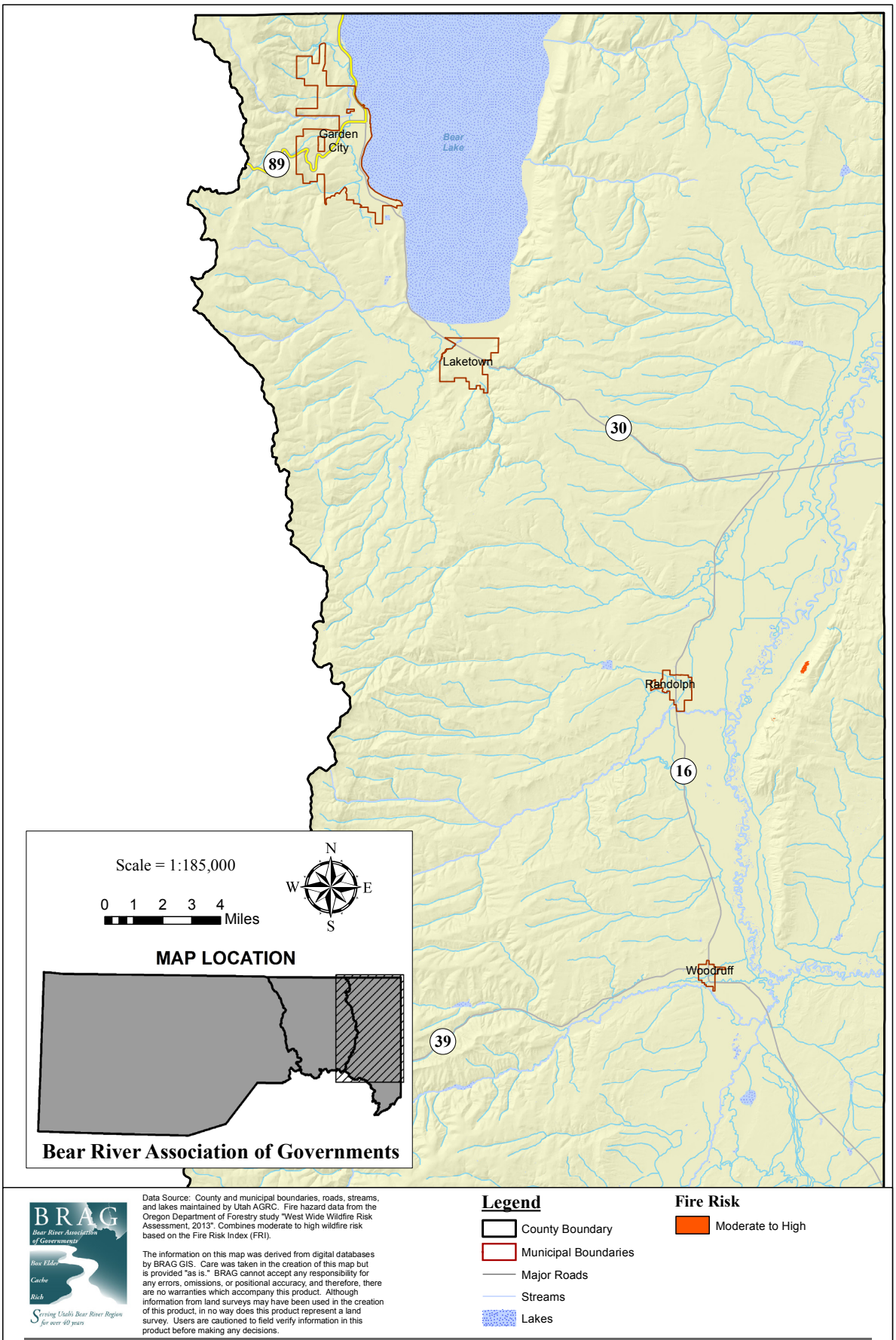
E
S
MAP LOCATION
Bear River Association of Governments
BRAG
Bear River Association of Governments
Box Elder
Cache
Rich
Serving Utah's Bear River Region for over 40 years
Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Flood layer obtained from SSURGO Soils database. Represents percentage of the map unit that is subject to water being ponded on the soil surface, expressed as one of four classes; 0-14%, 15-49%, 50-74% or 75-100%.
The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.
Legend
County Boundary
Municipal Boundaries
Major Roads
Streams
Lakes
Ponding frequency - 65%
Ponding frequency - 95%
RICH COUNTY - Flood Zone


Garden City
Bear Lake
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Laketown
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Randolph
16
Woodruff
39
Scale = 1:185,000
0 1 2 3 4 Miles
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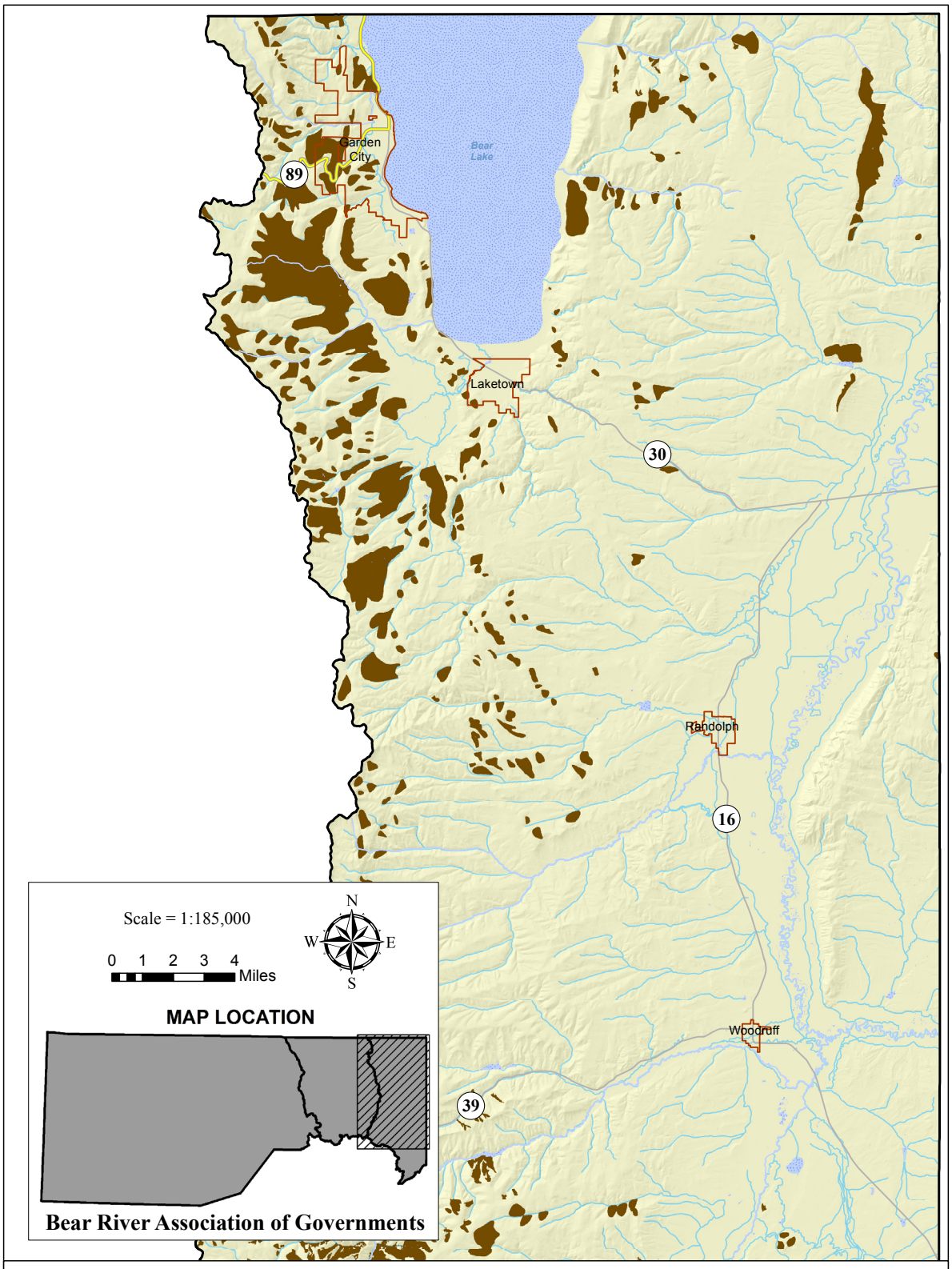
MAP LOCATION
Bear River Association of Governments
Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Fire hazard data from the Oregon Department of Forestry study "West Wide Wildfire Risk Assessment, 2013". Combines moderate to high wildfire risk based on the Fire Risk Index (FRI).
The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.
BRAG
Bear River Association of Governments
Box Elder
Cache
Rich
Serving Utah's Bear River Region for over 40 years
Legend
County Boundary
Municipal Boundaries
Major Roads
Streams
Lakes
Fire Risk
Moderate to High
RICH COUNTY - Wildfire Hazard



BRAG
Bear River Association of Governments
Box Elder
Cache
Rich
Serving Utah's Bear River Region for over 40 years

Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Data obtained from the Utah Geological Survey showing landslide deposits, landslide scarps, and debris-flow travel paths, 2010.

The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.

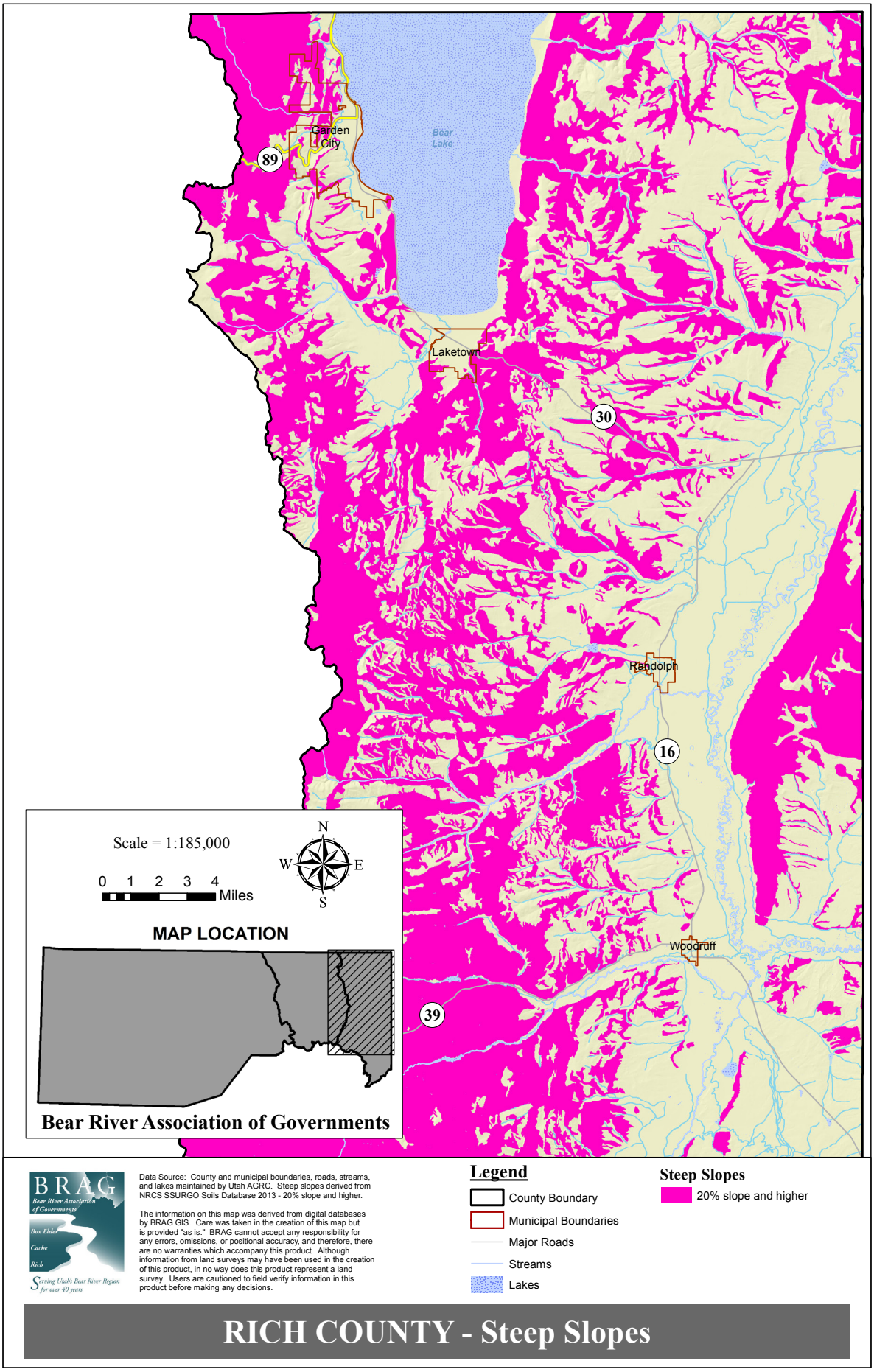
Legend

- County Boundary
- Municipal Boundaries
- Major Roads
- Streams
- Lakes

Landslides

- Deposits, scarps, and debris-flow travel paths

RICH COUNTY - Landslides


Garden City
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Scale = 1:185,000
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MAP LOCATION
Bear River Association of Governments
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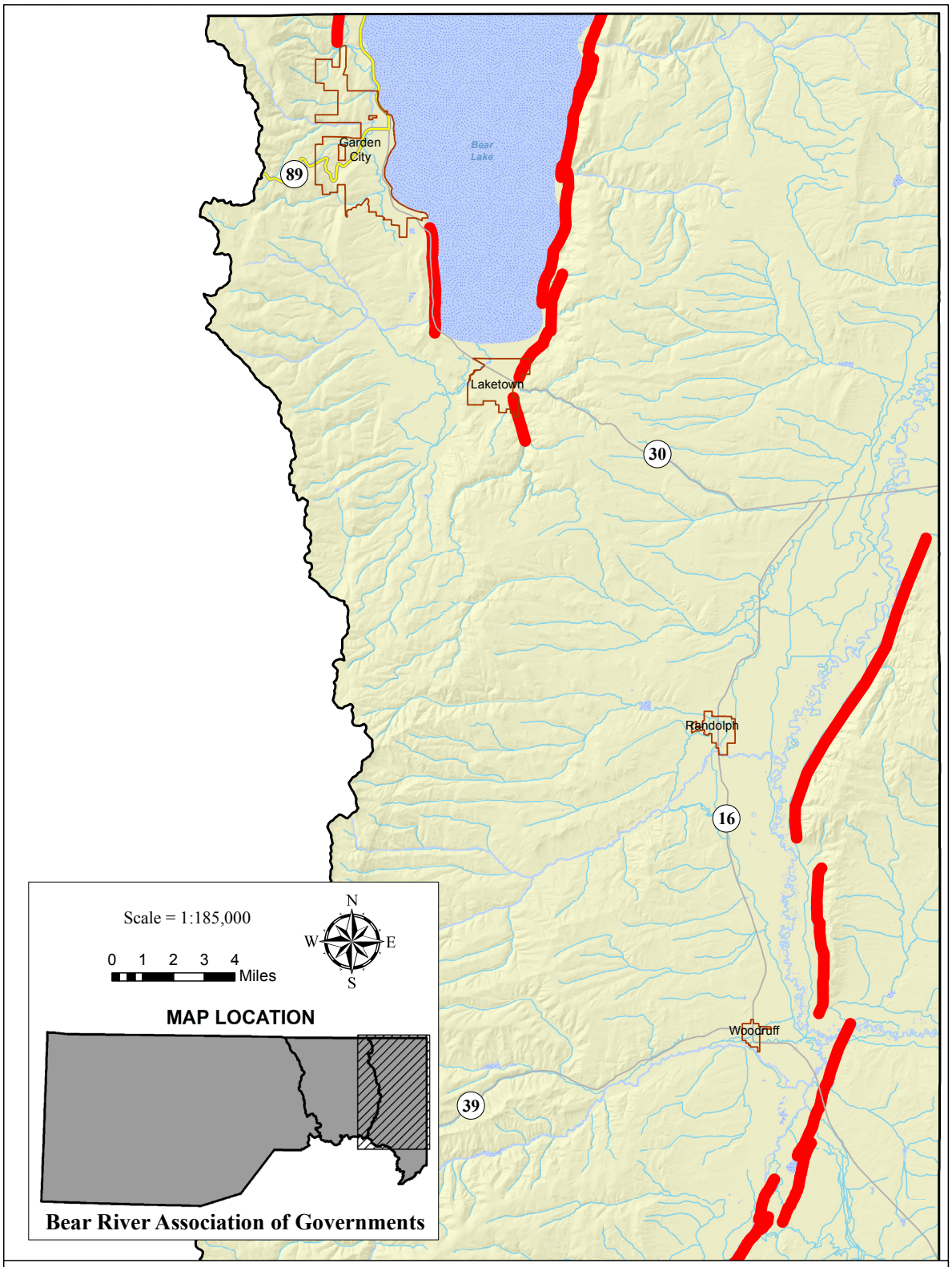
Bear River Association of Governments
Box Elder
Cache
Rich
Serving Utah's Bear River Region for over 40 years
Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Steep slopes derived from NRCS SSURGO Soils Database 2013 - 20% slope and higher.
The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.
Legend
County Boundary
Municipal Boundaries
Major Roads
Streams
Lakes
Steep Slopes
20% slope and higher
RICH COUNTY - Steep Slopes



BRAG
Bear River Association of Governments
Box Elder
Cache
Rich
Serving Utah's Bear River Region for over 40 years

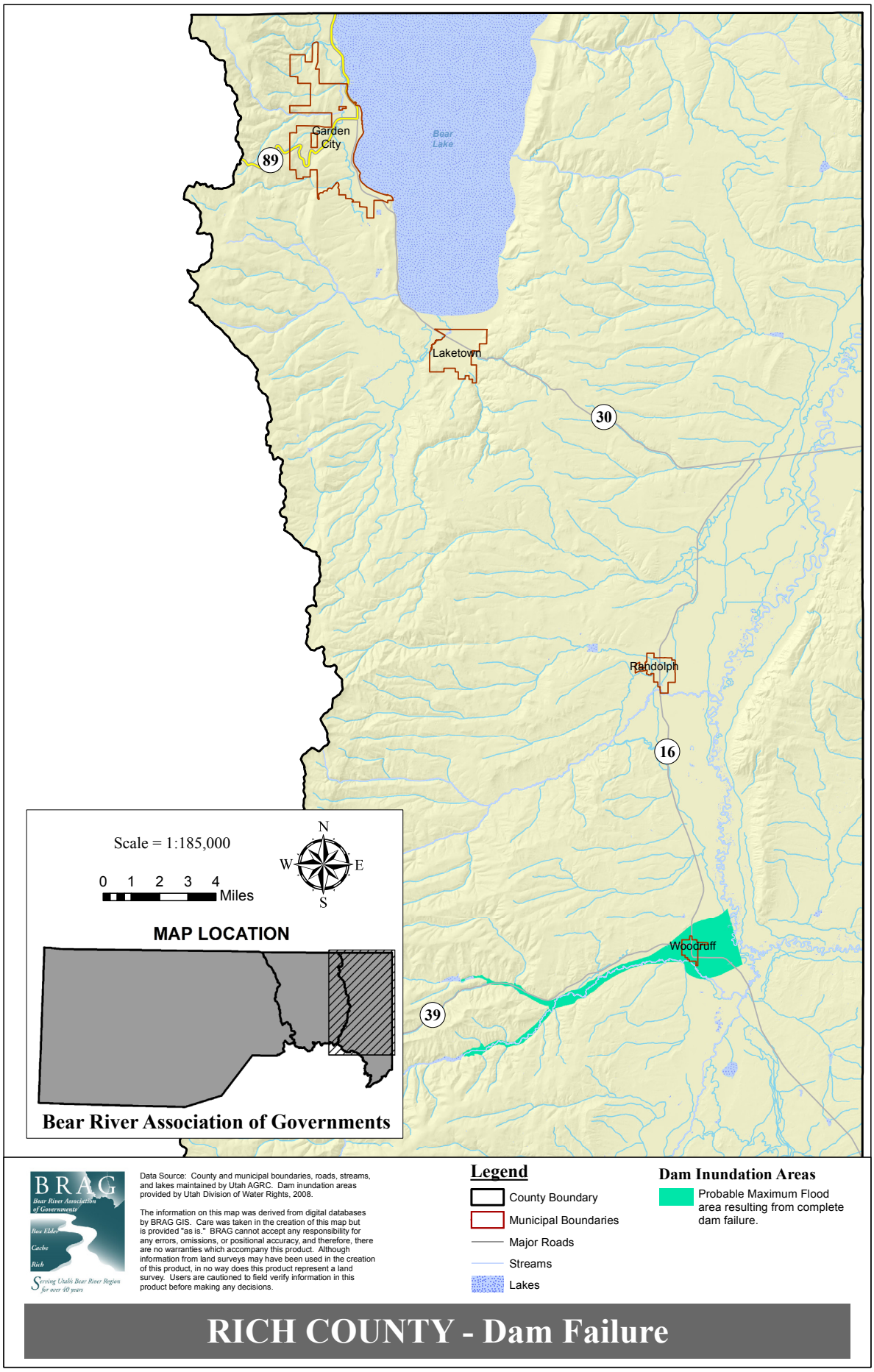
Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Quaternary faults and folds were taken from the U.S. Geological Survey, 2004. Buffers of 1000 feet on both sides of faults/folds were considered damage zones for this analysis.

The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.

Legend

- County Boundary
- Municipal Boundaries
- Major Roads
- Streams
- Lakes
- Quaternary Fault Damage Zones

RICH COUNTY - Geological Faults


Garden City
Bear Lake
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Laketown
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Randolph
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Woodruff
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Scale = 1:185,000
0 1 2 3 4 Miles
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MAP LOCATION
Bear River Association of Governments
BRAG
Bear River Association of Governments
Box Elder
Cache
Rich
Serving Utah's Bear River Region for over 40 years
Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Dam inundation areas provided by Utah Division of Water Rights, 2008.
The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.
Legend
County Boundary
Municipal Boundaries
Major Roads
Streams
Lakes
Dam Inundation Areas
Probable Maximum Flood area resulting from complete dam failure.
RICH COUNTY - Dam Failure

COMMUNITY SECTIONS: NATURAL HAZARDS, POTENTIAL LOSSES, AND MITIGATION STRATEGIES

RICH COUNTY

Analysis of hazard risk involving Rich County revealed that there is potential risk resulting from **dam failure, faults, landslide, poor soils, and steep slopes**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and recreational features within municipal boundaries. Currently, liquefaction and wildfire hazards have the greatest potential to impact the community based on potential loss values. Other natural hazard types not mentioned were found to have no potential impacts to Rich County. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 98: Rich County Potential Loss Figures

Natural Hazards

Current Development

Dam failure. Rich County's risk of dam failure involves Birch Creek Reservoir west of the town Woodruff, as well as Woodruff Creek Dam located in Wyoming nine miles East of Woodruff. Every structure located in Woodruff would be at risk if either one of these dams were to fail. Infrastructure, residents, environment, agriculture, and amenities in this area could experience significant damage.

Faults. Rich County has a great potential for earthquakes. The predominant and most active faulting probability is on the East Bear Lake Fault east of the lake. Woodruff, Randolph, and Laketown are some of the jurisdictions that could experience significant damage in the occurrence of an earthquake. Human life, structures, agriculture, and other amenities in the fault zone are all at risk for this natural hazard.

Landslide. The jurisdictions having the

Rich County, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	215	66	7,684,738	6	452,739	824,628
Faults	352	108	13,623,992	1	271,923	137,438
Wildfire	0	0	0	0	0	0
Flood	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	486	149	29,889,215	0	0	0
Slope	1,167	358	48,190,591	5	2,725,092	687,190
Poorly Drained Soils	427	131	31,315,380	5	3,640,837	687,190

* Based on average persons per owner household for Rich County from 2013 American Community Survey, which is 3.26.
** Current Market Value per parcel. Numbers were derived from Rich County parcels data provided by the Rich County Assessor.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($137,438 per firm). Derived from 2002 Survey of Business Owners for Rich County, US Census Bureau.

Rich County, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	3375.22	3773.31	637.19	0	0
Faults	4151.27	3867.24	3150.94	1	0
Wildfire	0	0	0	0	0
Flood	0	0	0	0	0
Liquefaction	0	0	0	0	0
Landslide	750.56	2015.4	21026.03	0	0
Slope	2790.99	0	181002.89	0	0
Poorly Drained Soils	7903.8	8155.32	33.74	2	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Rich County , UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement[1]	Schools/Public Facilities[2]	Health Care Facilities[3]	Places of Worship[4]	Infrastructure[5]
Dam Failure		Rendezvous Beach State Park, Camp Hunt			5 Bridges, 6 Dams
Faults		Bear Lake Aquatics Base, 1 RV Park			1 Bridge, 8 Dams
Wildfire					
Flood					
Liquefaction					
Landslide		2 Campgrounds, Cook Reservoir			27 Dams , Cisco's Landing LLC
Slope		1 Campground, 1 Hwy 89 Overlook			225 Dams
Poorly Drained Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

Rich County, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	3375.22	3773.31	637.19	0	0
Faults	4151.27	3867.24	3150.94	1	0
Wildfire	0	0	0	0	0
Flood	0	0	0	0	0
Liquefaction	0	0	0	0	0
Landslide	750.56	2015.4	21026.03	0	0
Slope	2790.99	0	181002.89	0	0
Poorly Drained Soils	7903.8	8155.32	33.74	2	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Rich County, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian°	Lakes[1]	Streams[2]	Parks[3]	Trails[4]	Amenities[5]
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	664.06	21.64	47.04	0.00	3.18	2.00
Faults	2,385.36	1,236.83	80.90	0.00	1.97	0.00
Wildfire	0.00	0.00	0.00	0.00	0.00	0.00
Flood	0.00	0.00	0.00	0.00	0.00	0.00
Liquefaction	0.00	0.00	0.00	0.00	0.00	0.00
Landslide	196.48	50.96	134.78	0.00	53.20	2.00
Slope	788.76	111.27	844.19	0.00	296.17	6.00
Poorly Drained Soils	1,564.28	50.79	55.83	1.16	0.11	0.00

Note: Total acres of land and miles of streams and trails were identifed using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

greatest tendencies for landslides are Garden City and Laketown, located in the northern most region of Rich County. Having steeper slopes and a large amount of development, it poses great risks to human life, structures, and infrastructure. Although there are no accounts of landslide activity, the Rich County data set includes high landslide risk areas in much of the northern parts of the Rich County Region.

Steep Slopes. Rich County has risks associated with steep slopes within its unincorporated areas. Steep slopes have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction.

Poorly Drained Soils. The towns Randolph and Woodruff have the largest threat for poorly drained soils. Both located adjacent to reservoirs and having high ponding frequencies. This hazard has a potential to effect human life, structures, infrastructure, environmental and recreational features, and agriculture.

Future Development

No concerns involving potential future development within Rich County were reported by city representatives.

Hazard Mitigation Strategies

Table 99: Rich County Mitigation Strategies

RICH COUNTY- COMMUNITY MITIGATION STRATEGIES

Protecting Current Residents and Property

Jurisdiction	Hazard	Goal	Action	Action (For NFIP Compliance, if Applicable)	Priority (High, Medium, Low)	Time-frame (Year)	Potential Funding Sources	Responsible Entity	Estimated Cost	Resources
Rich County	Dam Failure	Protect current residents and property	Update existing plans for dam failure	N/A	N/A	N/A	N/A	Rich County, Utah Dam Safety	N/A	Div. water rights
Rich County	Landslide	Protect current residents and property	Map past and potential landslide locations with an overlay of existing ownership and development	N/A	Low	N/A	N/A	Rich County, UGS	N/A	UGS, AGRC
Rich County	Flood	Protect current residents and property	Map floodplain as specifically as possible based on existing geographic data.	Work with state floodplain manager to assure compliance with NFIP.	Medium	2017	Local	Rich County, Utah DEM	Minimal	BRAG, FEMA, UGS
Rich County	Fault	Protect current residents and property	Obtain better fault mapping	N/A	Medium	2018	UGS, USGS	Rich County, UGS	TBD	BRAG, UGS
Rich County	Problem Soils	Protect current residents and property	Map problem soils and determine local risk.	N/A	Medium	2017	Local	Rich County, BRAG, NRCS	Minimal	BRAG
Rich County	Wildfire	Protect current residents and property	Continue urban wildfire interface education. Continue to build firebreaks around homes in existing wildfire areas (Firebreak, USFS above Sweetwater).	N/A	Medium	N/A	N/A	Rich County, Utah FFSL	N/A	FFSL
Rich County	Steep Slopes	Protect current residents and property	Determine slopes that may slip in an earthquake or sever weather event.	N/A	N/A	N/A	N/A	Rich County, UGS, BRAG	N/A	Rich county public works, Private contractors
Rich County	Severe Weather	Protect current residents and property	Coordinate with the National Weather Service to provide alerts concerning possible approaching cells in populated areas.	N/A	Medium	2016	DEM, FEMA	Rich County, NOAA	N/A	N/A

RICH COUNTY- COMMUNITY MITIGATION STRATEGIES

Protecting Future Residents and Property

Jurisdiction	Hazard	Goal	Action	Action (For NFIP Compliance, if Applicable)	Priority (High, Medium, Low)	Time-frame (Year)	Potential Funding Sources	Responsible Entity	Estimated Cost	Resources
Rich County	Landslide	Protect future residents and property	Consider earth movement in any future development.	N/A	N/A	N/A	N/A	Rich County, UGS	N/A	N/A
Rich County	Flood	Protect future residents and property	Review current floodplain ordinance and explore possibility of updating.	Work with state floodplain manager to assure compliance with NFIP.	Medium	2017	Local	Rich County, Utah DEM	Minimal	BRAG, FEMA, UGS
Rich County	Fault	Protect future residents and property	Obtain better fault mapping	N/A	Medium	2018	UGS, USGS	Rich County, UGS	TBD	BRAG, UGS
Rich County	Problem Soils	Protect future residents and property	Map problem soils and determine local risk.	N/A	Medium	2017	Local	Rich County, BRAG, NRCS	Minimal	BRAG
Rich County	Wildfire	Protect future residents and property	Consider natural vegetation types and property protection when reviewing new development	N/A	Medium	N/A	N/A	Rich County, Utah FFSL	N/A	FFSL, County, Cities
Rich County	Steep Slopes	Protect future residents and property	Minimize or prohibit any development	N/A	N/A	N/A	N/A	Rich County, UGS, BRAG	N/A	N/A
Rich County	Severe Weather	Protect future residents and property	Utilize warning systems	N/A	N/A	N/A	N	Rich County, NOAA	N	N/A
Rich County	Dam Failure	Protect future residents and property	Minimize or prohibit development below dams.	N/A	N/A	N/A	N/A	Rich County, Utah Dam Safety	N/A	N/A

GARDEN CITY

Analysis of hazard risk involving the community of Garden City revealed that there is potential risk resulting from **wildfire, landslides, steep slopes, and poorly drained soils**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and recreational features within municipal boundaries. Currently, landslide, slope, and poorly drained soil hazards have the greatest potential to impact human life, property, and various community amenities based on potential loss values. Other natural hazard types not mentioned were found to have no potential impacts to the unincorporated portions of Garden City. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 100: Garden City Potential Loss Figures

Natural Hazards

Current Development

Landslides. Although there have been no large accounts of landslide activity in Garden City, the Utah Geological Survey completed statewide mapping of landslide potential in this jurisdiction. Landslides have the potential to impact life, property, critical facilities, infrastructure, and environmental, recreational and agricultural features in the jurisdiction. Areas for this risk are predominantly located on the western slopes and unincorporated parts near Garden City..

Steep Slopes. Garden City has risks associated with steep slopes within its incorporated and unincorporated areas. Steep slopes have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction.

Garden City, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0
Flood	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	528	162	31,368,728	0	0	0
Slope	238	73	18,478,240	2	2,332,683	274,876
Poorly Drained Soils	544	167	34,341,783	3	3,152,825	412,314

* Based on average persons per owner household for Rich County from 2013 American Community Survey, which is 3.26.
** Current Market Value per parcel. Numbers were derived from Rich County parcels data provided by the Rich County Assessor.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($137,438 per firm). Derived from 2002 Survey of Business Owners for Rich County, US Census Bureau.

Garden City, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0	0.03	15,750	0	0
Flood	0	0	0	0	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0	0	0	0	0
Landslide	0	0	0	0	0	0	12.15	6,378,750	0.22	330,000
Slope	0	0	0	0	0	0	8.91	4,677,750	0.51	765,000
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Garden City , UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure		Garden City Park, Ideal Beach, Blue Water Beach			
Faults					
Wildfire					
Flood					
Liquefaction					
Landslide					
Slope					2 dams
Poorly Drained Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

Garden City, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	0	0	0	0	0
Wildfire	0	0	0	0	0
Flood	0	0	0	0	0
Liquefaction	0	0	0	0	0
Landslide	69.72	167.3	0.8	0	0
Slope	21.54	0	5.72	0	0
Poorly Drained Soils	16.39	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Table -- : Garden City, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0
Flood	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	11.43	0.12	4.86	0	0.98	0
Slope	11.6	0	4.64	0	3.44	0
Poorly Drained Soils	24.53	0.35	0.02	15.82	0	0

Note: Total acres of land and miles of streams and trails were identifed using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

Wildfire. Garden City is susceptible to the risk of wildfires, there is a potential for some infrastructure to receive damage in the occurrence of a wildfire.

Poorly Drained Soils. Garden City situated adjacent to Bear Lake tends to have problem soils. Residential and Commercial units near the shoreline experience the greatest risks. Most if not all infrastructure located near the lakes shoreline will have some type of risk for poor soils.

Future Development

There is a newer development being constructed with subdivisions in the Shundahai development area.

Hazard Mitigation Strategies

Table 101: Garden City Mitigation Strategies

GARDEN CITY- COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Garden City	Earthquake	Protect current residents and property	Creating community emergency response plans	N/A	Medium	2016	County, City, State, and Federal	Garden City, UGS, Rich County	N/A	City, County State, and Federal
Garden City	Wildfire	Protect current residents and property	Identify emergency evacuation routes in the various communities and publish on city and local fire department websites. Provide info to property owners on how to create defensible space around their homes	N/A	High	2015	Local Fire Department Budget	Garden City, Utah FFSL	$500	Fire District, County, FFSL
Garden City	Severe Weather	Protect current residents and property	Create local emergency community response groups.	N/A	Medium	2016	Local churches, City, County	Garden City, Rich County	N/A	Local churches, City, County
Garden City	Flooding	Protect current residents and property	Providing information to public concerning hazard zones and preventative preparation.	N/A	Medium	2016-2018	City and County	Garden City, Utah DEM	N/A	City and County
Garden City	Landslide	Protect current residents and property	Identify high risk areas and enact restrictive zoning laws for those hazard areas.	N/A	Medium	2016-2020	City and County	Garden City, UGS	N/A	City and County

GARDEN CITY- COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Garden City	Earthquake	Protect future residents and property	Review all future developments and business applications for adequate ingress and egress in relation to the expected traffic potential in the event of local evacuation emergency.	N/A	Medium	2016	City, County, State, and Federal	Garden City, UGS, Rich County	N/A	City, County, State, Federal
Garden City	Wildfire	Protect future residents and property	Require mandatory defensible setbacks in identified high risk wildfire zones before homeowners can receive occupancy permits.	N/A	High	2016	City, and County	Garden City, Utah FFSL	$500	City, County, FFSL
Garden City	Landslides	Protect future residents and property	Identify potential risk zones and place restrictive zoning on them.	N/A	Medium	2016-2020	City, County	Garden City, UGS	N/A	City, County
Garden City	Flooding	Protect future residents and property	Identify additional flood zones and ensure proper zoning laws in place.	N/A	Low	2016-2020	City and County	Garden City, Utah DEM	N/A	City and County
Garden City	Landslide	Protect future residents and property	Identify potential risk zones and place restrictive zoning on them.	N/A	Medium	2016-2020	City and County	Garden City, UGS	N/A	City and County

LAKETOWN

Analysis of hazard risk involving the community of Laketown revealed that there is potential risk resulting from **faults, landslide, and slope**. These hazards have varying potential to impact human life, property, infrastructure, agriculture, and recreational features within municipal boundaries. Currently, all three of the risks most likely to be found in Laketown have the greatest potential to impact human life, property, and infrastructure based on potential loss values. Other natural hazard types not mentioned were found to have no potential impacts to Laketown. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 102: Laketown Potential Loss Figures

Natural Hazards

Current Development

Faults. Laketown has potentially the greatest risk of fault damage in Rich County due to the faults location, situated closest to any of the jurisdictions infrastructure. The eastern portions of the town bench lie on top of the East Bear Lake Fault. Human life, structures, and other amenities in the fault zone could suffer catastrophic damage in the event of a large earthquake.

Landslides. Laketown has the potential risk of landslides in areas found on the lower bench areas surrounding the town boundary. Landslides have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction.

Laketown, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	72	22	3,348,696	3	445,248	412,314
Wildfire	0	0	0	0	0	0
Flood	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	10	3	922,641	0	0	0
Slope	78	24	4,309,474	3	390,144	412,314
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Rich County from 2013 American Community Survey, which is 3.26.
** Current Market Value per parcel. Numbers were derived from Rich County parcels data provided by the Rich County Assessor.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($137,438 per firm). Derived from 2002 Survey of Business Owners for Rich County, US Census Bureau.

Laketown, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	0	0	2.03	1,065,750	0.04	60,000
Wildfire	0	0	0	0	0	0	0	0	0	0
Flood	0	0	0	0	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0	0	0	0	0
Landslide	0	0	0	0	0	0	0.08	42,000	0	0
Slope	0	0	0	0	0	0	0.84	441,000	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Laketown , UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					
Wildfire					
Flood			NONE		
Liquefaction					
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

Laketown, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	96.32	73.06	176.08	0	0
Wildfire	0	0	0	0	0
Flood	0	0	0	0	0
Liquefaction	0	0	0	0	0
Landslide	0	0	36.74	0	0
Slope	12.84	0	207.63	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Laketown, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	0.05	0	0	0	0.63	0
Wildfire	0	0	0	0	0	0
Flood	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0.03	0
Slope	0	0	0	0	0.55	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land and miles of streams and trails were identifed using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

Steep Slopes. Laketown has risk associated with steep slopes within its jurisdictional boundaries. Steep slopes have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction.

Future Development

There is currently one residential home being built on the hill.

Hazard Mitigation Strategies

Table 103: Laketown Mitigation Strategies

LAKETOWN- COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Laketown	Wildfire	Protect current residents and property	Create fire break on east side of town	N/A	Medium	2018	PDMG, USFS, FFSL	Laketown, Utah FFSL	TBD	Local, Utah FFSL, County
Laketown	Flood	Protect current residents and property	Determine flood risk based on historical data and available mapping to avoid loss.	Work with state floodplain manager to assure compliance with NFIP.	Medium	2017	Local	Laketown, Utah DEM	Minimal	Utah DEM, FEMA, BRAG
Laketown	Landslide	Protect current residents and property	Determine landslide risk based on historical data and available mapping to avoid loss.	N/A	Medium	2017	Local	Laketown, UGS	Minimal	UGS, USGS, BRAG
Laketown	Earthquake/ Faults	Protect current residents and property	Update Geological Mapping	N/A	Medium	2020	UGS, FEMA, BRAG	Laketown, UGS	Minimal	BRAG, USU, UGS, USGS
Laketown	Steep Slopes	Protect current residents and property	Update Geological Mapping	N/A	Medium	2020	UGS, FEMA, BRAG	Laketown, UGS	Minimal	BRAG, USU, UGS, USGS

LAKETOWN- COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Laketown	Wildfire	Protect future residents and property	Create fire break on east side of town	N/A	Medium	2018	PDMG, USFS, FFSL	Laketown, Utah FFSL	TBD	Local, Utah FFSL, County
Laketown	Flood	Protect future residents and property	Review current ordinances to determine if improvements need to be made to protect future residents.	Work with state floodplain manager to assure compliance with NFIP.	Medium	2017	Local	Laketown, Utah DEM	Minimal	Utah DEM, FEMA, BRAG
Laketown	Landslide	Protect future residents and property	Review current ordinances to determine if improvements need to be made to protect future residents.	N/A	Medium	2017	Local	Laketown, UGS	Minimal	UGS, USGS, BRAG
Laketown	Earthquake/ Faults	Protect future residents and property	Update Geological Mapping	N/A	Medium	2020	UGS, FEMA, BRAG	Laketown, UGS	Minimal	BRAG, USU, UGS, USGS
Laketown	Steep Slopes	Protect future residents and property	Update Geological Mapping	N/A	Medium	2020	UGS, FEMA, BRAG	Laketown, UGS	Minimal	BRAG, USU, UGS, USGS

RANDOLPH

Analysis of hazard risk involving the community of Randolph revealed that there is potential risk resulting from **slope, and poorly drained soils**. These hazards have varying potential to impact human life, property, infrastructure, agriculture, and some environmental features. Other natural hazard types not mentioned were found to have no potential impacts to Randolph. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 104: Randolph Potential Loss Figures

Natural Hazards

Current Development

Steep Slopes. Randolph has a potential risk due to steep slopes on the eastern foothills in the towns boundary as well as it's unincorporated region. There are a few residential units at risk as well as several acres of agricultural land.

Poorly Drained Soils. Randolph has a high potential for poorly drained soils. These soils have varying potential to impact human life, property, infrastructure, and some environmental and agricultural lands and features. Parts of the town as well as land outside of Randolph's town boundary have very

Randolph, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0
Flood	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	13	4	306,679	0	0	0
Poorly Drained Soils	104	32	2,827,709	2	318,453	274,876

* Based on average persons per owner household for Rich County from 2013 American Community Survey, which is 3.26.
** Current Market Value per parcel. Numbers were derived from Rich County parcels data provided by the Rich County Assessor.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($137,438 per firm). Derived from 2002 Survey of Business Owners for Rich County, US Census Bureau.

Randolph, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0	0	0	0	0
Flood	0	0	0	0	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0	0	0	0	0
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0	0	0	0
Poorly Drained Soils	0	0	0.28	392,000	0	0	1.17	614,250	0.41	615,000

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Randolph , UT, Critical Facilites at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure	Randolph Jail	Rich County Extension Office			
Faults					
Wildfire					
Flood					
Liquefaction					
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

Randolph, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	0	0	0	0	0
Wildfire	0	0	0	0	0
Flood	0	0	0	0	0
Liquefaction	0	0	0	0	0
Landslide	0	0	0	0	0
Slope	3.87	0	0.62	0	0
Poorly Drained Soils	80.3	107.36	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Randolph , UT, Critical Facilites at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure	Randolph Jail	Rich County Extension Office			
Faults					
Wildfire					
Flood					
Liquefaction					
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

Randolph, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	0	0	0	0	0
Wildfire	0	0	0	0	0
Flood	0	0	0	0	0
Liquefaction	0	0	0	0	0
Landslide	0	0	0	0	0
Slope	3.87	0	0.62	0	0
Poorly Drained Soils	80.3	107.36	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Randolph, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0
Flood	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	7,368.18	0	0	0

Note: Total acres of land and miles of streams and trails were identifed using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

saturated soils with a high ponding frequency.

Future Development

No concerns involving potential future development within Randolph were reported by city representatives.

Hazard Mitigation Strategies

Table 105: Randolph Town Mitigation Strategies

RANDOLPH - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Randolph	Wildfire	Protect current residents and property	Coordinate with agencies on response and prevention.	N/A	High	2016	N/A	Randolph, Utah FFSL	Minimal	FFSL, County
Randolph	Earthquake	Protect current residents and property	Educate residents on Effects	N/A	Medium	2017	N/A	Randolph, UGS	Minimal	State, UGS
Randolph	Dam Failure	Protect current residents and property	Work with Wyoming on finding dam affects.	N/A	High	2017	N/A	Randolph, Wyoming, Utah Dam Safety	N/A	Utah Water, Woodruff Leadership
Randolph	Problem Soils	Protect current residents and property	Review current ordinances and general plan for soils data.	N/A	N/A	N/A	N	Randolph, NRCS	N/A	N/A

RANDOLPH - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Randolph	Wildfire	Protect future residents and property	Review current ordinances to see if they need any improvements.	N/A	Medium	2016	N/A	Randolph, Utah FFSL	Minimal	Utah FSSL, Local, BLRC
Randolph	Earthquake	Protect future residents and property	Educate residents on Effects	N/A	Medium	2017	N/A	Randolph, UGS	Minimal	State, UGS
Randolph	Dam Failure	Protect future residents and property	Work with Wyoming on finding dam affects.	N/A	High	2017	N/A	Randolph, Wyoming, Utah Dam Safety	N/A	Utah Water, Woodruff Leadership
Randolph	Problem Soils	Protect future residents and property	Review current ordinances and general plan for soils data.	N/A	N/A	N/A	N	Randolph, NRCS	N/A	N/A

WOODRUFF

Analysis of hazard risk involving the community of Woodruff revealed that there is potential risk resulting from **dam failure, and poorly drained soils**. These hazards have varying potential to impact human life, property, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, dam failure has the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from poorly drained soils appear to have less potential for impacts, yet still pose risks. Other natural hazard types not mentioned were found to have no potential impacts to Woodruff. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 106: Woodruff Town Potential Loss Figures

Natural Hazards

Current Development

Dam failure. Woodruff has a very significant risk of dam failure. Two dam structures have the impact to completely flood the town of Woodruff. Birch Creek Reservoir west of the town Woodruff, as well as Woodruff Creek Dam located in Wyoming nine miles East of Woodruff. Every structure located in Woodruff would be at risk if either one of these dams were to fail. Human life, Infrastructure, structures, environmental features, agriculture, and amenities in this area could experience significant damage.

Poorly Drained Soils. On the western boundary of Woodruff there tends to be a higher risk for poorly drained soils. This hazard has the varying potential to impact human life, structures, agriculture, and environmental and recreational features. Poorly drained soils have a higher impact on resi-

Woodruff, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	287	88	7,050,416	8	745,412	1,099,504
Faults	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0
Flood	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	16	5	229,651	0	0	0

* Based on average persons per owner household for Rich County from 2013 American Community Survey, which is 3.26.
** Current Market Value per parcel. Numbers were derived from Rich County parcels data provided by the Rich County Assessor.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($137,438 per firm). Derived from 2002 Survey of Business Owners for Rich County, US Census Bureau.

Woodruff, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0.92	1,288,000	0.14	17,780	4.42	2,320,500	0.85	1,275,000
Earthquakes	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	0	0	0	0	0	0
Flood	0	0	0	0	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0	0	0	0	0
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Woodruff , UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure	2 Fire Stations			1 Place of Worship	1 Bridge, 2 Broadband Anchors
Faults					
Wildfire					
Flood					
Liquefaction					
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilites were identifed using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Water Resources, and public and community leader input.

Woodruff, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	158.27	288.39	0	0	0
Faults	0	0	0	0	0
Wildfire	0	0	0	0	0
Flood	0	0	0	0	0
Liquefaction	0	0	0	0	0
Landslide	0	0	0	0	0
Slope	0	0	0	0	0
Poorly Drained Soils	6.73	6.73	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Woodruff, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	2.38	6.01	0	0
Faults	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0
Flood	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0.14	0	0	0

Note: Total acres of land and miles of streams and trails were identifed using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

dential structures more than anything else.

Future Development

We have not yet attained this information from city representatives.

Hazard Mitigation Strategies

Table 107: Woodruff Town Mitigation Strategies

WOODRUFF - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Woodruff	Dam Failure	Protect current residents and property	Work with the Utah Division of Water Rights and other groups to implement Emergency Action Plans on a local level.	N/A	High	Ongoing	Utah Division of Water Rights, Local	Woodruff, Utah Dam Safety	Minimal	Utah Division of Water Rights, Local
Woodruff	Flood	Protect current residents and property	Work with Utah DEM, FEMA, and BRAG to determine local flood risk and potential projects.	Work with state floodplain manager to assure compliance with NFIP.	Medium	2017	Utah DEM, FEMA	Woodruff, Utah DEM	Minimal	Utah DEM, FEMA
Woodruff	Problem Soils	Protect current residents and property	Review current ordinances and general plan for soils data.	N/A	Medium	2017	Local	Woodruff, NRCS	Minimal	City

WOODRUFF - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Woodruff	Dam Failure	Protect future residents and property	Work with the Utah Division of Water Rights and other groups to implement Emergency Action Plans on a local level.	N/A	High	Ongoing	Utah Division of Water Rights, Local	Woodruff, Utah Dam Safety	Minimal	Utah Division of Water Rights, Local
Woodruff	Flood	Protect future residents and property	Review current ordinances and general plan to see if flood ordinances need to be updated.	Work with state floodplain manager to assure compliance with NFIP.	Medium	2017	Utah DEM, FEMA	Woodruff, Utah DEM	Minimal	Utah DEM, FEMA
Woodruff	Problem Soils	Protect future residents and property	Review current ordinances and general plan for soils data.	N/A	Medium	2017	Local	Woodruff, NRCS	Minimal	City

SECTION 8: COMMUNITY CAPABILITY ASSESSMENT

INTRODUCTION

What follows is a description of the organizational, technical and political capacity of the Bear River Region to implement hazard mitigation strategies and goals. A plan will do nothing to improve hazard mitigation efforts in the region without sufficient implementation capacity and capability; particularly local level capacity (town, city and county government). The purpose of this section is to identify where capacity to implement this plan is lacking for jurisdictions in the region.

LOCAL ORGANIZATIONAL AND TECHNICAL CAPABILITY

Only a handful of communities in the Bear River region have full time professional staff of any kind. In many cases a limited tax base means that hiring full-time professional staff in the smaller cities and towns is financially unobtainable. Often these smaller communities rely on local volunteers or elected and appointed officials to perform many of the tasks normally handled by professional staff.

Table 108: State and Regional Hazard Mitigation Resources

State and Regional Hazard Mitigation Resources - Bear River Region	
Agency/Group	**Description**
Utah Division of Emergency Services and Homeland Security	Training, technical assistance and funding.
Utah League of Cities and Towns	Training, technical assistance and planning assistance
Utah Chapter American Planning Association	Local land use planning resource.
Utah Geological Survey	Technical assistance, plan review
Bear River Association of Governments	Technical assistance, plan review, GIS, and Community Development Block Grants.
Bear River Health Department	Emergency preparedness and response. Homeland security planning.
Cache Chapter of the American Red Cross	Training, emergency preparedness and response.
Utah Association of Conservation Districts	Technical assistance and planning assistance.
Utah Division of Forestry, Fire, and State Lands	Technical assistance and funding resources. Community Wildfire Protection Plan writing assistance.

It's not uncommon to have volunteer city council members or planning commissioners assigned the task of emergency management, grant writing, or long range planning. Professional staff at BRAG and each of the three counties help provide some technical and planning assistance to these smaller communities. This regional assistance is often limited by staffing capacity and funding. As funding allows, some communities are able to contract for professional services from private consultants.

Only Logan City, Brigham City, and Utah State University have staff that is, for the most part, dedicated full-time to emergency management related tasks. While Box Elder, Cache and Rich Counties have emergency managers, all of these individuals have other responsibilities in addition to core emergency management functions.

POLICY AND PROGRAM CAPABILITY

Most jurisdictions in the Bear River Region have an adopted General Plan as required by state code. Although many communities have recently updated their General Plan, some are very outdated and have not been revised in years. Generally speaking, if these plans address natural hazards at all, most often flooding and geological hazards are addressed generally. However, there are several communities in the region currently making efforts to improve the natural hazard aspects of their plan.

All of the thirty-nine municipalities have an adopted zoning ordinance as well as each county in the region. Again, these ordinances are often outdated and are not consistent with the jurisdiction's General Plan.

Table 109: Local Community Capability

Local Level Hazard Mitigation Capability - Bear River Region		
Jurisdiction	**Professional Staffing (e.g. Emergency Manager, City Manager, Engineer, Planner)**	**Technical Capacity (In House)**
BOX ELDER COUNTY	County Emergency Management Coordinator (has other duties part-time), County Planners, Public Works, Building Inspector	GIS capability and staffing
Bear River City	Volunteer\contracted consultant	None
Brigham City	Full time EM, CED Director, ED Director, Planner, Public Works	GIS capability and staffing
Corinne City	Part-time City Manager	None
Deweyville Town	Volunteer\contracted consultant	None
Elwood Town	Volunteer\contracted consultant	None
Fielding Town	Volunteer\contracted consultant	None
Garland City	Part-time Emergency Manager	None
Honeyville City	Volunteer\contracted consultant	None
Howell Town	Volunteer\contracted consultant	None
Mantua Town	Volunteer\contracted consultant	None
Perry City	Full-time City Administrator	None
Plymouth Town	Volunteer\contracted consultant	None
Portage Town	Volunteer\contracted consultant	None
Snowville Town	Volunteer\contracted consultant	None
Tremonton City	City Manager, City Engineer, part-time Emergency Preparedness Coordinator	CAD capability
Willard City	Planner	Some GIS capability
CACHE COUNTY	County Emergency Manager, County CED Director, Planners, Public Works, Building Inspector	GIS capability and staffing
Amalga Town	Volunteer\contracted consultant	None
Clarkston Town	Volunteer\contracted consultant	None
Cornish Town	Volunteer\contracted consultant	None
Hyde Park City	Volunteer Emergency Manager	Some GIS capability
Hyrum City	Zoning Administrator\City Manager, City Engineer, Emergency Manager (p/t?)	Some GIS capability
Lewiston City	Volunteer\contracted consultant	Some GIS capability
Logan City	Emergency Manager, CED Director, Planner(s), City Engineers, & Public Works.	GIS capability with customized application to Emergency Management.
Mendon City	Volunteer\contracted consultant	None
Millville City	Volunteer Planner	limited
Newton Town	Volunteer\contracted consultant	None
Nibley City	City Manager, Public Works, and Planner	None
North Logan City	City Manager, Engineer, Public Works, and Planner	GIS capability and staffing
Paradise Town	Volunteer\contracted consultant	None
Providence City	City Administrator and Public Works	None
Richmond City	Part-time City Manager	None
River Heights City	Volunteer\contracted consultant	None
Smithfield City	City Manager and Public Works	Some GIS capability
Trenton Town	Volunteer\contracted consultant	None
Wellsville City	City Manager	None
RICH COUNTY	Countywide Planner (Bear Lake Regional Commission), Part-time Emergency Manager, Building Inspector	GIS capability
Garden City	Volunteer\contracted consultant	GIS capability
Laketown	Volunteer\contracted consultant	None
Randolph City	Volunteer\contracted consultant	None
Woodruff Town	Volunteer\contracted consultant	None

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

Many of the smaller communities lack emergency response plans.

JURISDICTIONAL CAPABILITY TO EXPAND POLICIES AND PROGRAMS

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

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

Those communities that have full-time staff are much more likely to have adequate capacity to apply for funding or update the General Plan and other plans/documents in house (See Table 109).

Authority

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

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

State: The State of Utah derives its authority under the Emergency Management Act of 1981 (Utah Code 53-2, 63-5) as well as the Governor's Emergency Operations Directive and Executive Order of the Governor 11.

Associations of Governments: The Associations of Governments have been duly constituted under the authority of Title XI, Chapter 13, Utah Code Annotated, 1953, as amended (The Inter-local Cooperation Act) and pursuant to Section 3 of the Executive Order of the Governor of the State of Utah, dated May 27, 1970, with the authority to conduct planning studies and to provide services to its constituent jurisdictions.

Local: Utah Code, Title 17, Chapter 27 is the County Land Use Development and Management Act that grants authority to counties. Utah Code, Title 10 Chapter 9 grants similar authority to municipalities.

SECTION 9 - PLAN MAINTENANCE, IMPLEMENTATION, FUNDING & PUBLIC INVOLVEMENT

PLAN MAINTANENCE PROCEDURE

Monitoring, Evaluating and Updating the Plan

Periodic monitoring and reporting of the Plan is required to ensure that the goals and objectives for the Bear River Region are kept current and that local mitigation efforts are being carried out. The following procedures for plan maintenance are similar to the procedures in the 2009 version of this plan. Due to staff turnover, the annual reporting procedures from the 2009 plan were not carried out, and there was no need to revise or update the plan before this 5-year update process. However, we feel that these procedures, with a few minor modifications from the 2009 plan, are the most efficient way to maintain the plan. BRAG staff is committed to follow the procedures outlined below in order to help community's better implement the plan on a local level. Reporting annually on the plan is also a great reminder of the need to implement community mitigation strategies over the next five years.

Annual Reporting Procedures

The Plan shall be reviewed annually, as required by the BRAG Governing Board, or as situations dictate such as following a disaster declaration. The second quarter of each year the BRAG Community and Economic Development Department Staff will review the plan and ensure the following:

1. The Executive Director and the Governing Board will receive an annual report and/or presentation on the implementation status of the Plan.
2. The report will include an evaluation of the effectiveness and appropriateness of the mitigation actions proposed in the Plan.
3. The report will recommend, as appropriate, any required changes or amendments to the Plan.

If the BRAG Governing Board determines that a modification of the Plan is warranted, the Board may initiate a plan amendment.

Revisions and Updates

Periodic revisions and updates of the Plan are required to ensure that the goals and objectives for the Bear River Region are kept current. More importantly, revisions may be necessary to ensure the Plan is in full compliance with Federal regulations and State statutes. This portion of the Plan outlines the procedures for completing such revisions and updates.

Five (5) Year Plan Review

Contingent on funding, every five years the plan will be reviewed and a complete update will be initiated. All information in the plan will be evaluated for completeness and accuracy based on new information, methods, or data sources. New property development activities will be added to the plan and evaluated for impacts. New or improved sources of hazard related data will also be included.

The goals, objectives, and mitigation strategies will be readdressed and amended as necessary based on new information, additional experience, and the implementation progress of the plan. The approach to this plan update effort will be essentially the same as used for the original plan development.

Plan Amendments

Plan amendments will be considered by the BRAG Governing Board during the plan's annual review to take place the second quarter of each year. All affected local jurisdictions (Cities, Towns and Counties) will be required to hold a public hearing and adopt the recommended amendment by resolution prior to final plan modification by the BRAG Governing Board.

IMPLEMENTATION THROUGH EXISTING PROGRAMS

Integration with Local Planning

This plan is only useful to the extent its recommendations and mitigation strategies are integrated into local level decision making, programs, regulations, and resource allocation priorities. In the preparation of this plan it soon

became very evident that for most elected and appointed officials in the Bear River Region there is a strong desire to improve the jurisdiction's handling of natural hazard related issues. For many cities and towns, particularly the smaller ones, lack of motivation is not the issue. Finding the personnel, time, and financial resources is always a concern for smaller communities.

There are many different avenues for the local implementation of this plan by Bear River jurisdictions. The most direct application for local jurisdictions is to create or update a natural hazards zone or overlay in the local General Plans, zoning, and land use ordinances. Regulating land uses in natural hazard areas can effectively reduce losses of life and property. Updating these documents can be time consuming, but communities should be updating their General Plan about every five years at a minimum anyway. This regular update process is a great opportunity for communities to review their sections of the Bear River Region's Pre-Disaster Mitigation Plan (PDMP), identify risks documented in the plan, and to update their local General Plan, zoning, and ordinances accordingly. BRAG staff is very willing to give planning and zoning assistance to communities, help with GIS analysis, and provide contacts for natural hazards and community planning.

According to Utah law, there are only three elements that jurisdictions are required to address in their General Plan; transportation, affordable housing (only for incorporated cities with over 1,000 people), and land use. While these three elements are the only required sections for the plan, jurisdictions are given authority to do much more in protecting the public's health, safety, and welfare. This is also true regarding development and geologic hazards.

In 2008, the Utah Land Use Development and Management Act was amended to more specifically grant jurisdictions authority to regulate development in floodplains and geologic hazard areas. It reads, "A municipality may enact an ordinance regulating land use and development in a flood plain or potential geologic hazard area to protect life and prevent the substantial loss of real property or substantial damage to real property (LUDMA, 10-9a-505. Zoning districts, Amended by Chapter 326, 2008 General Session)." The same is true for counties.

The responsibility and authority to regulate development in natural hazard areas lies with the County, City, or Town. The State of Utah does not regulate most development, and while the Utah Geological Survey and others offer assistance to Counties/communities, they do not have authority to regulate. Public health, safety, and welfare can be protected most effectively as communities exercise the authority given them and use the resources available to them to plan development responsibly near hazard areas.

Many local emergency response plans are written in a national response framework, which is an all hazards approach to emergency response. These plans are outlined in a way that simplifies emergency response based on NIMS (National Incident Management System) principles. It focuses on partnerships, preparedness, tiered response, etc., but does not particularly focus on specific natural hazards. As such, it's difficult to implement natural hazards planning directly into these documents. However, local emergency management officials train for emergency response to all types of natural hazards. This plan can serve as a reference to them providing historical hazard events, points of contact, general geographic locations of hazards, and potential losses per jurisdiction per hazard. Also, continued involvement in several follow-up Pre-Disaster Mitigation planning meetings will provide useful forums for discussion and collaboration among various organizations and levels of government.

Public works departments can also implement the information from this plan. As communities view the natural hazards data and mapping in this plan, they can accordingly identify where infrastructure could be damaged in the event of a natural disaster or where weak sections are in the various systems. Data sets for the various hazards identified in this plan are continually being updated and refined. The Utah Geological Survey and others can provide zoning and ordinance assistance for geological hazard areas, and can provide the most up-to-date data and mapping.

As far as Flood Mitigation Plans, those

communities that do have a plan can update it referencing the data and statistics in this plan. Potential losses and the general number of structures in FEMA floodplains can be very beneficial in those plan updates. However, the best resource for updating floodplain planning efforts is the Utah Division of Homeland Security and Emergency Services. The State Floodplain Manager has the necessary training and resources to assist communities in this respect. Likewise, for wildfire protection, the Utah Division of Forestry, Fire, and State Lands can provide assistance to communities which can help them become eligible for funding. For general pre-disaster mitigation funding and project assistance, the Utah Division of Homeland Security and Emergency Services hazard mitigation planning staff can provide the most up-to-date knowledge and experience.

Another local application of the Bear River Region's PDMP is the community Capital Improvements List. As communities realize which hazards exist in their area, they can plan accordingly to apply for funding for emergency response equipment or new infrastructure and buildings that help protect the health and safety of residents. This list can include building retrofits, new structures, machinery or equipment, vehicles, utility lines, and other projects in the community. A Utah Permanent Community Impact Fund Board (CIB) fund allows for communities to take out low interest loans, sometimes with a percentage of the total funding including a grant, to fund these projects. Likewise, the US Department of Housing and Urban Development (HUD) administers Community Development Block Grants (CDBG) that could also be used for the purchase of these CIB projects on a competitive basis. These funds are administered for the Bear River Region by BRAG. One other funding source for these types of projects is the USDA Rural Development low interest loans.

Perhaps the most direct way communities in the Bear River Region can implement this plan into current planning mechanisms is by completing the mitigation strategies for their respective community found in this plan. These strategies were written by communities and County working groups to find ways to decrease potential losses to life and property. As communities strive to improve natural hazards planning within their jurisdictional boundaries, they will more effectively protect the public's health, safety, and welfare by implementing these mitigation strategies.

BRAG does not have the legal standing or the regulatory authority to require Cities, Towns, or Counties to make plan, ordinance, or policy changes. At best, BRAG can encourage, educate, and suggest changes to local codes, plans, regulations, and policies. Given this, it is suggested in this plan that BRAG's ongoing implementation effort would be most useful if focused on building local capacity, educating local officials on what is at stake (both in terms of funding eligibility and concern for citizenry), and providing the sustained technical assistance that is so crucial for the successful implementation of any long-term mitigation strategies.

Specifically, BRAG proposes to help move the implementation phase forward by (contingent on funding):

1. Establishing, coordinating, and hosting follow-up hazard mitigation meetings annually or biannually.
2. Presenting to local governments on the benefits of natural hazards planning, hazard mitigation project options, and funding opportunities.
3. Providing on-going technical assistance to Counties, Cities, and Towns by request.

POTENTIAL FUNDING SOURCES

Although all mitigation techniques will likely save money by avoiding losses, many projects are costly to implement. The Bear River jurisdictions will continue to seek outside funding assistance for mitigation projects for both the pre- and post-disaster environment. This portion of the Plan identifies the primary Federal and State grant programs for Bear River jurisdictions to consider, and also briefly discusses local and non-governmental funding sources.

Federal

There are several federal grant programs that have been identified as funding sources, specifically targeting hazard mitigation projects:

Below are some federal pre-disaster mitigation funding sources:

Title: Pre-Disaster Mitigation Program
Agency: Federal Emergency Management Agency
Through the Disaster Mitigation Act of 2000, Congress approved the creation of a national program to provide a funding mechanism that is not dependent on a Presidential Disaster Declaration. The Pre-Disaster Mitigation (PDM) program provides funding to states and communities for cost-effective hazard mitigation activities that complement a comprehensive mitigation program and reduce injuries, loss of life, and damage and destruction of property.

The funding is based upon a 75% Federal share and 25% non-Federal share. The non-Federal match can be fully in-kind or cash, or a combination. Special accommodations will be made for "small and impoverished communities", who will be eligible for 90% Federal share/10% non-Federal.

FEMA provides PDM grants to states that, in turn, can provide sub-grants to local governments for accomplishing the following eligible mitigation activities: State and local hazard mitigation planning, technical assistance (e.g. risk assessments, project development), mitigation projects, acquisition or relocation of vulnerable properties, hazard retrofits, minor structural hazard control or protection projects, community outreach, and education (up to 10% of State allocation).

Title: Hazard Mitigation Grant Program
Agency: Federal Emergency Management Agency
The Hazard Mitigation Grant Program (HMGP) was created in November 1988 through Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistant Act. The HMGP assists states and local communities in implementing long-term mitigation measures following a Presidential disaster declaration.

To meet these objectives, FEMA can fund up to 75% of the eligible costs of each project. The state or local cost-share match does not need to be cash; in-kind services or materials may also be used. With the passage of the Hazard Mitigation and Relocation Assistance Act of 1993, federal funding under the HMGP is now based on 15% of the federal funds spent on the Public and Individual Assistance programs (minus administrative expenses) for each disaster.

The HMGP can be used to fund projects to protect either public or private property, so long as the projects in question fit within the state and local governments overall mitigation strategy for the disaster area, and comply with program guidelines. Examples of projects that may be funded include the acquisition or relocation of structures from hazard-prone areas, the retrofitting of existing structures to protect them from future damages; and the development of state or local standards designed to protect buildings from future damages.

Eligibility for funding under the HMGP is limited to state and local governments, certain private nonprofit organizations or institutions that serve a public function, Indian tribes and authorized tribal organizations. These organizations must apply for HMPG project funding on behalf of their citizens. In turn, applicants must work through their state, since the state is responsible for setting priorities for funding and administering the program.

Title: Flood Mitigation Assistance Program
Agency: Federal Emergency Management Agency
FEMA's Flood Mitigation Assistance program (FMA) provides funding to assist states and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes and other structures insurable under the National Flood Insurance Program (NFIP). FMA was created as part of the National Flood Insurance Reform Act of 1994 (42 USC 4101) with the goal of reducing or eliminating claims under the NFIP.

FMA is a pre-disaster grant program, and is available to states on an annual basis. This funding is available for mitigation planning and implementation of mitigation measures only, and is based upon a 75% Federal share/25% non-Federal share. States administer the FMA program and are responsible for selecting projects for funding from the applications submitted by all communities within the state. The state then forwards selected applications to FEMA for an eligibility determination. Although individuals cannot apply directly for FMA funds, their local government may submit an application on their behalf.

Title: Public Assistance (Infrastructure) Program, Section 406
Agency: Federal Emergency Management Agency
FEMA's Public Assistance Program, through Section 406 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, provides funding to local governments following a Presidential Disaster Declaration for mitigation measures in conjunction with the repair of damaged public facilities and infrastructure. The mitigation measures must be related to eligible disaster related damages and must directly reduce the potential for future, similar disaster damages to the eligible facility. These opportunities usually present themselves during the repair/replacement efforts.

Proposed projects must be approved by FEMA prior to funding. They will be evaluated for cost effectiveness, technical feasibility and compliance with statutory, regulatory and executive order requirements. In addition, the evaluation must ensure that the mitigation measures do not negatively impact a facility's operation or risk from another hazard.
Public facilities are operated by state and local governments, Indian tribes or authorized tribal organizations and include:
*Roads, bridges & culverts
*Draining & irrigation channels
*Schools, city halls & other buildings
*Water, power & sanitary systems
*Airports & parks
Private nonprofit organizations are groups that own or operate facilities that provide services otherwise performed by a government agency and include, but are not limited to the following:
*Universities and other schools
*Hospitals & clinics
*Volunteer fire & ambulance
*Power cooperatives & other utilities
*Custodial care & retirement facilities
*Museums & community centers

Title: Emergency Management Performance Grant
Agency: Federal Emergency Management Agency
By authorizing the Robert T. Stafford Disaster Relief and Emergency Assistance Act and Section 662 of the Post Katrina Emergency Management Reform Act of 2006, Congress approved the creation of a national program to provide a funding mechanism. Title VI of the Stafford Act authorizes FEMA to make grants for the purpose of providing a system of emergency preparedness for the protection of life and property in the United States from hazards and to vest responsibility for emergency preparedness jointly in the federal government and the states and their political subdivisions. The Federal Government, through the EMPG Program, provides necessary direction, coordination, and guidance, and provides necessary assistance, as authorized in this title, to support a comprehensive all hazards emergency preparedness system.

The funding is administered through the state based upon a 50% Federal share and 50% non-Federal share. The non-Federal match can be fully in-kind or cash, or a combination.

FEMA provides EMPG assistance to states that, in turn, can provide sub-grants to local governments for accomplishing the following eligible mitigation activities: management and administration, planning, organization costs, equipment, training, conducting exercises, construction and renovation projects, and maintenance and sustainment activities and projects.

Title: SBA Disaster Assistance Program
Agency: US Small Business Administration
The SBA Disaster Assistance Program provides low-interest loans to businesses following a Presidential disaster declaration. The loans target businesses to repair or replace uninsured disaster damages to property owned by the business, including real estate, machinery and equipment, inventory and supplies. Businesses of any size are eligible, along with non-profit organizations.

SBA loans can be utilized by their recipients to incorporate mitigation techniques into the repair and restoration of their business.

Title: Community Development Block Grants
Agency: US Department of Housing and Urban Development
The Community Development Block Grant (CDBG) program provides grants to local governments for community and economic development projects that primarily benefit low- and moderate-income households. The CDBG program also provides grants for post-disaster hazard mitigation and recovery following a Presidential disaster declaration. Funds can be used for activities such as acquisition, rehabilitation, or reconstruction of damaged properties and facilities and for the redevelopment of disaster areas.

Title: Community Assistance
Agency: US Bureau of Land Management
This funding can be used on private land adjacent to BLM lands. In addition, through the CWPP process the community can recommend fuels treatment project to the BLM on their jurisdictional area.

Title: State Fire Assistance-Healthy Forests Restoration Act (HFRA)
Agency: US Forest Service
The Healthy Forests Restoration Act allows communities to identify/recommend fuel mitigation projects on public lands. This in turn allows federal agencies to plan, process, and implement projects on these lands in an expedited manner.

Title: Stevens
Agency: US Forest Service
The Stevens grant is funding for projects that include a portion of Forest Service land and there must be a prescribed fire component.

Title: Secure Rural Schools and Community Self Determination Act
Agency: US Forest Service (money is funneled through the State Department of Treasury then to the Counties.
This act was amended and reauthorized for fiscal year 2008-2011, and was signed by the President on October 3, 2008. This authorizes the use of Title III monies for the development of Community Wildfire Protection Plans. The Utah Division of Forestry, Fire, and State Lands has technical experts who can assist with the development of these plans.

Title: Disaster Assistance and Relief Act
Agency: (no agency other than Congress)
This funding can be used to implement "shovel or chainsaw" ready projects. These project areas must be adjacent to Forest Service lands. A community must have an approved Community Wildfire Protection Plan to be eligible for these funds.

Local

Local governments depend upon local property taxes as one of their primary sources of revenue. These taxes are typically used to finance services that must be available and delivered on a routine and regular basis to the general public. If local budgets allow, these funds are used to match Federal or State grant programs when required for large-scale projects.

Non-Governmental

Another potential source of revenue for implementing local mitigation projects are monetary contributions from non-governmental organizations, such as private sector companies, churches, charities, community relief funds, the Red Cross, hospitals, Land Trusts, and other non-profit organizations.

CONTINUED PUBLIC INVOLVEMENT

During interim periods between the five year re-write, efforts will be continued to encourage and facilitate public involvement and input. The plan will be available for the public electronically on the BRAG website (http://www.brag.utah.gov). A hardcopy will also be available at the BRAG office in Logan, Utah. Comments will always be received whether orally, written, or by e-mail.

In addition to the public comment period for the draft version of the plan, including the proper public notices in local newspapers, a press release of the final plan will help to educate the public. This should involve education on the need for preparing for and mitigating against the effects of natural hazards and the purpose and usefulness of the final adopted plan.

As implementation of the mitigation strategies continues in each local jurisdiction, the primary means of public involvement will be the jurisdiction's own public comment and hearing process. State law as it applies to municipalities and counties requires this as a minimum for many of the proposed implementation measures. BRAG encourages Counties, Cities, and Towns to go beyond the minimal requirements of receiving public input, and to engage stakeholders.

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APPENDIX A - REGIONAL DEMOGRAPHICS AND POPULATION DATA

Annual Estimates of the Population for Incorporated Places in Box Elder County, Utah: July 1, 2009 to July 1, 2013							
Population Estimates							
Geographic Area	7/1/2013	7/1/2012	7/1/2011	7/1/2010	7/1/2009	09-'13 Population Growth	09-'13 Percent Growth
Bear River	842	838	849	855	852	-10	-1.17%
Brigham City	18,454	18,199	18,055	17,963	18,900	-446	-2.36%
Corinne	688	689	680	689	706	-18	-2.55%
Deweyville	327	326	329	333	337	-10	-2.97%
Elwood	1,034	1,032	1,036	1,039	889	145	16.31%
Fielding	437	439	446	454	427	10	2.34%
Garland	2,402	2,388	2,415	2,432	2,086	316	15.15%
Honeyville	1,421	1,421	1,433	1,447	1,389	32	2.30%
Howell	246	246	245	245	250	-4	-1.60%
Mantua	676	672	679	688	774	-98	-12.66%
Perry	4,531	4,490	4,508	4,526	3,950	581	14.71%
Plymouth	395	397	401	405	376	19	5.05%
Portage	246	245	248	245	290	-44	-15.17%
Snowville	164	164	168	167	167	-3	-1.80%
Tremonton	7,903	7,774	7,791	7,660	7,002	901	12.87%
Willard	1,761	1,751	1,764	1,775	1,774	-13	-0.73%
Data Source: Annual Estimates of the Population for Incorporated Places in Utah, Listed Alphabetically: April 1, 2009 to July 1, 2013 (U.S. Census Bureau)							

Annual Estimates of the Population for Incorporated Places in Cache County, Utah: July 1, 2009 to July 1, 2013							
Population Estimates							
Geographic Area	7/1/2013	7/1/2012	7/1/2011	7/1/2010	7/1/2009	09-'13 Population Growth	09-'13 Percent Growth
Amalga	493	495	492	490	483	10	2.07%
Clarkston	666	675	673	668	758	-92	-12.14%
Cornish	296	295	293	290	286	10	3.50%
Hyde Park	4145	4062	3967	3869	4039	106	2.62%
Hyrum	7,745	7,765	7,719	7,653	7,670	75	0.98%
Lewiston	1,759	1,777	1,779	1,780	2,038	-279	-13.69%
Logan	48,913	49,017	49,020	48,375	49,549	-636	-1.28%
Mendon	1,267	1,275	1,281	1,286	1,203	64	5.32%
Millville	1,869	1,872	1,862	1,846	1,833	36	1.96%
Newton	782	789	788	791	808	-26	-3.22%
Nibley	5,938	5,828	5,720	5,530	4,605	1,333	28.95%
North Logan	9,659	8,780	8,375	8,306	8,500	1,159	13.64%
Paradise	922	924	919	910	904	18	1.99%
Providence	7,033	7,049	7,039	7,020	6,612	421	6.37%
Richmond	2,515	2,523	2,509	2,490	2,374	141	5.94%
River Heights	1,852	1,857	1,847	1,830	1,713	139	8.11%
Smithfield	10,466	10,132	9,869	9,683	9,757	709	7.27%
Trenton	469	470	468	465	513	-44	-8.58%
Wellsville	3,495	3,504	3,482	3,452	3,273	222	6.78%
Data Source: Annual Estimates of the Population for Incorporated Places in Utah, Listed Alphabetically: July 1, 2009 to July 1, 2013 (U.S. Census Bureau)							

Annual Estimates of the Population for Incorporated Places in Rich County, Utah: July 1, 2009 to July 1, 2013							
Population Estimates							
Geographic Area	7/1/2013	7/1/2012	7/1/2011	7/1/2010	7/1/2009	09-'13 Population Growth	09'-'13 Percent Growth
Garden City	574	571	580	562	466	108	23.18%
Woodruff	182	181	185	179	184	-2	-1.09%
Randolph	462	463	473	461	476	-14	-2.94%
Laketown	255	252	256	249	187	68	36.36%
Data Source: Annual Estimates of the Population for Incorporated Places in Utah, Listed Alphabetically: July 1, 2009 to July 1, 2013 (U.							

Current and Projected Population Estimates		
County	2013 Population Estimate	2040 Projected Population Estimate
Box Elder County	50,794	64,704
Cache County	116,909	196,559
Rich County	2,288	3,153
2040 Projected Population Estimates From the Governor's Office of Planning and Budget (GOPB) De		

Box Elder County- Demographic and Economic Summary

2009-2013 American Community Survey 5-Year Estimates -

Data Profile Highlights:

NOTE. Although the American Community Survey (ACS) produces population, demographic and housing unit estimates, it is the Census Bureau's Population Estimates Program that produces and disseminates the official estimates of the population for the nation, states, counties, cities and towns and estimates of housing units for states and counties.

Social Characteristics - show more >>	Estimate	Percent	U.S.	Margin of Error
Average household size	3.07	(X)	2.63	+/-0.05
Average family size	3.46	(X)	3.22	+/-0.08
Population 25 years and over	29,132			+/-60
High school graduate or higher	(X)	91.7	86	+/-1.0
Bachelor's degree or higher	(X)	21.2	28.8	+/-1.4
Civilian veterans (civilian population 18 years and over)	2,724	8.2	6.7	+/-248
Disability status (population 5 years and over)	5,689	11.5	14.8	+/-452
Foreign born	1,564	(X)	12.8	+/-215
Male, Now married, except separated (population 15 years and over)	11,754	65.2	49.5	+/-353
Female, Now married, except separated (population 15 years and over)	11,677	64.9	47.8	+/-425
Speak a language other than English at home (population 5 years and over)	3,246	7.2	20.7	+/-400
Household population	49,708	(X)		+/-102
Group quarters population	(X)	(X)	2.6	(X)
Economic Characteristics - show more >>	**Estimate**	**Percent**	**U.S.**	**Margin of Error**
In labor force (population 16 years and over)	23,128	65.6	64.3	+/-393
Mean travel time to work in minutes (workers 16 years and over)	22.6	(X)	25.5	+/-1.0
Median household income (in 2013 inflation-adjusted dollars)	57,292	(X)	53,046	+/-2,183
Median family income (in 2013 inflation-adjusted dollars)	62,898	(X)	64,719	+/-2,439
Per capita income (in 2013 inflation-adjusted dollars)	21,720	(X)	28,155	+/-633
Families below poverty level	(X)	7	11.3	(X)
Individuals below poverty level	(X)	8.8	15.4	(X)
Housing Characteristics - show more >>	**Estimate**	**Percent**	**U.S.**	**Margin of Error**
Total housing units	17,539	(X)		+/-74
Occupied housing units	16,207	92.4	87.5	+/-264
Owner-occupied housing units	12,849	79.3	64.9	+/-279
Renter-occupied housing units	3,358	20.7	35.1	+/-291
Vacant housing units	1,332	7.6	12.5	+/-241
Owner-occupied homes	12,849	79.3		+/-279
Median value (dollars)	166,100	(X)	176,700	+/-2,978
Median of selected monthly owner costs				
With a mortgage (dollars)	1,223	(X)	1,540	+/-24
Not mortgaged (dollars)	357	(X)	452	+/-14
ACS Demographic Estimates - show more >>	**Estimate**	**Percent**	**U.S.**	**Margin of Error**
Total population	50,160			*****
Male	25,300	50.4	49.2	+/-0.1
Female	24,860	49.6	50.8	+/-0.1
Median age (years)	31.4	(X)	37.3	+/-0.3
Under 5 years	4,788	9.5	3.3	+/-68
18 years and over	33,357	66.5	36.9	+/-44
65 years and over	5,744	11.5	5.6	+/-87
One race	49,018	97.7	97.1	+/-220
White	46,764	93.2	72.4	+/-372
Black or African American	174	0.3	12.6	+/-64
American Indian and Alaska Native	375	0.7	0.9	+/-86
Asian	288	0.6	4.8	+/-74
Native Hawaiian and Other Pacific Islander	68	0.1	0.2	+/-27
Some other race	1,349	2.7	6.2	+/-365
Two or more races	1,142	2.3	2.9	+/-220
Hispanic or Latino (of any race)	4,287	8.5	16.3	*****

Source: U.S. Census Bureau, 2009-2013 American Community Survey

Explanation of Symbols:

'***' - The median falls in the lowest interval or upper interval of an open-ended distribution. A statistical test is not appropriate.

'*****' - The estimate is controlled. A statistical test for sampling variability is not appropriate.

'N' - Data for this geographic area cannot be displayed because the number of sample cases is too small.

'(X)' - The value is not applicable or not available.

Cache County- Demographic and Economic Summary

2009-2013 American Community Survey 5-Year Estimates -

Data Profile Highlights:

NOTE. Although the American Community Survey (ACS) produces population, demographic and housing unit estimates, it is the Census Bureau's Population Estimates Program that produces and disseminates the official estimates of the population for the nation, states, counties, cities and towns and estimates of housing units for states and counties.

Social Characteristics - show more >>	Estimate	Percent	U.S.	Margin of Error
Average household size	3.12	(X)	2.63	+/-0.03
Average family size	3.54	(X)	3.22	+/-0.04
http://factfinder.census.gov/img/cws/1px.gif	http://factfinder.census.gov/img/cws/1px.gif	http://factfinder.census.gov/img/cws/1px.gif	http://factfinder.census.gov/img/cws/1px.gif	http://factfinder.census.gov/img/cws/1px.gif
Population 25 years and over	57,586			+/-126
High school graduate or higher	(X)	92.5	86	(X)
Bachelor's degree or higher	(X)	36.9	28.8	(X)
Civilian veterans (civilian population 18 years and over)	4,258	5.4	6.7	+/-268
Disability status (population 5 years and over)	8,633	7.6	14.8	+/-500
Foreign born	7,868	6.9	12.8	+/-489
Male, Now married, except separated (population 15 years and over)	24,280	58.8	49.5	+/- 564
Female, Now married, except separated (population 15 years and over)	23,498	55.6	47.8	+/-626
Speak a language other than English at home (population 5 years and over)	14,178	13.8	20.7	+/-656
http://factfinder.census.gov/img/cws/1px.gif				
Household population				
Group quarters population	(X)	(X)	2.6	(X)
Economic Characteristics - show more >>	Estimate	Percent	U.S.	Margin of Error
In labor force (population 16 years and over)	57,269	70	64.3	+/-788
Mean travel time to work in minutes (workers 16 years and over)	16.6	(X)	25.5	+/-0.5
Median household income (in 2013 inflation-adjusted dollars)	49,506	(X)	53,046	+/-1,169
Median family income (in 2013 inflation-adjusted dollars)	57,220	(X)	64,719	+/-1,816
Per capita income (in 2013 inflation-adjusted dollars)	20,074	(X)	28,155	+/-484
Families below poverty level	(X)	11.2	11.3	(X)
Individuals below poverty level	(X)	16.6	15.4	(X)
Housing Characteristics - show more >>	Estimate	Percent	U.S.	Margin of Error
Total housing units	37,630			+/-172
Occupied housing units	35,375	94	87.5	+/-371
Owner-occupied housing units	22,810	64.5	64.9	+/-430
Renter-occupied housing units	12,565	35.5	35.1	+/-492
Vacant housing units	2,255	6	12.5	+/-311
http://factfinder.census.gov/img/cws/1px.gif	http://factfinder.census.gov/img/cws/1px.gif	http://factfinder.census.gov/img/cws/1px.gif	http://factfinder.census.gov/img/cws/1px.gif	http://factfinder.census.gov/img/cws/1px.gif
Owner-occupied homes	22,810	64.5		+/-430
Median value (dollars)	189,100	(X)	176,700	+/-2,984
Median of selected monthly owner costs				
With a mortgage (dollars)	1,286	(X)	1,540	+/-24
Not mortgaged (dollars)	342	(X)	452	+/-8
ACS Demographic Estimates - show more >>	Estimate	Percent	U.S.	Margin of Error
Total population	114,181			*****
Male	56,867	49.8	49.2	+/-112
Female	57,314	50.2	50.8	+/-112
Median age (years)	25		37.3	(X)
Under 5 years	11,187	9.8	3.3	+/-68
18 years and over	78,295	68.6	36.9	(X)
65 years and over	9,028	7.9	5.6	+/-38
http://factfinder.census.gov/img/cws/1px.gif				
One race	111,527	97.7	97.1	
White	104,255	91.3	72.4	+/-587
Black or African American	716	0.6	12.6	+/-99
American Indian and Alaska Native	658	0.6	0.9	+/-183
Asian	2,345	2.1	4.8	+/-151
Native Hawaiian and Other Pacific Islander	132	0.1	0.2	+/-46
Some other race	3,421	3	6.2	+/-561
Two or more races	2,654	2.3	2.9	+/-338
http://factfinder.census.gov/img/cws/1px.gif				
Hispanic or Latino (of any race)	11,467	10	16.3	(X)

Source: U.S. Census Bureau, 2009-2013 American Community Survey

Explanation of Symbols:

'***' - The median falls in the lowest interval or upper interval of an open-ended distribution. A statistical test is not appropriate.

'*****' - The estimate is controlled. A statistical test for sampling variability is not appropriate.

'N' - Data for this geographic area cannot be displayed because the number of sample cases is too small.

'(X)' - The value is not applicable or not available.

Rich County- Demographic and Economic Summary

Data Source: U.S. Census

	Number	Percent	U.S.
General Characteristics - show more >>			
Total population	2,279		****
Male	1,154	50.6	49.2
Female	1,125	49.4	50.8
Median age (years)	35.2	37.3	37.3
Under 5 years	208	7.6	3.3
18 years and over	1,576	69.2	36.9
65 years and over	362	17.1	5.6
http://factfinder.census.gov/img/cws/1px.gif	http://factfinder.census.gov/img/cws/1px.gif	http://factfinder.census.gov/img/cws/1px.gif	
One race	2,273	99.7	97.1
White	2,254	98.9	72.4
Black or African American	3	0.1	12.6
American Indian and Alaska Native	1	0	0.9
Asian	0	0	4.8
Native Hawaiian and Other Pacific Islander	2	0	0.2
Some other race	13	0.6	6.2
Two or more races	**6**	**0.3**	**2.9**
http://factfinder.census.gov/img/cws/1px.gif	http://factfinder.census.gov/img/cws/1px.gif	http://factfinder.census.gov/img/cws/1px.gif	
Hispanic or Latino (of any race)	54	2.4	16.3
http://factfinder.census.gov/img/cws/1px.gif	http://factfinder.census.gov/img/cws/1px.gif	http://factfinder.census.gov/img/cws/1px.gif	
Household population	664	(X)	
Group quarters population	(X)	(X)	3
http://factfinder.census.gov/img/cws/1px.gif	http://factfinder.census.gov/img/cws/1px.gif	http://factfinder.census.gov/img/cws/1px.gif	
Average household size	3.41	(X)	2.63
Average family size		(X)	3.22
http://factfinder.census.gov/img/cws/1px.gif	**http://factfinder.census.gov/img/cws/1px.gif**	**http://factfinder.census.gov/img/cws/1px.gif**	
Total housing units	2,882		****
Occupied housing units	664	23.1	87.5
Owner-occupied housing units	554	83.4	64.9
Renter-occupied housing units	110	16.6	35.1
Vacant housing units	2,211	76.9	12.5
Social Characteristics - show more >>	Number	Percent	U.S.
Population 25 years and over	1,421		
High school graduate or higher	537	37.8	86
Bachelor's degree or higher	202	14.2	29
Civilian veterans (civilian population 18 years and over)	1,576	6.9	6.7
Disability status (population 5 years and over)	389	17.2	14.8
Foreign born	**11**	**0.5**	**12.8**
Male, Now married, except separated (population 15 years and over)	16	2.4	49.5
Female, Now married, except separated (population 15 years and over)	61	9.2	47.8
Speak a language other than English at home (population 5 years and over)	48	2.3	20.7
Economic Characteristics - show more >>	Number	Percent	U.S.
In labor force (population 16 years and over)	950	58.8	64.3
Mean travel time to work in minutes (workers 16 years and over)	22	(X)	25.5
Median household income in (dollars)	50,000	(X)	53,046
Median family income in (dollars)	65,250	(X)	64,719
Per capita income in (dollars)	24,258	(X)	28,155
Families below poverty level	(X)	4.5	11.3
Individuals below poverty level	(X)	7	15.4
Housing Characteristics - show more >>	Number	Percent	U.S.
Single-family owner-occupied homes			
Median value (dollars)	156,600	(X)	176,700
Median of selected monthly owner costs			
With a mortgage (dollars)	1,128	(X)	1,540

(X) Not applicable.

Source: U.S. Census Bureau, Summary File 1 (SF 1) and Summary File 3 (SF 3)

APPENDIX B - NATURAL HAZARDS DEFINITIONS AND INFORMATION

HAZARD DEFINITIONS

The following is a description of each of the hazards evaluated in the Bear River Region's Pre-disaster Mitigation Plan. These definitions, with minor modifications and additions, were developed by DESHS and used by permission in this plan.

Flooding

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

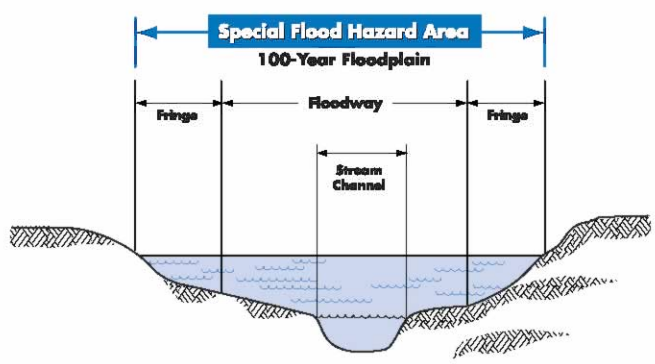
Another important consideration to make regarding flooding is the variety of flood types and other hazards that often happen at the same time flooding occurs. For example, rarely are flood waters clear and free from debris. Often, mud/sediment/debris flows happen concurrently with flooding, causing damages sometimes more severe than what flooding alone may have caused. Also, when defining and analyzing flood hazards in the Bear River Region, irrigation canals should be included. Canals are not designed to handle storm water during high rain events. By the nature of canal design, the further downstream on the canal, the less water that canal can handle. As water is extracted from the system, less water is available. This design is opposite to how a storm water system is designed, which should be able to handle higher flows further downstream (Scott Stoddard, personal communication, 8/13/09). Canals located on steep or unstable hillsides can also exacerbate problems when a landslide occurs, increasing risk and adding an element of flooding to an already dangerous situation.

As development near floodplains occurs, cut and fill of hillsides can change the hydrology of the landscape. In some circumstances, the floodplain levels can actually raise much like putting marbles one at a time in a bathtub filled with water. One by one, projects can slowly alter the floodplain until more residents and structures are at risk. Homes built earlier that were never in the FEMA floodplain to begin with could then be at risk.

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

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

Conditions which my exacerbate floods include: steeply sloped watersheds, constrictions, obstructions, debris contamination, soil saturation and velocity.



Explanation of Common Flood Terms

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

Base Flood: Is the standard that has been adopted for the NFIP. It is a national standard that represents a compromise between minor floods and the greatest flood likely to occur in a given area and provides a useful benchmark.

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

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

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

Earthquakes

An earthquake is the abrupt shaking of the earth caused by the sudden breaking of rocks when they can no longer withstand the stresses, which build up deep beneath the earth's surface. The rocks tend to rupture along weak zones referred to as faults. When rocks break they produce seismic waves that are transmitted through the rock outward producing ground shaking. Earthquakes are unique multi-hazard events, with the potential to cause huge amounts of damage and loss. Secondary effects of a sudden release of seismic energy (earthquake) include: ground shaking, surface fault rupture, liquefaction, tectonic subsidence, slope failure, and various types of flooding.

The Intermountain Seismic Belt

The Intermountain Seismic Belt (ISB), which the Bear River Region is part of, is a zone of pronounced earthquake activity up to 120 miles wide extending in a north south direction 800 miles from Montana to northern Arizona. The Utah portion of the ISB trends from the eastern Box Elder and Cache County area south through the center of the State, along the Wasatch Front, and then southwest through Richfield and Cedar City, concluding in St. George. "The zone generally coincides with the boundary between the Basin and Range physiographic province to the west and the Middle Rocky Mountains and Colorado Plateau physiographic provinces to the east" (Eldredge 6).

Secondary Earthquake Threats

The major secondary effects of earthquakes include: ground shaking, surface fault rupture, liquefaction, tectonic subsidence, avalanches, rock fall, slope failure, and various types of flooding. Other sections discuss landslides, and flooding therefore they will not be discussed under secondary effects of earthquakes yet importance needs to be given to the fact that earthquakes can increase the likelihood of flooding and landslides.

Ground Shaking

Ground shaking causes the most impact during an earthquake because it affects large areas and is the origin of many secondary effects associated with earthquakes. Ground shaking, which generally lasts 10 to 30 seconds in large earthquakes, is caused by the passage of seismic waves generated by earthquakes. Earthquake waves vary in both frequency and amplitude. High frequency low amplitude waves cause more damage to short stiff structures, were as low frequency high amplitude waves have a greater effect on tall (high-rise) structures. Ground shaking is measured using Peak Ground Acceleration (PGA). The PGA measures the rate in change of motion relative to the established rate of accelera-

tion do to gravity.

Local geologic conditions such as depth of sediment and sediment make up, affect earthquake waves. Deep valley sediments increase the frequency of seismic waves relative to bedrock. In general, ground shaking increases with increased thickness of sediments" (Eldredge 8).

Surface Fault Rupture

During a large earthquake fault movement may propagate along a fault plain to the surface, resulting in surface rupture along the fault plain. Most faults in the Bear River Region are normal (mountain building) faults with regards to movement, meaning the footwall of the fault moves upward and the hanging wall moves in a down direction. Thus faulting is on a vertical plain, which results in the formation of large fault scarps. In historic time surface fault rupture has only occurred once in Utah; the 1934 Hansel Valley earthquake in Box Elder County with a magnitude 6.6 produced 1.6 feet of vertical offset.

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

Surface fault rupture doesn't occur on a single distinct plain; instead it occurs over a zone often several hundred feet wide known as the zone of deformation. This zone of deformation occurs mainly on the down thrown side of the main fault trace. Tectonic subsidence, caused by antithetic faults moving in the opposite direction of the main fault, slide down hill on the main fault scarp creating grabens (down dropped blocks) within the zone of deformation.

Hintze described an "enigma" of Utah in that seismicity does not always coincide with surface fault scarps or faults (Geologic History of Utah, 1988). The epicenter of the earthquake may be miles away from the surface faulting.

Liquefaction

Soil liquefaction occurs when water-saturated cohesionless sandy soils are subject to ground shaking. When liquefaction occurs, soils behave more like a viscous liquid (quicksand) and lose their bearing capacity and shear strength. Two conditions must be met in order for soils to liquefy: (1) the soils must be susceptible to liquefaction (sandy, loose, water-saturated, soils typically between 0 and 30 feet below the ground surface) (2) ground shaking must be strong enough to cause susceptible soils to liquefy (lips). The loss of shear strength and bearing capacity due to liquefaction causes buildings to settle or tip and light buoyant structures such as buried storage tanks and empty swimming pools to float upward. Liquefaction can occur during earthquakes of magnitude 5.0 or greater.

Lateral Spread

Soils, once liquefied, can flow on slopes with angles of .5 to 5 percent this movement of liquefied soils is known as lateral spread. "The surficial soil layers break up and sections move independently, and are displaced laterally over a liquefied layer" (Eldredge 10). Liquefaction can cause damage in several ways, with lateral spreading being one of the most common. Displacement of three (3) or more feet may occur and be accompanied by ground cracking and vertical displacement. Lateral spreading causes roads, buildings, buried utilities, and any other buried or surface structure to be pulled apart.

Various Flooding Issues Related to Earthquakes

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

Seiches

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

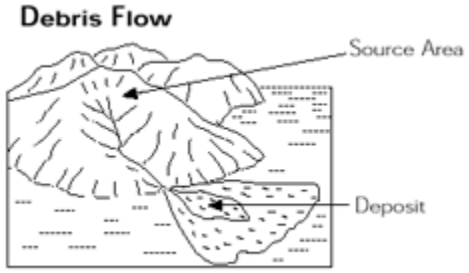
Landslides

Landslides are defined as, "…the movement of a mass of rock, debris, or earth down a slope (Cruden, 1991)." Landslides, often referred to as mass wasting or slope failure, are one of the most common natural disasters. Slope failures can vary considerably in shape, rate of movement, extent, and effect on surrounding areas. Slope failures are classified by their type of movement, and type of material. The types of movement are classified as falls, slides, topples, and flows. "The types of material include rock, debris (coarse grained soil) and earth (fine grained soil)" (Eldredge 17). "Types of slope failures then are identified as rock falls, rock slides, debris flows, debris slides, and so on" (Eldredge 17). Slope failures occur because of either an increase in the driving forces (weight of slope and slope gradient) or a decrease in the resisting forces (friction, or the strength of the material making up a slope). "Geology (rock type and structure), topography (slope gradient), water content, vegetative cover, and slope aspect are important factors of slope stability" (Eldredge 18).

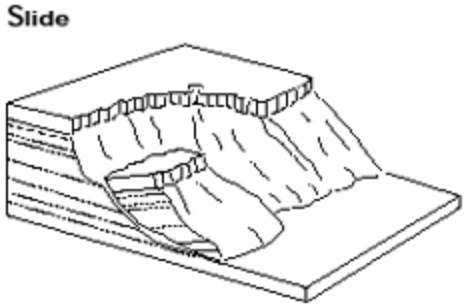
Certain landslides, such as debris flows can be exacerbated by flooding and water saturation. Landslides alone can be dangerous, but adding flooding to the situation can increase risk.

Three Common Types of Landslides in Utah

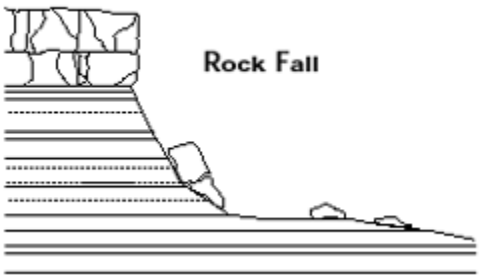
Debris flows consist of sediment-water mixtures that flow down a streambed or hillside, commonly depositing sediment at canyon mouths in fan like deposits know as alluvial fans.



Slides are down slope movements of soil or rock on slopes.



Rock falls consist of rock(s) falling from a cliff or cut slope and are very common in the canyon country of southern Utah.



Conditions That Make Slopes More Susceptible to Landslides

- Discontinuities: faults, joints, bedding surfaces.
- Massive Materials over soft materials.
- Orientations of dip slope: bedding plans that dip out of slope.

- Loose structure and roundness.
- Adding weight to the head of a slide area: rain, snow, landslides, mine waste piles, buildings, leaks from pipes, sewers, and canals, construction materials fill materials.
- Ground shaking: earthquakes or vibrations.
- Increase in lateral spread caused by mechanical weathering.
- Removal of lateral support.
- Human activities: cut and fill practices, quarries, mine pits, road cuts, lowering of reservoirs.
- Removing underlying support: under cutting of banks in a river.
- Increase in pore water pressure: snow melt, rain, and irrigation.
- Loss of cohesion.

Steep Slopes

According to the Utah Governor's Office of Planning and Budget (UGOPB), steep slopes are considered areas with a slope angle of 20% or greater over a minimum horizontal distance of 30 feet (UGOPB, n.d.). Areas with steep slopes put development and lands are risk for a variety of reasons. Steeper slopes can fail, leading to damaged property and resources. Risk to avalanche increases in areas with high angle slopes. Erosion is often associated with steep slopes as well, as displacement of soils and debris is more likely to occur with severe weather events. Steeper terrain is also increases wildfire risk in dry areas with adequate fuel loads. Complicating the risk associated with steep slopes is that mitigation can be more expensive, as construction and engineering solution cost more to implement.

Utah Governor's Office of Planning and Budget. (n.d.) *Steep Slopes.* Retrieved from http://www.planning.utah.gov/CriticalLands/Critical%20Lands%20PDFs/steepslopes.pdf

Wildfire

A wildfire is an uncontrolled fire spreading through vegetative fuel often exposing or consuming structures. Wildfires often begin unnoticed and spread quickly and are usually sighted by dense smoke. Wildfires are placed into two classifications Wildland and Urban-Wildland Interface.
Wildland fires are those occurring in an area where development is essentially nonexistent, except for roads, railroads, or power lines. Urban-Wildland Interface fire is a wildfire in a geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels.

When discussing wildfires it is important to remember that fires are part of a natural process and are needed to maintain a healthy ecosystem. Three basic elements are needed for a fire to occur (1) a heat source (2) oxygen and (3) fuel. Major ignition sources for wildfire are lightning and human causes such as arson, recreational activities, burning debris, and carelessness with fireworks. On average, 65 percent of all wild fires started in Utah can be attributed to human activities. Once a wildfire has started, vegetation, topography and weather are all conditions having an affect wildfire behavior.

Severe Weather

For the purpose of this mitigation plan the term severe weather is used to represent downbursts, lightening, heavy snowstorms, blizzards, avalanches, hail, and tornados.

Downbursts

A downburst is a severe localized wind, blasting from a thunderstorm. Depending on the size and location of these events, the destruction to property may be devastating. Downbursts fall into two categories by size. Microbursts cover and area less than 2.5 miles in diameter. Macrobursts cover an area with a diameter larger than 2.5 miles.

Lightening

During the development of a thunderstorm, the

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

Heavy Snowstorms

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

Blizzards

A blizzard is a snowstorm with sustained winds of 40 miles per hour (mph) or more or gusting winds up to at least 50 mph with heavy falling or blowing snow, persisting for one hour or more, temperatures of ten degrees Fahrenheit or colder and potentially life-threatening travel conditions. The definition includes the conditions under which dry snow, which has previously fallen, is whipped into the air and creates a diminution of visual range.

Hail Storms

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

Drought

Drought is a normal recurrent feature of climate, although many, in Utah, erroneously consider it a rare and random event. It occurs in virtually all-climatic zones, while its characteristics vary significantly from one region to another. Droughts, simple put, are cumulative hazards, which result from long periods of below normal precipitation. Drought is a temporary aberration and differs from aridity since the latter is restricted to low rainfall regions and is a permanent feature of climate.

The State of Utah uses the Palmer Drought Severity Index or (PDSI) to quantify the existence of a drought. Using the PDSI, drought is expressed as a negative number. Much of the basis, used by the State, to determine drought years, or drought periods, comes from the PDSI. In addition, the PDSI is used by the State Climatologist, the National Geophysical Data Center of NOAA, and the National Drought Mitigation Center.

For the most part droughts no longer affect the availability of drinking water, thus no longer place people's lives at risk, the same cannot be said for a person's livelihood. Numerous water projects throughout the state have placed enough water in storage to insure drinking water. Prolonged droughts have a significant effect on agricultural and agribusinesses, within the state dependent on irrigation water. Droughts also stress wildlife, and heighten the risk of wildfire.

Tornados and High Winds

According to the National Oceanic and Atmospheric Administration, a tornado is defined as a violently rotating column of air extending from a thunderstorm to the ground. While there have not been many destructive tornados in Utah's history, several have caused damages and casualties. The most

destructive of these was the Salt Lake City tornado on August 11, 1999. This F2 tornado caused $170 million in damages, injured 80 people, and caused one casualty (Alder et al., 2005).

In the Bear River Region, many of the tornados on record have been in mostly unpopulated areas, and have not caused any substantial damages or threats to life. However, history has shown the potential for tornados in the region, and communities should be aware of that potential, and the possible risk of a tornado touching down in their community.

Dam Failure

Dam failures result from the failure of a man made water impoundment structure, which often results in catastrophic down grade flooding. Dam failures are caused by one or a combination of the following: "breach from flooding or overtopping, ground shaking from earthquakes, settlement from liquefaction, slope failure, internal erosion from piping, failure of foundations and abutments, outlet leaks or failures, vegetation and rodents, poor construction, lack of maintenance and repair, misuse, improper operation, terrorism, or a combination of any of these" (Eldredge, 46). The Utah State Engineer has been charged with regulating non-federal dams in the State dams since 1919. "In the late 1970's Utah started its own Dam Safety Section within the State of Utah Engineers Office to administer all non-federal dams in response to the Federal Dam Safety Act (PL-92-367)" (Eldredge, 46).

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

Agricultural (Infestation, Disease, Livestock/Crop Loss)

Agricultural losses can be detrimental to residents and local economies in the Bear River Region. Insect infestation and other types of crop loss can not only affect a farmer's livelihood, but can lessen the amount of feed available for livestock, and lead to increased feed prices. Disease can also have extremely negative effects for the agricultural economy and residents livelihoods, where animals and crop populations can quickly be decimated. Where the Bear River Region relies quite substantially on agricultural incomes, these threats should be taken seriously and planned for accordingly.

Avalanche

An avalanche is a flow of snow down a steep slope. Generally, the snow is released due to a mechanical failure in structure of the snow, which often occurs after the deposit of multiple layers of snowfall (snowpack). There are three different types of avalanches, slab, powder snow, and wet snow, with slab avalanches being the most common in backcountry recreation accidents. Gravity can trigger avalanches, however they may also be triggers by other forces such as human use, such as skiing or snowmobiling. Large-scale avalanches often coincide with severe winter weather events.

Volcanic

According to the Natural Disasters Association, volcanoes are a "landform created by magma by the earth's interior." Volcanic eruptions have the potential to have a wide variety of impacts ranging from loss of life, to destruction of property, lands, and agricultural production. The closest active volcano to the region is Yellowstone, which could have a catastrophic effect on the region. Volcanic activity also creates several other hazards such as landslides,

tsunamis and debris flows. Another aspect of volcanic activity that poses a risk is geothermal activity. Geothermal activity has the potential to heat bodies of water used for recreation, as well as release dangerous gasses into the atmosphere.

Radon

According to the Environmental Protection Agency (EPA), radon "is an odorless, tasteless and invisible gas produced by the decay of naturally occurring uranium in soil and water" (EPA, 2014). Radon's only known risk is its ability to cause lung cancer in humans. Radon can exist in both indoor and outdoor areas. If an indoor space is found to have high levels of radon, the EPA recommends have the space repaired immediately to reduce levels to a safer level.

Source:
Environmental Protection Agency. (2014). *Radon*. Retrieved from http://www.epa.gov/radon/aboutus.html

Tsunami

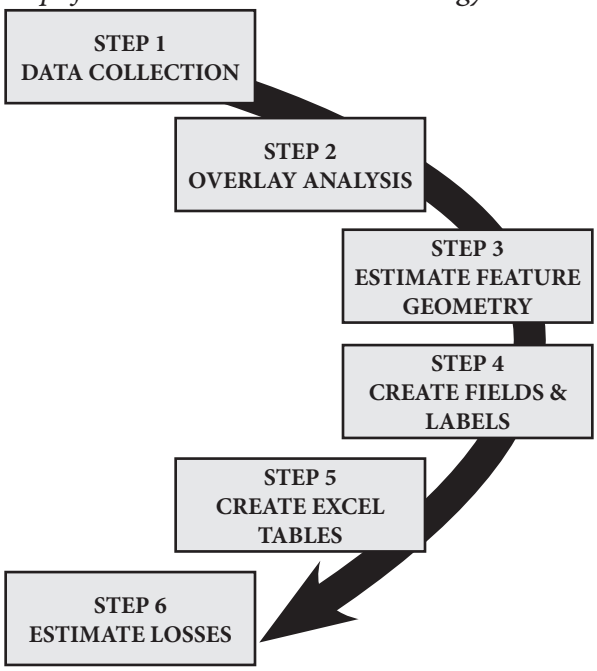
A tsunami is a set of waves, most commonly associated with the ocean that cause impacts to bodies of water and their surrounding shorelines. Tsunamis can also be associated with lakes in landlocked environments. Generally, three events trigger tsunamis, volcanoes, earthquakes and landslides. When faulting occurs near the surface during an earthquake, the resulting uplift or slippage creates a wave of water that grows as it reaches shore. Deposits of a landslide in a body of water can have a similar impacts, displacing water in an area and creating waves. Damage associated with tsunamis is a result of flooding from the corresponding waves.

APPENDIX C - DETAILED RISK ASSESSMENT METHODOLOGY

The risk assessment methodology for this plan includes several steps to gather, prepare, input, analyze, and export data to provide detailed information of the potential impacts of natural hazards in the Bear River Region. The planning team primarily utilized Geographic Information Systems (GIS) software, developed by Environmental System Research Institute (ESRI). This software enables the creation of large data set models in ArcGIS Modelbuilder to input and analyze spatial information. This feature of the software was relied on heavily for processing all spatial layers, and ultimately for generating the spatial information provided in the Community Risk Assessment tables in Chapters 5 - 7.

GIS analysis also included the use of Python scripting features of ArcGIS to automate the creation of fields and labeling each file with the necessary hazard, input, and jurisdiction information for the nearly 30,000 output files generated from this hazard overlay process. To help illustrate the methodology for this analysis, the process steps for generating the risk assessment findings of this report are shown below.

Steps for Risk Assessment Methodology



STEP 1 - DATA COLLECTION

Step one is used to identify all available spatial data to be included in the model. This includes all hazard types, jurisdictional boundaries, and input layers that were organized into the following five categories: Agriculture, Critical Facilities, Environmental/Recreational, Infrastructure, and Population. The list below identifies all the hazard and input layers that were identified and grouped by their respective category. See Appendix G for a complete list of layers and data sources/ descriptions.

HAZARD LAYERS

- Dam Failure
- Earthquake
- Flood
- Landslides
- Liquefaction (moderate-high to high risk)
- Poorly Drained Soils
- Steep Slopes (20% slope or higher)
- Wildfire (moderate to high risk)

INPUT LAYERS

Agriculture

- Agricultural Land (producing)
- Century Farms
- Farmland of Statewide Importance (soils)
- Grazing Lands (permits)
- Historic Barns

Critical Facilities

- Airports
- Bridges
- Broadband Anchors
- Correctional Facilities
- Dams
- EMS/Fire Stations
- Health Care Facilities
- Law Enforcement Offices
- Places of Worship
- Public Facilities
- Schools

Environmental/Recreational

- Lakes
- Local Parks
- Outdoor Amenities
- Riparian Areas
- Streams
- Trails
- Wetlands

Infrastructure

- Canals
- Electrical Lines
- Natural Gas Lines
- Railroads
- Roads

Population

- Commercial Parcels
- Population Density
- Residential Parcels

After identifying all available spatial data, the planning team worked to prepare all the hazard layers for analysis. This was based on meetings with technical experts in their respective fields to ensure data accuracy, and also to utilize any categories or ranking of the hazard data that is relevant and most beneficial to assessing risks to people and resources in the region.

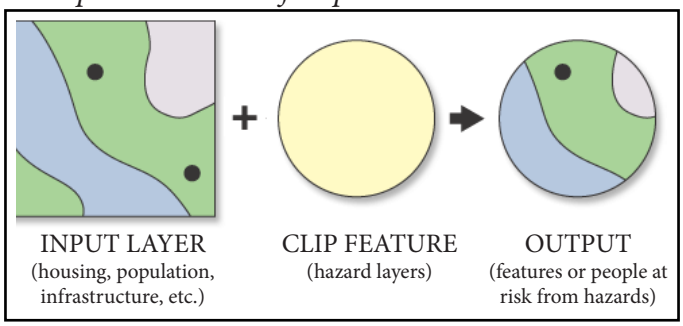
Once all available data was identified and processed, the planning team created the remaining infrastructure layers through digitization in ArcGIS. This included the geocoding of pdf maps for all Questar Natural Gas lines in the region. Ruby Pipeline was also digitized by observing ground disturbance through the use of aerial imagery provided by the National Agriculture Imagery Program (NAIP).

STEP 2 - OVERLAY ANALYSIS

After preparing and organizing spatial layers by category, models were developed to overlay all of the hazard layers with each of the input layers. This was done first at the county level, then at the municipal level.

This process is accomplished with the Clip (Data Management) tool in ArcGIS. The tool extracts all features of a layer that are within the features of another layer - similar to a cookie cutter. Using this tool, each input layer was clipped by individual hazard layer, then clipped by county, and lastly by jurisdictional boundary.

Example Illustration of Clip Tool



The use of ArcGIS Modelbuilder greatly reduced the amount of time necessary to process such a large number of hazard and input layers. As a result of all the models ran for this plan update, there were around 27,342 files that were created from running the clip tool for all jurisdictions in the region.

Number of Files Generated by Overlay Models

7 Hazards x 31 Input layers = 217 Output files

217 Output files x 3 Counties = 651 Output files

651 Output files x 42 Jurisdictions = 27,342 Output files

STEP 3 - ESTIMATE FEATURE GEOMETRIES

Once all the overlay models are complete, the resulting output files contain one of three types of geometric features that are either point, line, or polygon. Point features for example include mostly structures or facilities such as airports, bridges, or schools. Line features include things like roads, railroad, or utility lines. And lastly, polygon features include areas such as agricultural land, housing or commercial parcels, wetlands, or parks.

Using the feature geometry of each line or polygon output file, distance or area calculations can be estimated within ArcGIS. This information is added to the attribute table of each layer in order to identify the total linear miles or acres of input

features impacted by hazards. This information is then used later to assign dollar values to each feature impacted by natural hazards.

STEP 4 - CREATE OUTPUT FILE FIELDS & LABELS

With the large number of output files created through the modelling process, the ability to easily sort feature information is critical to estimating losses and organizing data by jurisdiction. This required the addition of four fields in the attribute table that help identify:

1. Input Layer - critical facility, road, parcel, etc.
2. Hazard Layer - flood, slope, etc.
3. Jurisdiction - location of hazard impacts
4. Feature Geometry - miles or acres of features impacted by hazards

Due to the large number of files requiring additional attribute fields and labels, Python programming scripts were written in the Pythonwin application to process all remaining files quickly and uniformly. This scripting feature allowed for the labeling of the final output files, and also for deleting any empty shapefiles created as a result of the modelling process where no overlap occurred between hazard and input layers.

STEP 5 - CREATE EXCEL TABLES

With all the models and scripts complete, files were merged according to geometry (point, line, or polygon) and then converted from shapefiles to Excel spreadsheets using the Merge and Table to Excel tools in ArcGIS Toolbox. This was done to minimize the number of ArcGIS licenses needed to complete the value and loss estimates by BRAG staff, and also for the sort and summarize functions available in Excel.

With all the modelling results in spreadsheet format, the planning team could easily assign dollar values to infrastructure input layer losses and quickly summarize those losses by hazard, input layer, and jurisdiction.

STEP 6 - ESTIMATE LOSSES

Dollar values for infrastructure losses were estimated using the following data sources (listed by layer):

Linear Infrastructure Cost Estimates

CANALS	
Cost Estimate	$1.5 million/mile
Source	Bob Fotheringham, Cache County and regional project cost estimates, 2015.
ELECTRICAL LINES	
Cost Estimate	$127,000/mile
Source	Logan Light & Power, 2015.
NATURAL GAS LINES	
Cost Estimate	$1.4 million/mile. Derived by averaging linear foot replacement costs estimated for gas lines ranging from 2”-20”, then multiplying the average by 5280 feet.
Source	Questar Gas, 2015.
RAILROADS	
Cost Estimate	$1.5 million/mile
Source	BRAG Pre-Disaster Hazard Mitigation Plan, 2009.
ROADS	
Cost Estimate	$525,000/mile. Derived with base replacement cost of $350,000/mile with 50% added for unkowns and engineering/inspection.
Source	Bill Gilson, Box Elder County Road Supervisor & Josh Runhaar, Cache County Director of Development Services, 2015.

LETTER FROM QUESTAR GAS REGARDING NATURAL GAS LINE REPLACEMENT COSTS

Questar Gas
1140 West 200 South
P.O. Box 45360
Salt Lake City, UT 84145-0360
Tel 801-324-3539

Dan MacDonald
Operations Engineering

May 27, 2015

Zach Maughan
Bear River Association of Governments
170 N Main
Logan, Utah 84321

To whom it may concern,

In an email dated April 27, 2015, Bear River Association of Governments requested the replacement costs of Questar Gas pipeline facilities in Box Elder, Cache and Rich Counties. Below you will find tables containing the approximate replacement costs per linear foot for both distribution main (IHP) and high pressure main (HP). Any costs for repair or replacement will depend upon the nature of the required repairs or replacement. The estimated costs provided here are based upon the cost of material and labor in May of 2015. Moreover, the scope, timing and nature of an actual project would govern the actual costs and, without additional information, Questar Gas cannot provide more accurate estimates. Accordingly, Questar Gas does not warrant the reliability of this information for any particular purpose and offers it solely for informational purposes.

IHP	
Diameter	$/linear foot
<=3"	$ 60
4"	$ 85
6"	$ 130
8"	$ 160
10"	$ 185
12"	$ 210

HP	
Diameter	$/linear foot
2"	$ 150
3"	$ 165
4"	$ 175
6"	$ 205
8"	$ 240
10"	$ 275
12"	$ 320
20"	$ 590

Sincerely,
Dan MacDonald

APPENDIX D - LOCAL MITIGATION STRATEGY SURVEY AND COMMUNITY SUMMARIES

PLEASE COMPLETE AND RETURN TO BRAG BY *FRIDAY, MARCH 27, 2015

Mail: *Attn: Zac Covington, 170 N. Main, Logan UT 84321*

Email: *zacc@brag.utah.gov*

Fax: *(435)752-6962*

(PLEASE CONTACT ZAC COVINGTON FOR HELP OR WITH QUESTIONS AT 435.713.1423 OR *zacc@brag.utah.gov*)

Jurisdiction Name: _____

Completed by: _____

Address: _____

Phone: _____

Email: _____

RISK ASSESSMENT SECTION

1. Does your community participate in the National Flood Insurance Program (NFIP)?

   Yes: ____ No: ____ I don't know: ____

2. What existing or potential natural hazards threaten your community? (ex. drought, earthquake, flooding, landslide, wildfire, dam failure, soil, etc.). Note: You will be asked to elaborate on these further in the Mitigation Strategies Section of this survey.

3. Have there been natural hazard events in your community since November of 2009? If so, please list the event(s), the severity of the event(s) (damage or intensity), and the date (if known):

4. Do you have any maps, documents, or plans related to natural hazards for your community? Please describe:

5. Does your city/town currently have zoning or ordinances that address natural hazards and/or regulate construction in potentially hazardous areas?

   Yes: ____ No: ____ I don't know: ____ If yes, please describe:

6. Are you aware of future residential or commercial developments that could be affected by natural hazards? If so, please describe:

MITIGATION STRATEGIES SECTION

7. BRAG staff, with the assistance of County working groups, has been analyzing potential risks from natural hazards to your community. **THE FOLLOWING NATURAL HAZARDS HAVE BEEN IDENTIFIED AS A POTENTIAL RISK TO YOUR COMMUNITY (SEE CHECKED HAZARDS). Please check any other hazards you are aware of in your community.**

Natural Hazards identified:

***SURVEY SUMMARY CODES**

- **1** ☐ ▪ FLOOD
- **2** ☐ ▪ EARTHQUAKE
  - **2a** ☐ ○ FAULTS
  - **2b** ☐ ○ LIQUEFACTION
- **3** ☐ ▪ WILDFIRE
- **4** ☐ ▪ LANDSLIDES
- **5** ☐ ▪ DAM FAILURE
- **6** ☐ ▪ PROBLEM SOILS
- **7** ☐ ▪ DROUGHT(all jurisdictions, optional)
- **8** ☐ ▪ SEVERE WEATHER (all jurisdictions, optional)
- **9** ☐ ▪ AVALANCHE
- **10** ☐ ▪ TORNADO
- **11** ☐ ▪ TSUNAMI
- **12** ☐ ▪ VOLCANIC
- **13** ☐ ▪ RADON
- **14** ☐ ▪ STEEP SLOPES

8. ***Enclosed in this packet is a chart showing mitigation strategies for jurisdictions in your county from the 2009 Pre-Disaster Mitigation Plan. Please provide comments below regarding which strategies were implemented, those that were not implemented, and a brief explanation if they were not. You may also write comments/notes on the chart and mail it to BRAG with this survey.**

9. Below are blank mitigation strategy charts for you to fill in for each of the hazards highlighted above. Please enter the hazard in the first column, and fill in each of the following columns related to that hazard. **Each community must include a goal for protecting existing residents and property, and a goal for protecting future residents and property from the hazard.** If your community participates in the National Flood Insurance Program (NFIP), you must also include a separate action related to NFIP compliance for flood hazards. Also included in this packet is a copy of the document, "Mitigation Ideas," written by the Federal Emergency Management Agency (FEMA) to assist you in creating mitigation strategies. Below is an example for your reference:

HAZARD: _Wildfire_____	
GOAL 1: PROTECT CURRENT RESIDENTS AND PROPERTY	
Action	Update city ordinances to require defensive space and fire resistant vegetation surrounding homes located in wildland/urban interface.
Action (For NFIP Compliance, if Applicable)	N/A
Priority (High, Medium, or Low)	High
Timeframe (Year)	2016
Potential Funding Sources	City, Utah Dept. of Public Safety/FEMA
Estimated Cost	$2,000
Resources	Utah FFSL, County
GOAL 2: PROTECT FUTURE RESIDENTS AND PROPERTY	
Action	Update city ordinances to require sprinklers in all new homes located in the wildland/urban interface.
Action (For NFIP Compliance, if Applicable)	N/A
Priority (High, Medium, or Low)	High
Timeframe (Year)	2016
Potential Funding Sources	City, Utah Dept. of Public Safety/FEMA
Estimated Cost	$1,500
Resources	Utah FFSL, County

HAZARD: _____	
GOAL 1: PROTECT CURRENT RESIDENTS AND PROPERTY	
Action	
Action (For NFIP Compliance, if Applicable)	
Priority (High, Medium, or Low)	

***SEE PAGE 2 OF SURVEY FOR QUESTION 7 SURVEY SUMMARY CODES**

BEAR RIVER CITY MITIGATION SURVEY SUMMARY	
Jurisdiction	Bear River City
Completed by	Carol Andreasen
Address	po box 160, Bear River City, UT 84301
Phone	435-279-9047
Email	bearrivercity@frontiernet.net
Q1	Y
Q2	Earthquake, drought, wildfire, flooding
Q3	No
Q4	Box elder county hazard mapping (critical facilities, flood zone, wildfire, landslide, faults, liquefaction, and Pre Disaster mitigation plan of Bear river region
Q5	Yes- zoning regulations for sensitive lands
Q6	No
Q7	1,2,2b,3,4,5,
Q8	They are unaware of any strategies completed

BOX ELDER COUNTY MITIGATION SURVEY SUMMARY	
Jurisdiction	Box Elder County
Completed by	Kevin Potter and Marsha Andersen
Address	PO Box 888 Brigham City, UT 84302
Phone	(Marsha) 435-734-3823 (Kevin) 435-734-3814
Email	mkandersen@boxeldercounty.org, kbpotter@boxeldercounty.org
Q1	Yes
Q2	Drought, earthquake, flooding, landslide, wildfire, dam failure, soil.
Q3	No
Q4	Emergency Operations Plan, and BRAG Pre Mitigation Disaster Plan, PacifiCorp EAP
Q5	Yes
Q6	One development has been allowed next to the Bear River and there is concern that there will be more.
Q7	1,2,2a,2b,3,4,5,6,7,8,9,13,14
Q8	

BRIGHAM CITY MITIGATION SURVEY SUMMARY	
Jurisdiction	Brigham City
Completed by	Derek Oyler
Address	PO Box 1005
Phone	435-226-1404
Email	doyler@brighamcity.utah.gov
Q1	Yes
Q2	Drought, earthquakes, flooding, landslides, wildfires, Mantua dam failure, liquefaction, slope, and also soil erosion.
Q3	Box Elder Creek flood in spring of 2011. Damaged homes and infrastructure occurred. A small rock slide in Mantua- fall 2014 damaged penstock line and caused an accident on roadway.
Q4	Brigham City has adopted a new FEMA flood map in 2009 for the box elder creek areas. Brigham City does have a flood mapping for the box elder creek. We also have flood mapping for Mantua dam failure. Brigham City does have a penstock line failure inundation map. Brigham City has a cutler dam failure inundation map. Brigham City has an active emergency operations plan for all types of hazards. Geological surveys have been completed at flat bottom canyon and the 2nd 5 million gallon water tank.
Q5	Yes
Q6	Yes, valley floors have liquefaction hazards. Brigham City has future development areas in wild land interface areas as well as steep slopes.
Q7	1,2,2a,2b,3,4,5,6,7,8,9,13,14
Q8	Work with the Utah Division of Water Rights and other groups to utilize Emergency Action Plans on a local level. Develop or update an environmental safety zone - with identified hazard areas, disclosure/education, hazard maps. Wildfire Defense Program. Perform seismic upgrades to existing Brigham City Library to meet current building codes. Protect 36" Penstock water line coming from Mantua to Brigham City by burying it. Trim trees to keep limbs clear of electrical power system. Reconcile current development with soon to be adopted FEMA floodplain maps for Box Elder County for NFIP communities. For non-NFIP communities, talk with Utah ESHS about the benefits of NFIP.

ELWOOD TOWN MITIGATION SURVEY SUMMARY	
Jurisdiction	Elwood Town
Completed by	Keenen Nelson and Jon Howard
Address	5235 W 8800 N
Phone	435-257-5518
Email	jhoward @elwoodtown.com
Q1	N
Q2	earthquake, wildfire, flooding, landslide
Q3	flooding of the sewer around 2010
Q4	N
Q5	They are not sure
Q6	N
Q7	1,2,2b,3,4,5
Q8	Left Blank

PORTAGE TOWN MITIGATION SURVEY SUMMARY	
Jurisdiction	Portage
Completed by	Tom Davis
Address	PO box 4, Portage UT 84331
Phone	435-279-3119
Email	tomdozer@hotmail.com
Q1	N
Q2	See list
Q3	In 2013 wildfire in west mountain (state Fire). On 8800 W in town, Rose Lane (2011). Wind storms of 2013 -14 blew lots of shingles off homes.
Q4	No
Q5	Y- currently updating General plan-
Q6	South of town, future homes are being built in a canyon. Slope, Wildfire, and possible flooding of a riparian region at the bottom of the canyon could happen in the future.
Q7	1,2,2a,2b,3,7,8,13,14,
Q8	

HONEYVILLE CITY MITIGATION SURVEY SUMMARY	
Jurisdiction	Honeyville City
Completed by	David Forsgren, Mayor
Address	5990 No. Hwy 38
Phone	435-279-4485
Email	dlforsgren@hotmail.com
Q1	Y
Q2	Earthquake,Faults,Drought,Dam Failure, Landslides,Steep Slopes, Liquefaction, Wildfires.
Q3	N
Q4	N
Q5	NO- but they do have drawings and studies showing known underground faults, so we can caution developers of those dangers.
Q6	N
Q7	1,2,2a,2b,4,5,14
Q8	Left Blank

HOWELL TOWN MITIGATION SURVEY SUMMARY	
Jurisdiction	Howell Town
Completed by	Brag Staff
Address	P.O. Box 45 Howell, UT, 84316
Phone	435-471-2378
Email	
Q1	
Q2	
Q3	
Q4	
Q5	
Q6	
Q7	3,5,14
Q8	

PERRY CITY MITIGATION SURVEY SUMMARY	
Jurisdiction	Perry City
Completed by	Greg Westfall
Address	80 W 50 S
Phone	435-723-6461
Email	greg.westfall@perrycity.org
Q1	Yes
Q2	Flood, Earthquake, wildfire, landslides, dam failure, drought, severe weather, steep slopes.
Q3	
Q4	Yes, FEMA flood control maps
Q5	Yes, hillside protection ordinance
Q6	Yes, most of the new development is on the east bench on a hillside.
Q7	1,2,2a,2b,3,4,5,7,8,14
Q8	

PLYMOUTH TOWN MITIGATION SURVEY SUMMARY	
Jurisdiction	Plymouth Town
Completed by	Sharon B Hess/ Secretary
Address	20120 N 5200 W/ PO box 130
Phone	435-239-7278
Email	plytown@digis.net
Q1	No
Q2	Flood, Earthquake, Wildfires, Landslides, Steep slope and dam failure. We however are not aware of any potential dam failing hazards in our community.
Q3	No
Q4	No
Q5	Yes- natural klater klays. Those areas varying in width along streams, creeks, gully, springs, or washes which are natural drainage channels, as determined by the building inspector and in which areas no buildings shall be constructed.
Q6	No
Q7	1,2,2a,2b,3,4,5,14
Q8	This was not done. Our past mayor could not remember why.

SNOWVILLE TOWN MITIGATION SURVEY SUMMARY	
Jurisdiction	Snowville Town
Completed by	Tammie Morgan
Address	20 West Main Snowville, UT 84336
Phone	435-872-8501
Email	snowvilletown@frontiernet.net
Q1	N
Q2	Wildfire, drought, strong winds, dam failure, earthquake
Q3	None
Q4	No
Q5	No
Q6	No
Q7	2,3,5,7,8,13
Q8	Left Blank

TREMONTON CITY MITIGATION SURVEY SUMMARY	
Jurisdiction	Tremonton City
Completed by	Jim Hess
Address	102 S Tremont St
Phone	435-452-1070
Email	jhess@tremontoncity.com
Q1	Yes
Q2	Drought, earthquake, flooding, wildfire, dam failure
Q3	High winds, medium severity, minimal damage on several occurrences.
Q4	Wildfire WUI designation and fire break map. CWPP Wildfire plan for northeast Tremonton. NFIP flood plane map. Ordinance 11-04 flood damage prevention overlay zoning district adopt NFIP. Zoning Ordinances Chapter 1.11 and 1.12 Sensitive Area Zone establishment and NFIP ordinance.
Q5	Yes
Q6	Earthquake is a potential hazard for the entire community. Building along the malad river floodplain. Continued development in the northwest area of town for wildfires.
Q7	1,2,2b,3.5,7,8,14
Q8	Wildfire protection: Coop Wildfire Plan (CWPP) was established Feb 28, 2013 involving residents of Tremonton, Garland, and Box Elder County (unincorporated). Resulting from this agreement and in cooperation with FFSL, US Dept. of Agriculture, Box Elder County, Tremonton, and Garland Fire Departments, a fire break was created above affected homes to protect both residential areas and grazing land. Matching funds included equipment and labor costs by the fire departments, county roads and sheriff's dept. donated seeds from US Dept. of Agriculture and preparedness measures from residents.

WILLARD CITY MITIGATION SURVEY SUMMARY	
Jurisdiction	Willard City
Completed by	Bryce Wheelwright
Address	80 W 50 S
Phone	435-734-9881
Email	willardcity@comcast.net
Q1	We have their risk assessment section already
Q2	
Q3	
Q4	
Q5	
Q6	Yes- there are two planned developments. 150 units on the east side of hwy 89 and 200+ on the west side of hwy 89 at about 600 South and possible annexation of South Willard into Willard City
Q7	1,2,2a,2b,3,4,7,8,14
Q8	Left Blank

MANTUA TOWN MITIGATION SURVEY SUMMARY	
Jurisdiction	Mantua Town
Completed by	Kim Birch
Address	207 West 600 North Mantua, UT
Phone	435-720-1248
Email	kimbirch@live.com
Q1	Y
Q2	Earthquake, flooding, landslide, wildfire, dam failure
Q3	No
Q4	No
Q5	No
Q6	No
Q7	1,2,3,4,5
Q8	Left Blank

CACHE COUNTY MITIGATION SURVEY SUMMARY	
Jurisdiction	Cache County
Completed by	Rick Williams
Address	1225 West 200 North Logan, Utah 84321
Phone	435-755-1059
Email	rwilliams@cachesheriff.com
Q1	Yes
Q2	Drought, earthquake, flooding, landslide, wildfire, dam failure, soil.
Q3	Flooding on the Logan and Blacksmith Fork Rivers in 2011.
Q4	County Hazard Mitigation Plan
Q5	Yes
Q6	No
Q7	1,2,2a,2b,3,4,5,14
Q8	

CLARKSTON TOWN MITIGATION SURVEY SUMMARY	
Jurisdiction	Clarkston
Completed by	Richie Calderwood
Address	po box 63 Clarkston UT 84305
Phone	435-994-1067
Email	rcalderwood@batc.edu
Q1	Y
Q2	Left Blank
Q3	Flood with low severity or damage. Quick warming over frozen ground during January.
Q4	left blank
Q5	They are not sure
Q6	Left Blank
Q7	1,2,2a,2b,3,14
Q8	Left Blank

CORNISH TOWN MITIGATION SURVEY SUMMARY	
Jurisdiction	Cornish
Completed by	Joe Hansen
Address	12575 N 4800 W
Phone	435-760-6740
Email	cornishmayor@yahoo.com
Q1	N
Q2	
Q3	No
Q4	No
Q5	They are not sure
Q6	No
Q7	1,2,2a,2b,3,8,14
Q8	

HYDE PARK CITY MITIGATION SURVEY SUMMARY	
Jurisdiction	Hyde Park
Completed by	Sharidean Flint
Address	950 E 300 N
Phone	435-563-9576
Email	sharideanflint@gmail.com
Q1	Y
Q2	Earthquake, flood, wildfire
Q3	No
Q4	They are on file with the County.
Q5	Yes- no building on steep slopes in ordinances. Above 5,100 feet in elevation property owners must mow weeds and grasses.
Q6	No
Q7	1,2,2a,3,4,14
Q8	

HYRUM CITY MITIGATION SURVEY SUMMARY	
Jurisdiction	Hyrum City
Completed by	Ron Salvesen
Address	83 West Main
Phone	435-245-6033
Email	rsalvesen@hyrumcity.com
Q1	Yes
Q2	
Q3	
Q4	
Q5	
Q6	
Q7	1,2,2a,2b,3,4,5,14
Q8	

LEWISTON CITY MITIGATION SURVEY SUMMARY	
Jurisdiction	Lewiston City
Completed by	Julie T. Bergeson
Address	29 S Main PO Box 36
Phone	435-258-2141
Email	jbergeson@lewiston-ut.org
Q1	Y
Q2	
Q3	No
Q4	Yes, ordinance title 12 flood control rewritten and updated in 2011 to meet current FEMA and National Flood Insurance Act criteria.
Q5	Yes, Ordinance title 12 flood control
Q6	No
Q7	1,2,2b,3
Q8	

LOGAN CITY MITIGATION SURVEY SUMMARY	
Jurisdiction	Logan City
Completed by	Mark Nelson
Address	290 N 100 W
Phone	435-716-9151
Email	mark.nielsen@loganutah.org
Q1	y
Q2	D,E,F,L,W,DF,SW
Q3	Spring 2011 flooding.
Q4	Y: city has a municipal counter disaster plan. It includes a discussion of natural disasters and its associated risks.
Q5	Y- are zoning includes faults, high water tables, steep slopes, liquefaction, flood planes
Q6	N
Q7	1,2,2a,2b,3,4,5,14
Q8	Improvements were made to 600 W bridge to allow more flow across roadway and raised roadway grade. To prevent overtopping road during floods. Service center seismic retrofit is no longer a strategy due to high cost and alternative buildings for employees. The placement of water line from 700 N 800 E to 400 N 700 E is not as critical with current water operating procedures. additional water storage is still ongoing for the next 5 years.

MILLVILLE CITY MITIGATION SURVEY SUMMARY	
Jurisdiction	Mendon City
Completed by	Ed Buist
Address	P.O. Box 70 Mendon, UT 84325
Phone	435-770-9824
Email	ed.buist@usu.edu
Q1	Y
Q2	Flooding
Q3	January 2012 flooding event from snow run off and frozen ground resulting in sheeting water from above town down through town. Ditches and canals could not handle the extra water which resulted in several flooded basements, road sides being washed out with considerable road damage.
Q4	Disaster plans include citizen notification and cert team gathering to help city in any way needed.
Q5	No
Q6	No
Q7	1,2,2a,3,14
Q8	

MILLVILLE CITY MITIGATION SURVEY SUMMARY	
Jurisdiction	Millville City
Completed by	Harry Meadows
Address	p.o. box 308, Millville, UT 84326
Phone	435-881-2977
Email	hwmeadows@comcast.net
Q1	We have their risk assessment section already
Q2	
Q3	
Q4	
Q5	
Q6	No
Q7	1,2,2a,2b,3,4,14
Q8	Flood- Currently do not want to get involved with canal companies. For future they are working towards that goal--- Wildfire- done with strategy- For future there is very little building in that area----- Earthquake- current is done. Future is done.

NIBLEY CITY MITIGATION SURVEY SUMMARY	
Jurisdiction	Nibley City
Completed by	David Zook
Address	455 W 3200 S
Phone	435-752-0431
Email	
Q1	Y
Q2	We have their risk assessment section already
Q3	
Q4	
Q5	
Q6	
Q7	1,2,2b,3,4,5,6,14
Q8	

NORTH LOGAN CITY MITIGATION SURVEY SUMMARY	
Jurisdiction	North Logan
Completed by	Cordell Batt
Address	
Phone	
Email	
Q1	Yes
Q2	
Q3	Residential homes flooded, spring 2011. Flooding west of ag fields.
Q4	n
Q5	y-Geologic, slope, flood, wildfire ordinances
Q6	Canyon Gates subdivision - 250 new homes
Q7	1,2,22,2b,3,4,6,7,8,13,14
Q8	Earthquake training (Utah Shakeout). Working with canal companies. Wildfire Development plan. Geotechnical Requirements. Using flood areas as recreational opportunities.

PARADISE TOWN MITIGATION SURVEY SUMMARY	
Jurisdiction	Paradise
Completed by	
Address	9035 S 100 W
Phone	435-245-6737
Email	mayor@paradise.utah.gov
Q1	We have their risk assessment section already
Q2	
Q3	
Q4	
Q5	
Q6	
Q7	1,2,2b,3,5,14
Q8	

PROVIDENCE CITY MITIGATION SURVEY SUMMARY	
Jurisdiction	Providence City
Completed by	Randy L. Eck
Address	15 South Main Street Providence UT, 84332
Phone	435-753-0313 ext-21
Email	reck@providence.utah.gov
Q1	Y
Q2	Drought, Earthquake, Flooding, Landslide, Wildfire
Q3	Yes, there was flooding in 2011, and a wildfire in 2009
Q4	Yes, hazard zones in our master plan. We also have a map of Spring Creek that runs through the city. The flood that happened was in spring creek.
Q5	Yes
Q6	Yes, there is potential development on the east side of the city that lies in the foothills. Damage from flooding, landslide, and wildfire is possible.
Q7	1,2,2a,3,4,7,8,9,14
Q8	2009 plans did not include flooding of Spring Creek from run off.

RICHMOND CITY MITIGATION SURVEY SUMMARY	
Jurisdiction	Richmond City
Completed by	Marlowe C. Adkins
Address	PO Box 9 6 West Main Richmond, UT 84333
Phone	435-258-2092
Email	richmondcity@richmond-utah.com
Q1	Yes
Q2	Earthquake (1962), flooding (2004, 2006), lesser potential for wildfire and steep slope issues.
Q3	None since November 2009
Q4	Maps contained within the Richmond City General Plan dated 2013
Q5	No
Q6	None have been presented by developers or potential developers to date.
Q7	1,2,2a,2b,3,14
Q8	Essentially incorporated the bulk of the strategies used in the 2009 program, but did make some minor changes re: cities vs.. Richmond irrigation company for flooding.

SMITHFIELD CITY MITIGATION SURVEY SUMMARY	
Jurisdiction	Smithfield City
Completed by	Craig Giles
Address	96 South Main Street
Phone	435-792-7997
Email	cgiles@smithfieldcity.org
Q1	Y
Q2	Drought, Earthquake, Flooding, Landslide, and Wildfire
Q3	None
Q4	Yes, our general plan addresses natural and cultural resources such as: hillside and geologic hazards, hydrology, floodplains, and wetlands. We also have a geologic hazards map identifying hazards such as floodplains, slopes, and groundwater.
Q5	Yes
Q6	None
Q7	1,2,2a,3,4,7,
Q8	Smithfield has identified the floodplain running through the city, and have taken steps through the cities ordinance and general plan to minimize the effects of flooding. Smithfield works through LDS stakes with emergency preparedness, nothing else on the plan has been addressed.

TRENTON TOWN MITIGATION SURVEY SUMMARY	
Jurisdiction	Trenton town
Completed by	Ed Cottle
Address	1207 S 400 E
Phone	435-563-3501
Email	janet@teamwifi.net
Q1	N
Q2	earthquake
Q3	No
Q4	No
Q5	They are not sure
Q6	N
Q7	1,2,2a,2b,3,14
Q8	They listed that they implemented earthquake, landslide, and wildfire.

WELLSVILLE CITY MITIGATION SURVEY SUMMARY	
Jurisdiction	Wellsville City
Completed by	Don Hartle
Address	box 6. 75 E main Wellsville UT, 84339
Phone	435-245-3686
Email	wellsville@comcast.net
Q1	y
Q2	dam fail, faults, flooding, landslides, slope, wildfire
Q3	2011 flooding due to rain on frozen ground
Q4	Fema and Pictures
Q5	Y-
Q6	Left Blank
Q7	1,2,2a,2b,3,4,5,14
Q8	Left Blank

GARDEN CITY MITIGATION SURVEY SUMMARY	
Jurisdiction	Garden City
Completed by	Mike Wahlberg/ fire chief
Address	145 W Logan Road
Phone	435-994-2460
Email	gardencityfiredistrict@gmail.com
Q1	N
Q2	earthquake, landslides, wildfire/urban interface, flooding, extreme weather.
Q3	They have wildfires yearly, and moderate flooding happened in spring 2011. Moderate damage to residential homes.
Q4	Yes- county emergency plan, and urban/wild land interface evacuation maps
Q5	They are not sure
Q6	Yes- the Shundahai subdivision development is in a steep high fire potential wildfire prone hillside. Provisions are already being made to take that danger into consideration.
Q7	1,2,2a,2b,3,4,8
Q8	They have noticed no such plans or mitigation strategies

LAKETOWN MITIGATION SURVEY SUMMARY	
Jurisdiction	Laketown
Completed by	Melissa Johnson
Address	
Phone	435-946-9000
Email	(clerk@laketownutah.com) or (randolph@allwest.net)
Q1	Y
Q2	
Q3	Add wildlife to their risks. They mentioned a problem with deer eating many of the residents vegetation.
Q4	None- possibly zoning?
Q5	No
Q6	Yes- there is one residential home being built on the hill currently.
Q7	2,2a,3,4,5,6,13,14
Q8	

RANDOLPH TOWN MITIGATION SURVEY SUMMARY	
Jurisdiction	Randolph Town
Completed by	Lyn Weston
Address	
Phone	
Email	
Q1	We have their risk assessment section already
Q2	
Q3	
Q4	
Q5	
Q6	They just listed earthquake and wildfire but no development
Q7	2,,3,5,6,14
Q8	Left Blank

RICH COUNTY MITIGATION SURVEY SUMMARY	
Jurisdiction	Rich County
Completed by	Bryce Nielson
Address	Box 54
Phone	Garden City
Email	cisco@cut.net
Q1	No
Q2	Wildfire, weather cells, flooding, landslide, weather earthquake, dam failure.
Q3	
Q4	Previous pre-mitigation plan 2009
Q5	No
Q6	No
Q7	1,2,2a,3,4,5,8,14
Q8	

WOODRUFF MITIGATION SURVEY SUMMARY	
Jurisdiction	Woodruff
Completed by	Bo Holman
Address	Woodruff Town Hall 195 S. Main Woodruff, UT 84086
Phone	435- 793-4201
Email	N/A
Q1	Yes
Q2	Dam Failure, Problem Soils
Q3	In the spring of 2011 there was a quick warm spring and all the runoff flooded some parts of Woodruff.
Q4	N/A
Q5	N/A
Q6	There is currently one home being built.
Q7	5,6
Q8	They are currently filing for grants for underground pipes.

APPENDIX E - U.S. ARMY CORPS OF ENGINEERS: FLOOD HAZARD IDENTIFICATION STUDY FOR THE BEAR RIVER DISTRICT

Flood Hazard Identification Study
Bear River Association of Governments

By:
United States Army Corps of Engineers
Utah Division of Emergency Services and Homeland Security

September 9, 2003

Introduction
The US Army Corps of Engineers Sacramento District completed this flood hazard identification study through a contract with the seven Associations of Governments. Funding was provided under the USACE Planning Assistance to States Program (Section 22). The intent of the study is to aid in detailing natural hazards associated with fluvial process for entities within each AOG currently unmapped as part of the National Flood Insurance Program or mapped as D zone areas.

Acknowledgements
The following agencies aided in preparation, interpretation, and completion of this flood hazard investigation study.

Utah Associations of Governments
Bear River Association of Governments
Sacramento District Corps of Engineers
Utah Division of Emergency Services and Homeland Security

Scope of Work
This study will evaluate and identify areas with a high flood hazard and identify potential mitigation solutions. The areas evaluated in this study include the three unincorporated counties of Box Elder, Cache, and Rich. Municipalities within the three counties were studied if they met the following criteria:

1. Jurisdiction has not been mapped by FEMA,
2. Jurisdiction mapped by FEMA as a Zone D, area of undetermined flood hazard.

Fluvial hazards within the cities and towns of: Bear River, Deweyville, Elwood, Fielding, Garland, Howell, Plymouth, Portage, Snowville, and Tremonton were studied.

Description of the Study Area
This study includes the northern most counties of Utah, Box Elder, Cache, and Rich counties. The three counties are contained within two major physiographic provinces the Basin and Range province with comprises the majority of western Box Elder County, and the Middle Rocky Mountain Province. Vegetation corresponds with moisture, which increases with elevation. Thus, valleys and low land areas have desert brushes and grasses, which turn to pinyon-juniper and coniferous forests as elevation increases.

Population in the Bear River Association is predominately aligned along mountain fronts near interstates, with the majority of western Box Elder County sparsely populated. The agricultural sector still plays a large part in the economy of the study area, as does Utah State University located in Logan.

With the exception of the Raft River Mountains (tributary to the Snake River), the entire study area is drained by the Bear River, into the Great Salt Lake, a remnant of ancient Lake Bonneville. Major tributaries of the Bear River include: Malad River, Sheep Creek, Saleratus Creek, The little Bear, and Blacks Fork. Outside of the 1983 flooding event damage due to flooding in the study area has been quite limited, primarily damaging crops and agricultural infrastructure.

Discussion, Data, and Observations
Data presented in this study are from the following sources:

- Box Elder County Emergency Operations Plan

- Cache County Emergency Operations Plan
- Rich County Emergency Operations Plan
- Bear River Basin: Planning for the Future December 2002
- US Army Corps of Engineers Wasatch Front and Central Utah Study July 1984 Volumes I and II
- US Army Corps of Engineers Reconnaissance Report Bear River Basin Investigation February 1989

In addition to incorporating existing studies and plans completed in the area, this flood hazard study also contains information from technical experts familiar with the study area. The mitigation projects are purely suggested actions, which based on past experience, will reduce or eliminate the identified fluvial hazard. These mitigation recommendations in no way represent the only measure to attain fluvial mitigation. In many cases the proposed or best solution is simply avoidance. This method of mitigation is implemented through the use of zoning, and represents in most cases the lowest cost mitigation measure.

Need For Additional Research

Additional research should be conducted resulting in better maps for communities currently mapped as a FEMA Zone D, unmapped communities, and communities with outdated Flood Insurance Rate Maps. Communities would benefit from knowing peak flows and stages on tributaries of concern.

Disclaimer

The information provided in this study was developed from a number of sources including:

- Past USACE studies done within the region and drainage basins,
- Personal knowledge,
- Limited onsite visits,
- Map interpolations,
- Current GIS work.

Even though care was taken to ensure a measure of correctness and field checks were preformed on the information and data gathered, it is important to note this flood hazard study is presented “as is”. The United States Army Corps of Engineers, Division of Emergency Service and Homeland Security, or any other agency assisting in completion of this study cannot accept any responsibilities for errors, omissions, or accuracy. There are no warranties, which accompany this product. Users are cautioned to field verify information provided in this product before making any decisions. In no way does the mapping presented in this study take the place of a regulatory FEMA Flood Insurance Rate Map (FIRM), or replace any flood hazard identification product developed by FEMA / National Flood Insurance Program (NFIP).

How Communities Where Ranked

The communities within this study were ranked based on a committee’s evaluation. The evaluation committee consisted of the:

- Utah State Floodplain Program Manager
- Utah State Hazard Mitigation Officer,
- Natural Hazard Mitigation Planner,
- U.S. Army Corps of Engineers,
- State Earthquake Program Manager.

This committee researched each of the twenty-nine counties and all 269 incorporated areas within the State of Utah. Each jurisdiction was assigned one of five ratings: Very High, High, Moderate, Low, or Not Rated. These ratings in no way reflect actual flood threat. The ratings were assigned based on the following variables:

- Perceived flood threat based on topography, past flooding occurrences, and experience of committee members.
- Participation in the National Flood Insurance Program (NFIP).
- Past studies included, but not limited to, regulatory FEMA/NFIP Flood Insurance Studies (FIS), other flood studies, and reconnaissance reports.
- Population growth within the jurisdiction.
- If the community is mapped by FEMA/National Flood Insurance Program NFIP), and type of map which identifies high, moderate and low flood threats

Ratings were used to set the scope of work for each community within this study. Information on excluded communities was added were available.

A Word about Wildfires

Almost every year several communities around the state are flooded and/or affected by post burn debris flows. Wildfire damaged watersheds have conditions which increase the potential for debris flows which may damage structures and infrastructure in the impacted area. Overall, the heightened risk associated with alluvial fans is always of concern. Post fire revegetation and stabilization efforts in many cases do not alleviate the threat due to flooding and debris flow.

A Word About Dams

Dams are a critical support function for water managers in the State and can also act as a flood control measure. If a dam remains stable, does not get overtopped, or is not impaired as the result of an earthquake, then, at a minimum, they do provide incidental flood control. If not then they can add to the flood threat. There are 67 dams within Bear River AOG of those 12 have received a high hazard rating by Utah Division of Water Rights Dam Safety section. The State Dam Safety Section has developed a hazard rating system for all non-federal dams in Utah. Downstream uses, size, height, volume, and incremental risk/damage assessments are a variable used to assign dam safety classification. Using the hazard ratings systems developed by the State Dam Safety Section, dams are placed into one of three classifications high, moderate, and low. Dams receiving a low rating would have insignificant property loss do to dam failure. Moderate hazard dams would cause significant property loss in the event of a breach. High hazard dams would cause a possible loss of life in the event of a rupture. The frequency of dam inspection is designated based on hazard rating with the Division of Water Rights inspecting high-hazard dams annually, moderate hazard dams biannually, and low-hazard dams every five years.

Box Elder County

- Blue Creek
- Mutton Hollow Debris Basin
- Three Mile Creek Debris Basin
- Cutler
- Mantua

Cache County

- Tony Grove Lake Dam

- Hyrum
- Logan First Dam
- Porcupine
- Newton

Rich County

- Birch Creek No. 2
- Woodruff Creek

Bear Lake a prominent recreation area is near the mid-point of the Bear River. Historically, the Bear River did not naturally flow into Bear Lake. In 1902 a predecessor of Utah Power and Light constructed inlet and outlet canals in an effort to divert Bear River Water into the lake for later release during the agricultural growing season. River modifications have created an active storage capacity of 1,452,000 acre-feet in Bear Lake and the ability to control the flow of the river.

A Word about Prevention and Preparedness

Communities need to pay attention to such things as topography and past flood history when designing and approving new construction. Cities need insure adequate storm drain systems are installed, and paved areas and streets do not intersect stream channels only to become new “rivers”. Aged irrigation storage basins and canals represent a risk to down slope property should the canal fail.

Simple things like not storing valuables and keepsakes such as photographs in the basement (or other low lying areas), and raising your furnace, water heater, and electric panel can really lessen the impacts if a flood does occur. Consult with a professional for further information if this and other damage reduction measures can be taken.

Residents need to let their local officials know that flooding and the consequences it brings is a concern to the majority of the citizenry. Wherever a serious problem does exist, citizens could organize themselves, working to reduce or eliminate the flood threats that face the community.

Working together public officials and residents can make a BIG difference as to the outcome BEFORE floods threaten their community.

Box Elder County

COUNTY	CITY/TOWN	POPULATION	STATE MAP LOCATION	NFIP STATUS	THREAT (or NSFHA-eligible)
Box Elder	**Unincorporated**	8023		490005 - 9/1/87(L)	Bear River and Tributaries
Box Elder	**Bear River City**	750	B4	**Not Participating**	Bear River and Tributaries
Box Elder	Brigham City	17411	B4	490006 - 8/17/81	
Box Elder	Corrine	621	B4	490197 - 7/15/80(M)	
Box Elder	**Deweyville**	278	B4	**Not Participating**	Bear River and Tributaries
Box Elder	**Elwood**	678	B4	**Not Participating**	Bear River and Tributaries
Box Elder	**Fielding**	448	B4	**Not Participating**	Bear River and Tributaries
Box Elder	**Garland**	1943	B4	**Not Participating**	Bear River and Tributaries
Box Elder	Honeyville	1214	B4	490008 - 7/29/80(M)	
Box Elder	**Howell**	221	B4	**Not Participating**	NSFHA-Eligible
Box Elder	Mantua	791	C4	490009 - 7/8/80(M)	
Box Elder	Perry	2383	C4	490010 - 5/20/80(M)	
Box Elder	**Plymouth**	328	C4	**Not Participating**	Bear River and Tributaries
Box Elder	**Portage**	257	B4	**Not Participating**	Bear River and Tributaries
Box Elder	**Snowville**	177	B3	**Not Participating**	Deep Creek Tributaries
Box Elder	**Tremonton**	5592	B4	**Not Participating**	Bear River and Tributaries
Box Elder	Willard	1630	C4	490011A - 7/1/87(L)	

* D = Detailed Study Report and Map Prepared.

Box Elder County Flood and Dam failure History

Hazards	Date	Location	Critical Facility or Area Impacted	Comments

Flood Box Elder	August 6, 1947	Brigham City Willard	Limited damage to fruit orchards and US 91	
Flood Box Elder	May 17, 1949	Perry	50 farms damaged, several thousand dollars in damage to farms, orchards, and roads.	Source Mt. Baldy area
Flood Box Elder	August 10, 1952	Willard	$100,000 in damage to orchards due to hail, US 91 covered with mud	
Flood Box Elder	June 14, 1960	Brigham City	Crop damage	Heavy rains large hail.
Flood Box Elder	August 8, 1968	Howell	Flooding and damage to farmland	Source Blue Creek
Flood Box Elder	June 24, 1969	Brigham City	Business establishments flooded on Main Street.	
Flood Box Elder	Spring 1983	Brigham City,	Basement damage, foundation walls, and homes. Waste treatment plant in Box Elder Creek threatened.	Total PA requests of $146,596 for Box Elder County. Ground water and many slides.
		Garland	Dike along river eroded and floodwaters damaged community water supply pump house.	Source Bear River
		Honeyville	High ground water causing flooding	

		Willard	Several homes were inundated	Source Willard and Facer Creeks.
Flood Box Elder	Spring 1984	Entire County	Overland flows carried debris onto private lands, and filled Willard, Facer, and Barker Debris Basins. Flows eroded pave-ment, washed out road shoulders, and culverts.	Damage total $331,442.00

(All dollar values given are for year of disaster)

Unincorporated Box Elder County

Box Elder County Flood Mitigation Goals -
Goal 1 Reduce Risk of Potential Flooding

Unincorporated Box Elder County – Problem Identification: This county has just under 20 percent of its residents living in the unincorporated county – many in the areas surrounding Brigham City and Tremonton. Box Elder also appears to be the county with the smallest percentage of communities participating in the NFIP – most likely because the flood threats are, for the most part, only minor to moderate - several being NSFHA-Eligible. The Bear and Malad Rivers and their tributaries represent the major flood threats to development.

Objective: Minimize future flood damage in the unincorporated County including Riverside and other developed but unincorporated areas.

Action: Nonstructural measures appear to be the most prudent option for the county to implement in the unincorporated areas. Zoning to prevent development of structures near all rivers, creeks, and lakes would be prudent
(100 ft minimum setback; greater adjacent to the Bear River) as well as not allowing development on alluvial fans. New development near canals should also be discouraged, as there have been several potentially deadly flood events in the state due to flooding caused by canal failures. The cost of modifying county laws to include these is minimal and the benefits substantial (although there will be a small percentage of the population that will oppose any zoning or other changes in the laws for that matter).

Timeframe:
Funding:
Estimated Cost: Minimal.
Staff:

Bear River City – Problem Identification: This community does not participate in the NFIP. As

its name implies, the Bear River runs through it – posing a flood threat to the low-lying parts of the community adjacent to it. Fortunately, most development is located on higher ground. A tributary, the Malad River also runs along the west side of the community but it is quite incised so does not pose a major threat.

Objective: Minimize future flood damage in Bear River City.

Alternative Action: Given the relatively few number of existing structures, flood proofing may be a viable alternative – especially for those structures with a history of being flooded.

Timeframe:
Funding:
Estimated Cost: $10k - $30k for the average home to flood proof.
Staff:

Alternative Action: An alternate project could consist of zoning of the flood prone area to insure that all new developments are sited as far away from the channels as possible (or at least constructed so as to be higher in elevation than the flood threat). This however, would do nothing to protect existing development.

Timeframe:
Funding:
Estimated Cost: minimal.
Staff:

Deweyville – Problem Identification: This small community does not participate in the NFIP. The Bear River lies in the lowland on the west side of town (the bank is apparently the town boundary). The main flood threat appears to be due to the east side drainages as there is apparently little development near the Bear River.

Objective: Minimize future flood damage in Deweyville.

Alternative Action: Given the relatively few number of existing structures, flood proofing may be a viable alternative – especially for those structures with a history of being flooded.

Timeframe:
Funding:
Estimated Cost: $10k - $30k for the average home to flood proof.
Staff:

Alternative Action: An alternate project could consist of zoning of the flood prone area to insure that all new developments are sited as far away from the channels as possible (or at least constructed so as to be higher in elevation than the flood threat). This however, would do nothing to protect existing development.

Timeframe:
Funding:
Estimated Cost: minimal.
Staff:

Elwood – Problem Identification: This community does not participate in the NFIP. As with Bear

River City, it faces a minor threat from the Bear River on the east and the Malad River on the west. Much of the original development appears to be sited along Highway 191, approximately the same distance away from the two rivers making relatively safe from the flood threat of either. New development; however, has come increasingly closer to both rivers, increasing the overall flood threat.

Objective: Minimize future flood damage in Elwood.

Alternative Action: Given the relatively few number of existing structures at risk, flood proofing may be a viable alternative – especially for those structures with a history of being flooded.

Timeframe:
Funding:
Estimated Cost: $10k - $30k for the average home to flood proof.
Staff:

Alternative Action: An alternate project could consist of zoning of the flood prone area to insure that all new developments are sited as far away from the channels as possible (or at least constructed so as to be higher in elevation than the flood threat). This however, would do nothing to protect existing development.

Timeframe:
Funding:
Estimated Cost: minimal.
Staff:

Fielding – Problem Identification: Northeast of Garland, this community does not participate in the NFIP. However, it appears that it is far enough away and high enough above the Bear and Malad Rivers to be NSFHA-Eligible.

Objective: Minimize future flood damage in Fielding.

Action: Identify Fielding as a NSFHA-eligible community (pending evaluation of flood history and evidence of past flooding).

Timeframe:
Funding:
Estimated Cost: Minimal
Staff:

Garland – Problem Identification: Just north of Tremonton, Garland does not participate in the NFIP. Although the Malad River lies east of town, as there are apparently no rivers, creeks, or streams running through the town. Therefore, it appears to have little flood threat and would be NSFHA-Eligible (as long as all development stays on the bluff within the town limits shown).

Objective: Minimize future flood damage in Garland.

Action: Identify Garland as a NSFHA-eligible community (pending evaluation of flood history and evidence of past flooding).

Timeframe:
Funding:
Estimated Cost: Minimal
Staff:

Howell – Problem Identification: This small community does not participate in the NFIP. It does not appear to have a significant flood threat due in large measure to the upstream Blue Creek Reservoir. Therefore, Howell appears to be a NSFHA-Eligible community.

Objective: Minimize future flood damage in Howell.

Action: Identify Howell as a NSFHA-eligible community (pending evaluation of flood history and evidence of past flooding).
Timeframe:
Funding:
Estimated Cost: Minimal
Staff:

Plymouth – Problem Identification: This community does not participate in the NFIP. Most of the town appears vulnerable to flooding from the 2 rather large drainages to the northeast whose creeks pass through town.

Objective: Minimize future flood damage in Plymouth.

Alternative Action: One project that would reduce the existing flood threat would be an overflow channel along the east-west road (about ½ mile north of town) from Bishop Canyon, picking up the other two drainages, then under Highway 191 to the drainage adjacent to the city cemetery (which drains to the Bear River).
Timeframe:
Funding:
Estimated Cost: About $200k for excavation and culverts (assuming the road itself (and the culverts through it) do not need modification.
Staff:

Alternative Action: An alternate project could consist of zoning of the flood prone area to insure that all new developments are sited as far away from the channels as possible (or at least constructed so as to be higher in elevation than the flood threat). This however, would do nothing to protect existing development.
Timeframe:
Funding:
Estimated Cost: minimal.
Staff:

Portage – Problem Identification: This community does not participate in the NFIP. It is primarily threatened from 2 creeks to the west – Portage Canyon and an unnamed drainage to the north. The main Portage Canyon channel appears to skirt the town to the southwest while the unnamed drainage does a very similar thing on the northwest. The residual threat to developments in Portage appears to be very minimal.

Objective: Minimize future flood damage in Portage.

Action: Since the flood threat for this community is so minor, A potential project could consist of zoning of the flood prone areas to insure that all new developments are sited as far away from the channels as possible (or at least constructed so as to be higher in elevation than the flood threat). This however, would do nothing to protect existing development.

Timeframe:
Funding:
Estimated Cost: minimal.
Staff:

Snowville – Problem Identification: This the smallest incorporated community in the county with under 200 residents. It does not participate in the NFIP. There appears to be a substantial threat to most all the community from several relatively large Deep Creek tributary drainages to the east. (Rose Ranch Reservoir is downstream of the community so it cannot provide flood protection.)

Objective: Minimize future flood damage in Snowville.

Alternative Action: Given the relatively few number of existing structures at risk, flood proofing may be a viable alternative – especially for those structures with a history of being flooded.

Timeframe:
Funding:
Estimated Cost: $10k - $30k for the average home to flood proof.
Staff:

Alternative Action: An alternate project could consist of zoning of the flood prone area to insure that all new developments are sited as far away from the channels as possible (or at least constructed so as to be higher in elevation than the flood threat). This however, would do nothing to protect existing development.

Timeframe:
Funding:
Estimated Cost: minimal.
Staff:

Tremonton – Problem Identification: Although Tremonton is the second largest community in Box Elder County; it does not participate in the NFIP. There is; however, a moderate flood threat from the Malad River that flows right through the east side of town. The limited detail floodplains identified on the adjacent county map reflect what should be considered a minimized flood hazard area. In all likelihood, actual flooding would be greater than that shown on the limited detail map. Original development in Tremonton seems to be sited a reasonable distance away from the river. Newer development however is encroaching into the floodplain.

Objective: Minimize future flood damage in Tremonton.

Alternative Action: Given the relatively few number of existing structures at risk, flood proofing may be a viable alternative – especially for those structures with a history of being flooded.

Timeframe:

Funding:
Estimated Cost: $10k - $30k for the average home to flood proof.
Staff:

Alternative Action: An alternate project could consist of zoning of the flood prone area to insure that all new developments are sited as far away from the channels as possible (or at least constructed so as to be higher in elevation than the flood threat). This however, would do nothing to protect existing development.

Timeframe:
Funding:
Estimated Cost: minimal.
Staff:

Cache County

COUNTY	CITY/TOWN	POPULATION	STATE MAP LOCATION	NFIP STATUS	THREAT (or NSFHA-eligible)
Cache	**Unincorporated**	5766		490012 - 2/1/87(L)	Bear River and Tributaries
Cache	**Amalga**	427	B4	490013 - **NITP**	
Cache	Clarkston	688	B4	490014 - 8/19/80(M)	
Cache	**Cornish**	259	B4	**Not Participating**	Bear River and Tributaries
Cache	Hyde Park	2955	B5	490016 - 7/29/80(M)	
Cache	Hyrum	6316	B5	490017 - 4/8/80(M)	
Cache	Lewiston	1877	B5	490018 - 7/29/80(M)	
Cache	Logan	42670	B5	490019 - 9/28/84	
Cache	Mendon	898	B4	490020 - 7/22/80(M)	
Cache	Millville	1507	B5	490021 - 10/22/76	
Cache	Newton	699	B4	490022 - 7/22/80(M)	
Cache	Nibley	2045	B5	490023A - NITP	
Cache	North Logan	6163	B5	490024 - 3/18/86(M)	
Cache	Paradise	759	B5	490025 - NITP	
Cache	Providence	4377	B5	490226 - (NSFHA)	
Cache	Richmond	2051	B5	4900027 - 8/12/80(M)	
Cache	**River Heights**	1496	B5	**Not Participating**	**NSFHA-eligible**
Cache	Smithfield	7261	B5	490029 - 3/18/86(M)	
Cache	**Trenton**	449	B4	**Not Participating**	Bear River & Ransom Hollow
Cache	Wellsville	2728	B4	490031 - 7/29/80(M)	

* D = Detailed Study Report and Map Prepared.

Cache County Flood and Dam failure History

Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Flood Cache	May 30, 1958	Logan	Damage to crops due to hail and high winds. Water caused road damage	
Flood Cache	August 22, 1958	Clarkston	Limited damage to homes. Highways and roads covered with water	
Flood Cache	August 18, 1959	Providence	Dozens of homes damaged. Flooding caused rock and mudslides in Providence Canyon	
Flood Cache	June 6, 1964	Smithfield	Intense storm flooded a number of homes within town.	Source Summit Creek

(All dollar values given are for year of disaster)

Unincorporated Cache County

Cache County Flood Mitigation Goals -

Goal 1 Reduce Risk of Potential Flooding

Unincorporated Cache County – Problem Identification: Only 6 percent of the county's population is in the unincorporated county, primarily in the Cache Valley surrounding Logan. Clearly, the major flood threat is to those properties adjacent to the Bear River and its tributaries. Reservoirs include Hyrum and Newton.

Objective: Minimize future flood damage in the unincorporated County.

Action: Nonstructural measures appear to be the most prudent option for the county to implement in the unincorporated areas. Zoning to prevent development of structures near all rivers, creeks, and lakes would be prudent
(100 ft minimum setback; greater adjacent to the Bear River) as well as not allowing development on alluvial fans. New development near canals should also be discouraged, as there have been several potentially deadly flood events in the state due to flooding caused by canal failures. The

cost of modifying county laws to include these is minimal and the benefits substantial (although there will be a small percentage of the population that will oppose any zoning or other changes in the laws for that matter).

Timeframe:
Funding:
Estimated Cost: Minimal.
Staff:

Amalga – Problem Identification: Amalga lies in northern Cache County northwest of Smithfield. It is the second smallest community in Cache County and does not participate in the NFIP. It appears that there is a moderate flood threat to the low-lying areas on the north, east, and south sides of town in the low-lying areas adjacent to the Bear River. Of equal or greater concern the threat from the perched Amalga Branch of the West Cache Canal that runs through town near many homes.

Objective: Minimize future flood damage in Amalga.

Alternative Action: Given the relatively few number of existing structures at risk, flood proofing may be a viable alternative – especially for those structures with a history of being flooded.

Timeframe:
Funding:
Estimated Cost: $10k - $30k for the average home to flood proof.
Staff:

Alternative Action: An alternate project could consist of zoning of the flood prone area to insure that all new developments are sited as far away from the channels as possible (or at least constructed so as to be higher in elevation than the flood threat). This however, would do nothing to protect existing development.

Timeframe:
Funding:
Estimated Cost: Minimal.
Staff:

Cornish – Problem Identification: Cornish lies in northwest Cache County just south of the Idaho border. It is the smallest community in Cache County and does not participate in the NFIP. It appears that there is a moderate flood threat to the low-lying areas on the east side of town adjacent to the Bear River. There is a lesser threat from the drainages coming out of the hills west of town, which are blocked by the north-south West Cache Canal.

Objective: Minimize future flood damage in Cornish.

Alternative Action: Given the relatively few number of existing structures at risk, flood proofing may be a viable alternative – especially for those structures with a history of being flooded.

Timeframe:
Funding:
Estimated Cost: $10k - $30k for the average home to flood proof.
Staff:

Alternative Action: An alternate project could consist of zoning of the flood prone area to insure that all new developments are sited as far away from the channels as possible (or at least constructed so as to be higher in elevation than the flood threat). This however, would do nothing to protect existing development.

Timeframe:
Funding:
Estimated Cost: Minimal.
Staff:

River Heights – Problem Identification: This community, just south of Logan, does not participate in the NFIP. It appears that although the northern boundary is adjacent to the Logan River, the community is on a bluff overlooking the river. The only potential threats are from Dry Canyon to the northeast and from the unnamed drainages east of town. (The City of Logan has constructed a detention basin on Dry Canyon - east of River Heights). Based on the topographic map, it appears that the unnamed drainages some distance east of town, would tend to flow southwest toward the Spring Creek drainage south of River Heights proper. Based on the incorporated boundary on the county NFIP map, River Heights appears to be a NSFHA-Eligible community.

Objective: Minimize future flood damage in River Heights.

Action: Identify River Heights as a NSFHA-eligible community (pending evaluation of flood history and evidence of past flooding).

Timeframe:
Funding:
Estimated Cost: Minimal
Staff:

Providence – Problem Identification: This community participates in the NFIP. Its current designation is as a No Special Flood Hazard Area (NSFHA). However, it appears somewhat vulnerable to flooding on the north and east sides of town from Spring Creek Canyon (based on the county's floodplain mapping).

Objective: Minimize future flood damage in Providence.

Alternative Action: Given the relatively few number of existing structures at risk, flood proofing may be a viable alternative – especially for those structures with a history of being flooded.

Timeframe:
Funding:
Estimated Cost: $10k - $30k for the average home to flood proof.
Staff:

Alternative Action: An alternate project could consist of zoning of the flood prone area to insure that all new developments are sited as far away from the channels as possible (or at least constructed so as to be higher in elevation than the flood threat). This however, would do nothing to protect existing development.

Timeframe:
Funding:

Estimated Cost: minimal.
Staff:

Trenton – Problem Identification: This community does not participate in the NFIP. It appears vulnerable to flooding on the east side of town from the Bear River and to a lesser extent from Ransom Hollow Creek through town.

Objective: Minimize future flood damage in Trenton.

Alternative Action: Given the relatively few number of existing structures at risk, flood proofing may be a viable alternative – especially for those structures with a history of being flooded.
Timeframe:
Funding:
Estimated Cost: $10k - $30k for the average home to flood proof.
Staff:

Alternative Action: An alternate project could consist of zoning of the flood prone area to insure that all new developments are sited as far away from the channels as possible (or at least constructed so as to be higher in elevation than the flood threat). This however, would do nothing to protect existing development.
Timeframe:
Funding:
Estimated Cost: minimal.
Staff:

Rich County

COUNTY	CITY/TOWN	POPULATION	STATE MAP LOCATION	NFIP STATUS	THREAT (or NSFHA-eligible)
Rich	**Unincorporated**	739		**Not Participating**	
Rich	**Garden City**	357	B5	**Not Participating**	
Rich	Laketown	188	B5	490099 - (NSFHA)	
Rich	**Randolph**	483	B6	**Not Participating**	
Rich	Woodruff	194	C6	490101 - 7/22/80(M)	

Rich County Flood and Dam failure History

Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Flood Rich Presidential	Spring 1983	Randolph and Woodruff	Damage to roads, culverts bridges, basements, and farmlands.	Source Bear Lake, Dean Ditch, and Woodruff Creek, PA cost $37,161

(All dollar values given are for year of disaster)

Unincorporated Rich County

Rich County Flood Mitigation Goals -
Goal 1 Reduce Risk of Potential Flooding

Unincorporated Rich County – Problem Identification: As one of the smallest counties in terms of population, Rich County does not participate in the NFIP. Although over 1/3 of the county's population is in the unincorporated county, primarily in the areas adjacent to Garden City and Laketown on Bear Lake. Clearly, the major flood threat in the unincorporated county is to those properties adjacent to the Bear River and Bear Lake. Less significant threats also exist along Woodruff and other smaller creeks throughout the county. Bear Lake is by far the largest water body in the county.

Objective: Minimize future flood damage in the unincorporated County.

Action: Nonstructural measures appear to be the most prudent option for the county to implement in the unincorporated areas. Zoning to prevent development of structures near all rivers, creeks, and lakes would be prudent
(100 ft minimum setback; greater adjacent to the Bear River) as well as not allowing development on alluvial fans. New development near canals should also be discouraged, as there have been several potentially deadly flood events in the state due to flooding caused by canal failures. The cost of modifying county laws to include these is minimal and the benefits substantial (although

there will be a small percentage of the population that will oppose any zoning or other changes in the laws for that matter).

Timeframe:
Funding:
Estimated Cost: Minimal.
Staff:

Garden City – Problem Identification: This community does not participate in the NFIP. The major flood threat to this community is from Garden City Canyon and to a lesser extent, the drainages to the south and north.

Objective: Minimize future flood damage in Garden City.

Alternative Action: Given the relatively few number of existing structures, flood proofing may be a viable alternative – especially for those structures with a history of being flooded.

Timeframe:
Funding:
Estimated Cost: $10k - $30k for the average home to flood proof.
Staff:

Alternative Action: An alternate project could consist of zoning of the flood prone area to insure that all new developments are sited as far away from the channels as possible (or at least constructed so as to be higher in elevation than the flood threat). This however, would do nothing to protect existing development.

Timeframe:
Funding:
Estimated Cost: minimal.
Staff:

Randolph – Problem Identification: The largest community in Rich County, it does not participate in the NFIP. The main flood threat appears to be from Little Creek and adjacent drainages to the west. Based on the topographic map, there is a reservoir about 2 miles west of Randolph on Little Creek that could provide some incidental flood protection.

Objective: Minimize future flood damage in Randolph.

Alternative Action: A structural mitigation project for this community could be an overflow channel on the north side of town near the city limit – a distance of about a mile.

Timeframe:
Funding:
Estimated Cost: The preliminary cost for the levee project would be about $250k to $500k depending on the channel and culvert sizes.
Staff:

Alternative Action: An alternate project could consist of zoning of the flood prone area to insure that all new developments are sited as far away from the channels as possible (or at least constructed so as to be higher in elevation than the flood threat). This however, would do nothing to

protect existing development.

Timeframe:
Funding:
Estimated Cost: minimal.
Staff:

APPENDIX F - PUBLIC OUTREACH

№ 2312

AFFIDAVIT OF PUBLICATION

STATE OF IDAHO,
County of Bear Lake } ss.

Patricia Talcott

being duly sworn, deposes and says:

That he/she is the Office Manager of THE NEWS-EXAMINER, a weekly newspaper published at Montpelier, in the County of Bear Lake and the State of Idaho; and said paper has been and is in general circulation, in the county aforesaid, and in the vicinity of Montpelier; that the advertisement, a copy of which is attached hereto, was published in the said newspaper once a week for 1 consecutive weeks in the regular and entire issue of said paper during the period and time of publication, land was published in the newspaper proper and not a supplement; that said paper has been established and regularly published for more than seventy-eight consecutive weeks prior to the date of first publication of said advertisement.

Such notice was published in the issue beginning with May 28, 2014, and ending with the issue of May 28, 2014

Patricia Talcott

Fees, $50.60

Subscribed and sworn to before me this 28 day of May, 2014

Tracy Lee Schaffer

Notary Public, Residing in Bear Lake County, Idaho

My Commission Expires October 11, 2019

PUBLIC SERVICE ANNOUNCEMENT
5/13/2014

The Bear River Association of Governments (BRAG) is updating the region's current Pre-Disaster Mitigation Plan. During this update process over the next several months, BRAG staff will be working with jurisdictions and emergency planning personnel from Box Elder, Cache, and Rich Counties. A Federal Emergency Management Agency (FEMA) approved plan is required to be adopted by each jurisdiction in the tri-county Bear River Region if they want to be considered eligible for certain federal funds in the event of a presidentially declared natural disaster or to be eligible to apply for funding hazard mitigation projects. BRAG is updating the current plan, which was adopted by most jurisdictions in the region in 2008. The general public is invited to participate in the planning process. If you would like to become more involved in the Pre-Disaster Mitigation Plan update process, or have any questions, please call Zac Covington at (435)752-7242, or e-mail at zacc@brag.utah.gov.

Zac Covington, Sr. Regional Planner
Bear River Association of Governments

Publish May 28, 2014 — Legal No. 2312.

Tracy Lee Schaffer
Notary Public
State of Idaho

UINTA COUNTY HERALD **Evanston, Wyoming**

AFFIDAVIT OF PUBLICATION
Uinta County Herald
Evanston, Wyoming

STATE OF WYOMING
)ss.
County of Uinta

I, Mark Tesoro, do hereby, upon my oath, depose and say that I am the Publisher of the UINTA COUNTY HERALD NEWSPAPER, a twice-weekly newspaper published in the City of Evanston, County of Uinta, in the State of Wyoming; and that said newspaper has a general circulation in said County and State; and that the legal notice herein attached was published in said newspaper for the full period of 1 consecutive issue/weeks; the first publication being on the 26 day of May, 2015, and the last publication being on the 26 day of May, 2015; and that said advertisement appeared in each and every number of said newspaper during the period of publication as above stated.

(Signed)

Mark Tesoro, Publisher

State of Wyoming
SS
County of Uinta

Subscribed in my presence and sworn to before me on this 2 day of June A.D., 2015, by Mark Tesoro, Publisher.

Jamie Durrant
Notary Signature

JAMIE DURRANT - NOTARY PUBLIC
COUNTY OF UINTA STATE OF WYOMING
My Commission Expires May 27, 2018

DRAFT PRE-DISASTER MITIGATION PLAN FOR THE BEAR RIVER REGION

In accordance with the Disaster Mitigation Act of 2000, the regional Pre-Disaster Mitigation Plan for the Bear River Region has been updated. The plan will be available on June 1, 2015 for a 30-day public comment period ending June 30, 2015. The plan identifies potential natural hazards, estimates vulnerability to those hazards, and documents mitigation strategies for all jurisdictions located within Box Elder, Cache, and Rich Counties in northern Utah. The plan will be on the BRAG website at www.brag.utah.gov, and a hard copy will be available at the BRAG office in Logan, located at 170 N. Main Street, on June 1st. Please send comments and questions to Zac Covington, BRAG Regional Planner, at zacc@brag.utah.gov or call at 435.752.7242.

May 26 0526A

Civil
PROOF OF PUBLICATION

STATE OF UTAH
COUNTY OF CACHE, ss

On this 16th day of May , A.D. 2014 personally appeared
before me Monica Christensen who being first being duly sworn, deposes and says that
she is the Assistant to the Finance Director of the Cache Valley Publishing Co., publishers of The Herald Journal
a daily newspaper published in Logan City, Cache County Utah, and that the
Legal Notice, a copy of which is hereto attached was published in said
newspaper for 1 issue(s) and that said notice also published on utahlegals.com
on the same days(s) as publication in said newspaper

Commencing on the following days:
05/16/2014

_____, Assistant to the Finance Director

Subscribed and sworn to before me on this16th day of May , A.D. 2014

NOTARY PUBLIC
CHRISTOPHER R JENSEN
612269
COMMISSION EXPIRES
AUGUST 1, 2015
STATE OF UTAH

_____,Notary Public
Commissioned in the State of Utah
My Commission expires August 1, 2015

PUBLIC SERVICE ANNOUNCEMENT

5/13/14

The Bear River Association of Governments (BRAG) is updating the region's current Pre-Disaster Mitigation Plan. During this update process over the next several months, BRAG staff will be working with jurisdictions and emergency planning personnel from Box Elder, Cache, and Rich Counties. A Federal Emergency Management Agency (FEMA) approved plan is required to be adopted by each jurisdiction in the tri-county Bear River Region if they want to be considered eligible for certain federal funds in the event of a presidentially declared natural disaster or to be eligible to apply for funding hazard mitigation projects. BRAG is updating the current plan, which was adopted by most jurisdictions in the region in 2008. The general public is invited to participate in the planning process. If you would like to become more involved in the Pre-Disaster Mitigation Plan update process, or have any questions, please call Zac Covington at (435)752-7242, or e-mail at zacc@brag.utah.gov.

Publication Date: May 16, 2014

AFFIDAVIT OF PUBLICATION

№ 3596

The Leader-Garland Times

STATE OF UTAH }
County of Box Elder } ss.

I, Jodie ValDez

being first duly sworn, depose and say The Leader, a weekly newspaper of general circulation, published once each week, at Tremonton, Utah; that the foregoing notice was published in said newspaper for (1) one consecutive weeks, the first publication having been made on the 21 day of May, 20 14, and the last publication on the 21 day of May, 20 14. That said notice was published in the regular and entire issue of every number of paper during the period and times of publication, and the same was published in the newspaper proper and not in the supplement.

Jodie ValDez
Signature of person preparing proof of publication

This Public Notice is also published online at utahlegals.com, according to Section 45-1-101, Utah Code Annotated, beginning on the first date of publication and for at least 30 days thereafter.

Subscribed and sworn to before me this 21st day of May 20 14.

Ellen Cook Notary Public

NOTARY PUBLIC
ELLEN COOK
My Commission # 669723
My Commission Expires
August 28, 2017
STATE OF UTAH

Fee $50.55

PUBLIC SERVICE ANNOUNCEMENT

The Bear River Association of Governments (BRAG) is updating the region's current Pre-Disaster Mitigation Plan. During this update process over the next several months, BRAG staff will be working with jurisdictions and emergency planning personnel from Box Elder, Cache, and Rich Counties. A Federal Emergency Management Agency (FEMA) approved plan is required to be adopted by each jurisdiction in the tri-county Bear River Region if they want to be considered eligible for certain federal funds in the event of a presidentially declared natural disaster or to be eligible to apply for funding hazard mitigation projects. BRAG is updating the current plan, which was adopted by most jurisdictions in the region in 2008. The general public is invited to participate in the planning process. If you would like to become more involved in the Pre-Disaster Mitigation Plan update process, or have any questions, please call Zac Covington at (435) 752-7242, or e-mail at zacc@brag.utah.gov.

Published in the Leader on May 21, 2014.

UINTA COUNTY HERALD Evanston, Wyoming

AFFIDAVIT OF PUBLICATION
Uinta County Herald
Evanston, Wyoming

STATE OF WYOMING
)ss.
County of Uinta

I, Mark Tesoro, do hereby, upon my oath, depose and say that I am the Publisher of the UINTA COUNTY HERALD NEWSPAPER, a twice-weekly newspaper published in the City of Evanston, County of Uinta, in the State of Wyoming; and that said newspaper has a general circulation in said County and State; and that the legal notice herein attached was published in said newspaper for the full period of 1 consecutive issue(s)/weeks; the first publication being on the 16 day of May, 2014, and the last publication being on the 16 day of May, 2014; and that said advertisement appeared in each and every number of said newspaper during the period of publication as above stated.

(Signed)

Mark Tesoro, Publisher

PUBLIC NOTICE

The Bear River Association of Governments (BRAG) is updating the region's current Pre-Disaster Mitigation Plan. During this update process over the next several months, BRAG staff will be working with jurisdictions and emergency planning personnel from Box Elder, Cache, and Rich Counties. A Federal Emergency Management Agency (FEMA) approved plan is required to be adopted by each jurisdiction in the tri-county Bear River Region if they want to be considered eligible for certain federal funds in the event of a presidentially declared natural disaster or to be eligible to apply for funding hazard mitigation projects. BRAG is updating the current plan, which was adopted by most jurisdictions in the region in 2008. The general public is invited to participate in the planning process. If you would like to become more involved in the Pre-Disaster Mitigation Plan update process, or have any questions, please call Zac Covington at (435)752-7242, or e-mail at zacc@brag.utah.gov.

PUBLISH: May 16, 2014 0516K

State of Wyoming
SS
County of Uinta

Subscribed in my presence and sworn to before me on this 19 day of May A.D., 2014, by Mark Tesoro, Publisher.

Jodi Jensen
Notary Signature

My commission expires 11/22/17

JODI JENSEN - NOTARY PUBLIC
County of Uinta State of Wyoming
My Commission Expires Nov. 22, 2017

BOX ELDER NEWS JOURNAL
PROOF OF PUBLICATION

State of Utah
Box Elder County

Public Service Announcement
5/13/14

The Bear River Association of Governments (BRAG) is updating the region's current Pre-Disaster Mitigation Plan. During this update process over the next several months, BRAG staff will be working with jurisdictions and emergency planning personnel from Box Elder, Cache, and Rich Counties. A Federal Emergency Management Agency (FEMA) approved plan is required to be adopted by each jurisdiction in the tri-county Bear River Region if they want to be considered eligible for certain federal funds in the event of a presidentially declared natural disaster or to be eligible to apply for funding hazard mitigation projects. BRAG is updating the current plan, which was adopted by most jurisdictions in the region in 2008. The general public is invited to participate in the planning process. If you would like to become more involved in the Pre-Disaster Mitigation Plan update process, or have any questions, please call Zac Covington at (435)752-7242, or e-mail at zacc@brag.utah.gov.

June-11-c

I, Casey Claybaugh, being first duly sworn depose and say that I am the Publisher of the Box Elder News Journal, a newspaper of general circulation, published every Wednesday in Brigham City, Utah, County of Box Elder; that the notice

Public Service
BRAG

of which a copy is hereto attached, was published in said newspaper, the first publication having been made on the 11th day of June, 2014, and the last on the 11th day of June, 2014; that said notice was published in the regular and entire issue of every number of the paper during the period and times of publication, and the same was published in the newspaper proper and not in the supplement.

Same was also published online at utahlegals.com, according to Section 45-1-101, Utah Code Annotated beginning on the first date of publication and for 30 days thereafter.

Casey Claybaugh, Publisher

Subscribed and sworn before me this 11th day of June, 2014.

Sean Hales, Notary Public
Residence: Brigham City, Utah
My commission expires August 25, 2014

SEAN MICHAEL HALES
NOTARY PUBLIC · STATE OF UTAH
COMMISSION #600501
COMM. EXP. 08-25-2014

Civil
PROOF OF PUBLICATION

STATE OF UTAH
COUNTY OF CACHE, ss

On this 22nd day of May , A.D. 2015 personally appeared
before me JAIME MAW who being first being duly sworn, deposes and says that
(s)he is the Principal Legal Clerk of the Cache Valley Publishing Co., publishers of The Herald Journal
a daily newspaper published in Logan City, Cache County Utah, and that the
Legal Notice, a copy of which is hereto attached was published in said
newspaper for 1 issue(s) and that said notice also published on utahlegals.com
on the same days(s) as publication in said newspaper

Commencing on the following days:
05/22/2015

_____, Principal Legal Clerk

Subscribed and sworn to before me on this22nd day of May , A.D. 2015

_____,Notary Public
Commissioned in the State of Utah
My Commission expires 10/18/2015

NOTARY PUBLIC
LAURIE JACKSON
My Commission # 649375
My Commission Expires
October 18, 2015
STATE OF UTAH

DRAFT PRE-DISASTER MITIGATION PLAN FOR THE BEAR RIVER REGION

In accordance with the Disaster Mitigation Act of 2000, the regional Pre-Disaster Mitigation Plan for the Bear River Region has been updated. The plan will be available on June 1, 2015 for a 30-day public comment period ending June 30, 2015. The plan identifies potential natural hazards, estimates vulnerability to those hazards, and documents mitigation strategies for all jurisdictions located within Box Elder, Cache, and Rich Counties in northern Utah. The plan will be on the BRAG website at www.brag.utah.gov, and a hard copy will be available at the BRAG office in Logan, located at 170 N. Main Street, on June 1st. Please send comments and questions to Zac Covington, BRAG Regional Planner, at zacc@brag.utah.gov or call at 435.752.7242.

Publication Date: May 22, 2015

№ 2504

AFFIDAVIT OF PUBLICATION

ATE OF IDAHO, } ss.
unty of Bear Lake

Patricia Talcott

being duly sworn, deposes and says:

That he/she is the Office Manager of
E NEWS-EXAMINER, a weekly newspaper published at
ntpelier, in the County of Bear Lake and the State of Ida-
; and said paper has been and is in general circulation, in
county aforesaid, and in the vicinity of Montpelier; that the
vertisement, a copy of which is attached hereto, was pub-
ned in the said newspaper once a week for 1
nsecutive weeks in the regular and entire issue of said pa-
r during the period and time of publication, land was pub-
ned in the newspaper proper and not a supplement; that
d paper has been established and regularly published for
re than seventy-eight consecutive weeks prior to the date
first publication of said advertisement.

Such notice was published in the issue beginning with
May 27, 2015, and ending with the
ue of May 27, 2015

Patricia Talcott

es, $33.80

Subscribed and sworn to before me this 28 day of
May, 2015

Tracy Lee Schaffer

Notary Public, Residing in Bear Lake County, Idaho
Commission Expires October 11, 2019

DRAFT PRE-DISASTER MITIGATION PLAN FOR THE BEAR RIVER REGION

In accordance with the Disaster Mitigation Act of 2000, the regional Pre-Disaster Mitigation Plan for the Bear River Region has been updated. The plan will be available on June 1, 2015 for a 30-day public comment period ending June 30, 2015. The plan identifies potential natural hazards, estimates vulnerability to those hazards, and documents mitigation strategies for all jurisdictions located within Box Elder, Cache, and Rich Counties in northern Utah. The plan will be on the BRAG website at www.brag.utah.gov, and a hard copy will be available at the BRAG office in Logan, located at 170 N. Main Street, on June 1st. Please send comments and questions to Zac Covington, BRAG Regional Planner, at zacc@brag.utah.gov or call at 435.752.7242.

Publish May 27, 2015 — Legal No. 2504.

Tracy Lee Schaffer
Notary Public
State of Idaho

AFFIDAVIT OF PUBLICATION

The Leader-Garland Times

№ 3860

STATE OF UTAH } ss.
County of Box Elder

I, Jodie Valdez
being first duly sworn, depose and say The Leader, ~~a weekly newspaper of general circulation,~~ published once each week, at Tremonton, Utah; that the foregoing notice was published in said newspaper for (1) one consecutive weeks, the first publication having been made on the 27 day of May 2015, and the last publication on the 27 day of May, 2015. That said notice was published in the regular and entire issue of every number of paper during the period and times of publication, and the same was published in the newspaper proper and not in the supplement.

Jodie Valdez
Signature of person preparing proof of publication

This Public Notice is also published online at utahlegals.com, according to Section 45-1-101, Utah Code Annotated, beginning on the first date of publication and for at least 30 days thereafter.

Subscribed and sworn to before me this 27th day of May 2015.

Ellen Cook Notary Public

Publication Fee $42.75

DRAFT PRE-DISASTER MITIGATION PLAN FOR THE BEAR RIVER REGION

In accordance with the Disaster Mitigation Act of 2000, the regional Pre-Disaster Mitigation Plan for the Bear River Region has been updated. The plan will be available on June 1, 2015 for a 30-day public comment period ending June 30, 2015. The plan identifies potential natural hazards, estimates vulnerability to those hazards, and documents mitigation strategies for all jurisdictions located within Box Elder, Cache, and Rich Counties in northern Utah. The plan will be on the BRAG website at www.brag.utah.gov, and a hard copy will be available at the BRAG office in Logan, located at 170 N. Main Street, on June 1st. Please send comments and questions to Zac Covington, BRAG Regional Planner, at zacc@brag.utah.gov or call at 435.752.7242.

Published in the Leader on May 27, 2015.

NOTARY PUBLIC
ELLEN COOK
My Commission # 669723
My Commission Expires
August 28, 2017
STATE OF UTAH

BOX ELDER NEWS JOURNAL
PROOF OF PUBLICATION

State of Utah
Box Elder County

DRAFT PRE-DISASTER MITIGATION PLAN FOR THE BEAR RIVER REGION

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May-27-c

I, Casey Claybaugh, being first duly sworn depose and say that I am the Publisher of the Box Elder News Journal, a newspaper of general circulation, published every Wednesday in Brigham City, Utah, County of Box Elder; that the notice

Draft
Pre-Disaster

of which a copy is hereto attached, was published in said newspaper, the first publication having been made on the 27th day of May, 2015, and the last on the 27th day of May 2015; that said notice was published in the regular and entire issue of every number of the paper during the period and times of publication, and the same was published in the newspaper proper and not in the supplement.

Same was also published online at utahlegals.com, according to Section 45-1-101, Utah Code Annotated beginning on the first date of publication and for 30 days thereafter.

Casey Claybaugh, Publisher

Subscribed and sworn before me this 27th day of May 2015.

Sean Hales, Notary Public
Residence: Brigham City, Utah
My commission expires August 25, 2018

SEAN MICHAEL HALES
Notary Public • State of Utah
Commission # 678952
COMM. EXP. 08-25-2018

2015 PRE-DISASTER MITIGATION PLAN UPDATE - BEAR RIVER REGION

PROJECT SUMMARY & STATUS

Purpose of the Plan

- To identify natural hazards for all 42 jurisdictions in Box Elder, Cache, and Rich Counties, understand vulnerabilities to those hazards, and craft solutions which reduce threats to life and property.
- Support better decision making and minimize risk
- Utilize existing and planned resources to mitigate effects from natural hazards
- Help local communities and counties comply with the Hazard Mitigation Act of 2000

Natural Hazards Mapped, Analyzed, and Addressed in the Plan

Natural Hazards Analyzed Utilizing GIS (GIS Data Available)	Other Natural Hazards Included in the Plan
Dam Failure	Avalanche
Faults	Tornado
Wildfire	Tsunami
Flood	Volcanic
Liquefaction	Radon
Landslide	Severe Weather
Slope	Drought
Poorly Drained Soils	

Potential Loss Analysis

BEAR RIVER REGION PDMP POTENTIAL LOSS CATEGORIES					
RESIDENTS AND PROPERTY	Residents at Risk	Residential Units at Risk		Commercial Units at Risk	
CRITICAL FACILITIES	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
INFRASTRUCTURE	Railroad Lines	Natural Gas Lines	Electrical Power lines	Roads	Canals
AGRICULTURAL AMENITIES	Agriculture Production	Farm Land	Grazing	Century Farms	Historic Barns
ENVIRONMENTAL AND RECREATIONAL AMENITIES	Wetland/ riparian	Lakes	Streams	Parks	Trails/Amenities

Meetings Held

- Regional Kick-off Mtg. - 6/8/14 (42 Attend.)
- Rich Co.Risk Assess. Mtg. - 8/26/14 (7 Attend.)
- Box Elder Co. Risk Assess. Mtg. - 9/18/14 (26 Attend.)
- Cache Co. Risk Assess. Mtg. - 10/7/14 (26 Attend.)
- Rich Co.Mitigation Strat. Mtg. - 12/17/14 (14 Attend.)
- Box Elder Co. Mitig. Strat. Mtg. - 12/17/14 (32 Attend.)
- Cache Co. Mitigation Strat. Mtg.-12/17/14 (34 Attend.)
- Regional DRAFT Plan Pres. Mtg.-5/28/15 (TBD)
- Local Community Planning Meetings: Portage, Bear River, Cache Co., Wellsville, Richmond, Rich Co., Brigham City, Randolph, Laketown, Snowville, Honeyville, North Logan, and Nibley.

Mitigation Strategy Surveys

- Received and recorded 38 mitigation strategy surveys from cities, towns, and counties

*** The DRAFT Pre-Disaster Mitigation Plan will be available on the BRAG website (*www.brag.utah.gov*), and at the BRAG Cache County office for public comment on June 1st, 2015!**

Potential Loss Estimates - Perry City Sample

*COMPLETED FOR ALL 42 JURISDICTIONS IN THE BEAR RIVER REGION

Perry, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	582	186	39,335,240	8	1,427,234	9,658,440
Faults	930	297	68,546,347	25	9,512,139	30,182,625
Wildfire	3230	1032	228,609,539	58	32,732,408	70,023,690
Flood	25	8	1,678,900	1	665,000	1,207,305
Liquefaction	736	235	53,730,878	25	19,393,095	30,182,625
Landslide	38	12	1,912,842	3	133,635	3,621,915
Slope	72	23	9,146,313	4	2,607,700	4,829,220
Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.
** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Perry, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure	EMS Perry, Perry Police Dept.			1 place of worship	1 broadband anchor
Faults		Three Mile Creek School			2 bridges, 1 broadband anchor
Wildfire					
Flood					1 dam
Liquefaction	Perry Police Dept., EMS Perry	2 schools	3 healthcare facilities		3 bridges, 4 dams, 4 broadband anchors
Landslide					
Slope					1 dam
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

BRAG STAFF INVOLVED IN THE PLAN UPDATE:

- Brian Carver, Community and Econ. Dev. Director
- Zac Covington, Senior Regional Planner
- Landon Profaizer, Regional Planner
- Zach Maughan, Planning Intern
- Bryan Wilson, Planning Intern
- Michael Gottfredson (Past Planning Intern)
- Stephanie Tomlin (Past Planning Intern)

APPENDIX G - GEOGRAPHIC INFORMATION SYSTEMS (GIS) DATA SOURCES

GIS LAYERS AND DATA SOURCES

LAYERS	SOURCES	DATE
Hazards		
Dam Failure	Utah Division of Water Rights	2008
Faults	U.S. Geological Survey	2004
Flood	FEMA FIRM Maps	2010
Landslide	Utah Geological Survey	2010
Liquefaction	Utah Automated Geographic Reference Center (AGRC)	2001
Poorly Drained Soils	Natural Resource Conservation Service, SSURGO	2013
Slope	Natural Resource Conservation Service, SSURGO	2013
Wildfire	Oregon Department of Forestry	2013
Infrastructure		
Canals	USGS, National Hydrography Dataset (NHD)	2007
Electrical Lines	Utah Automated Geographic Reference Center (AGRC)	1990
Natural Gas	Questar Gas	2015
Railroads	Utah Automated Geographic Reference Center (AGRC)	2009
Roads	Utah Automated Geographic Reference Center (AGRC)	2014
Critical Facilities		
Airports	Utah Automated Geographic Reference Center (AGRC)	2003
Bridges	Utah Department of Transportation (UDOT)	2014
Broadband	Utah Automated Geographic Reference Center (AGRC)	2013
Dams	Utah Division of Water Resources	2014
EMS/Fire	Utah Automated Geographic Reference Center (AGRC)	2013
Health Care Facilities	Utah Automated Geographic Reference Center (AGRC)	2013
Law Enforcement	Utah Automated Geographic Reference Center (AGRC)	2014
Places of Worship	Utah Automated Geographic Reference Center (AGRC)	2010
Public Facilities	Public Input, Stakeholder Meetings	2014
Schools	Utah Automated Geographic Reference Center (AGRC)	2013
Environmental/Recreational		
Amenities	U.S. Forest Service, Wasatch Cache National Forest	2011
Lakes	USGS, National Hydrography Dataset (NHD)	2007
Local Parks	Utah Automated Geographic Reference Center (AGRC)	2010
Riparian Areas	Utah Division of Water Resources, Water Related Land Use	2007
Streams	USGS, National Hydrography Dataset (NHD)	2007
Trails	Utah Automated Geographic Reference Center (AGRC)	2014
Wetlands	U.S. Fish & Wildlife Service, National Wetlands Inventory	2014
Population		
Parcels	County Assessor, County GIS, County IT Personnel	2014
Population	U.S. Census Bureau, American Community Survey	2010
Agriculture		
Agricultural Land	Utah Division of Water Resources, Water Related Land Use	2007
Century Farms	Bear River Association of Governments	2009
Farmland	Natural Resource Conservation Service, SSURGO	2013
Grazing	Utah Automated Geographic Reference Center (AGRC)	2012
Historic Barns	Bear River Association of Governments	2009

APPENDIX H - PLAN PROMOLGATION/ LOCAL ADOPTION RESOLUTIONS

text

APPENDIX I - REGIONAL AND COUNTY-WIDE MEETING ATTENDANCE AND AGENDAS

AGENDA

PRE-DISASTER MITIGATION PLAN UPDATE
REGIONAL KICK-OFF MEETING

Wednesday, June 18, 2014 - 11:00 A.M. to 1:00 P.M.

Cache County Sheriff's Office
1225 West 200 North Valley View
Logan, Utah 84321
Third Floor Training Rooms

11:00 A.M.	**Welcome and Introductions**	**Rick Williams, Cache County EM**
11:15 A.M.	**Pre-Disaster Mitigation Planning**	**Utah Department of Emergency Mgmt.**
11:50 A.M.	***Lunch (Provided)***	
12:15 P.M.	**PDMP Planning in the Bear River Region and the plan update process**	**Zac Covington and Landon Profaizer, BRAG Staff**
1:00 P.M.	**Adjourn**	

REGIONAL DRAFT PDMP KICK-OFF MEETING
6/18/2014
Bear River Region
Cache County Sheriff's Complex
Attendance List

NAME	ORGANIZATION
J. Lynn Yeates	Box Elder County Sheriff
Mike Gottfredson	BRAG
Landon Profaizer	BRAG
Zac Covington	BRAG
Julie Bergeson	Lewiston City
Derek Oyler	Brigham City
Kevin Potter	Box Elder County
Bryce Wheelwright	Willard City
Mike Weibel	Bear River Health Dept.
Stephanie Miller	Hyrum City Mayor
Kimberly Giles	Utah DEM
Samuel Heiner	Perry City
Steve Bowman	Utah Geological Survey
Eric Martineau	Utah DEM
Shawn Warnke	Tremonton City
Dave Nance	Tremonton City
Jody Kimball	CVTD
Mark Nielsen	Logan City
Jon Keller	North Logan Fire
Cordell Batt	North Logan City
Dave Watson	BLM SLFO
Chris Harrild	Cache County
Breck Rushton	Logan Regional Hospital
Dawn Bergesen	Bear Lake Community Health Center
Keith Larsen	Bear River Health Dept.
Scott Lyons	Box Elder County
Mark Bradley	Brigham City
Judy Crockett	USU EM
Alyssa Petersen	Paradise Town Corp
Chris Bradshaw	Utah State Parks
Bob Fotheringham	Cache County
James Brackner	River Heights City
Will Lusk	Logan City
Laura Lewis	ARC
Matt Coombs	Utah Div. FFSL
Kevin Barjenbruch	National Weather Service
Mike Desimone	Logan City
Dwight Einzinger	River Heights City
Gary Cox	Garden City
Gary Bagley	SITLA
Elise Erler	SITLA
Rick Williams	Cache County EM

AGENDA

PRE-DISASTER MITIGATION PLAN UPDATE
RICH COUNTY WORKING GROUP MEETING

Tuesday, August 26, 2014 - 10:00 A.M. to 11:30 A.M.

Garden City Offices
Main Floor Conference Room
69 N. Paradise Pkwy. Bldg. B
Garden City, UT 84028

10:00 A.M.	**Welcome and Introductions**
10:10 A.M.	**Pre-Disaster Mitigation Planning – Background**
10:20 A.M.	**Critical Facilities in Rich County**
10:35 A.M.	**Natural Hazards**
11:05 A.M.	**Update Historical Hazard Event Data**
11:15 A.M.	**Potential Losses Analysis**
11:30 A.M.	**Next Steps and Adjourn**

RICH COUNTY RISK ASSESSMENT MEETING
8/26/2014
Rich County Working Group Meeting
Garden City Offices
Attendance List

NAME	ORGANIZATION
Mark Stevens	Bear River Health Department
Melinda Hislop	Bear Lake CVB
Daniel Roskelley	Utah State Parks
Troy Herold	SITLA
Mitch Poulsen	BLRC
Gary R. Cox	Garden City
Zac Covington	BRAG

AGENDA

PRE-DISASTER MITIGATION PLAN UPDATE
BOX ELDER COUNTY WORKING GROUP MEETING - RISK ASSESSMENT

Thursday, September 18, 2014 – 12:00 PM to 2:00 PM

Tremonton City Offices
City Council Chambers
102 S. Tremont St.
Tremonton, UT 84337

12:00 PM	**Welcome and Introductions**
12:10 PM	**Pre-Disaster Mitigation Planning – Background**
12:20 PM*	***LUNCH (PROVIDED)***
12:35 PM	**Critical Facilities in Box Elder County**
1:00 PM	**Natural Hazards Maps**
1:20 PM	**Fault Data Update – Steve Bowman, Utah Geological Survey** **Radon Update – Mark Stevens, Bear River Health Dept.**
1:35 PM*	***BREAK***
1:40 PM	**Update Historical Hazard Event Data**
1:50 PM	**Potential Loss Analyses - Methodology**
2:00 PM	**Next Steps and Adjourn**

BOX ELDER COUNTY RISK ASESSMENT MEETING

09- 18- 2014

Tremonton City Offices City Council Chambers

Attendance List

NAME	ORGANIZATION
Marsha Anderson	Box Elder County
Richie Aoki	Honeyville City
Andrew Atkinson	BLM
Gary Bagley	SITLA
Corey Barton	Box Elder Fire
Steve Bench	Tremonton City
Steve Bowman	Utah Geological Survey
Mark Bradley	Brigham City
Jim Buchanan	
Matt Coombs	Ut. Div. Forestry, Fire, and State Lands
Paul Fulgham	Tremonton Public Works
Kimberly Giles	State Department of Emergency Manag
Craig Hawkes	Howell Town
John D. Kitch	B.R.V.C.C
Scott Lyons	Box Elder County Planning
David Nance	Tremonton P.D.
Derek Oyler	Brigham City
Kevin Potter	Box Elder County
Mark Stevens	Bear River Health Department
Obray Susan	Perry City
Marcus Wager	Box Elder County Planning
Shawn Warnke	Tremonton City
Albers J. Whipple	Hill Air Force Base
Lynn Yeates	Box Elder Sherriff

AGENDA

PRE-DISASTER MITIGATION PLAN UPDATE
CACHE COUNTY WORKING GROUP MEETING - RISK ASSESSMENT

Tuesday, October 7, 2014 – 11:00 AM to 1:30 PM

Cache County Sheriff's Complex
1225 West Valley View (200 North)
3rd Floor, Training Room #2
Logan, UT 84321

11:00 AM	**Welcome and Introductions – Rick Williams, Cache County EM**
11:15 AM	**Pre-Disaster Mitigation Planning and Background – Zac Covington**
11:25 AM	**Critical Facilities in Cache County – Zac Covington**
12:00 PM	**** LUNCH - Presentations by Steve Bowman, Utah Geological Survey and Mark Stevens, Bear River Health Department***
12:30 PM	**Natural Hazard Maps – Zac Covington**
1:00 PM	**Update Historical Hazard Events Data – Rick Williams**
1:15 PM	**Potential Loss Analyses Methodology – Zac Covington**
1:30 PM	**Next Steps and Adjourn**

CACHE COUNTY RISK ASESSMENT MEETING

Tuesday, October 7, 2014 – 11:00 AM to 1:30 PM
Cache County Sheriff's Complex

Attendance List

NAME	ORGANIZATION
Rick Williams	Cache County
Mark Stevens	Bear River Health
Eric Marineau	UDEM
Dwight Scaugh	US. Bureau of Reclamation
Roger C . Jones	Brag
Elise Ealer	SITWA
Alyssa Peterson	Paradise Town
Cindy Cummings	Millville City
James Brackner	River Heights
Clara Harold	Cache County
Harry Meadows	Millville City
Cordell Batt	North Logan
Stephanie Miller	Hyrum City
Kimberly Giles	State DEM
Ben Erickson	UGS

AGENDA

PRE-DISASTER MITIGATION PLAN UPDATE – BEAR RIVER REGION

BOX ELDER COUNTY WORKING GROUP - MITIGATION STRATEGIES MEETING

Wednesday, December 17, 2014 – 8:15 AM to 10:30 AM

Box Elder County Sheriff's Complex
52 S. 1000 W.
Brigham City, UT 84302

8:15 AM	**Breakfast / Welcome and Introductions – Zac Covington**
8:30 AM	**Potential Loss Analysis – Zac Covington**
8:45 AM	**Mitigation Strategies for Geologic Hazards** ***Steve Bowman and Richard Giraud, Utah Geological Survey***
9:15 AM	**Mitigation Strategies for Severe Weather** ***Brian McInerney, National Weather Service***
9:35 AM	**Mitigation Strategies for Wildfire Hazards** ***Jennifer Hansen and Blaine Hamp, Utah Forestry, Fire, and State Lands***
10:05 AM	**Mitigation Strategies for Flooding** ***John Crofts, Utah Department of Public Safety***
10:25 AM	**Next Steps**
10:30 AM	**Adjourn**

BOX ELDER COUNTY MITIGATION STRATEGIES MEETING

Wednesday, December 17, 2014 – 8:15 AM to 10:30 AM
Box Elder County Sheriff's Complex

Attendance List

NAME	ORGANIZATION
Jennifer Hansen	FFSL
Blain Harp	Forestry Fire Strategies
Tammy Benson	NPS
Tamsen Johnson	BLM
Teresa Rigby	BLM
Tom Davis	Portage Fire and Planning
Brian Mcnervey	NIUS
Steve Bowman	UGS
Rich Girand	UGS
Dave Isleman	US Bureau of Reclamation
Dwight Slaugh	US Bureau of Reclamation
Kimberly Giles	State DEM
John Croft	UDEM
Lynn Neater	BESO
Derek Oyler	Brigham City
Lesa Wilson	Dispatch
David nance	Tremonton City
Susan Obray	Perry City
Paul Fulgham	Tremonton City
Karen Cronin	Perry City
Marsha Anderson	Box Elder Sherrif Dept
Jim Buchanan	SLCC
Mark Bradley	Brigham City
Scott Lyons	Box Elder County
Marcus Wager	Box Elder County
Curtis Murray	Plymouth Town
Sharen B Hess	Plymouth Town
Paul Gauchay	NPS
Jim Hess	Tremonton City
Kim Birch	Mantua town

AGENDA

PRE-DISASTER MITIGATION PLAN UPDATE – BEAR RIVER REGION

CACHE COUNTY WORKING GROUP - MITIGATION STRATEGIES MEETING

Wednesday, December 17, 2014 – 11:45 AM to 2:00 PM

Riverwoods Conference Center
Cottonwood - Juniper Room
615 Riverwoods Parkway
Logan, UT

11:45 AM	**Lunch / Welcome and Introductions – Zac Covington**
12:00 PM	**Potential Loss Analysis – Zac Covington**
12:15 AM	**Mitigation Strategies for Geologic Hazards** ***Steve Bowman and Richard Giraud, Utah Geological Survey***
12:45 PM	**Mitigation Strategies for Severe Weather** ***Brian McInerney, National Weather Service***
1:05 PM	**Mitigation Strategies for Wildfire Hazards** ***Jennifer Hansen and Blaine Hamp, Utah Forestry, Fire, and State Lands***
1:35 PM	**Mitigation Strategies for Flooding** ***John Crofts, Utah Department of Public Safety***
1:55 PM	**Next Steps**
2:00 PM	**Adjourn**

CACHE COUNTY MITIGATION STRATEGIES MEETING

Wednesday, December 17, 2014 – 11:45 AM to 2:00 PM

Riverwoods Conference Center

Attendance List

NAME	ORGANIZATION
Brian Mcnerney	NIJS
Cordell Batt	North Logan
Chris Harrold	Cache County
Jennifer hansen	FFSL
Blain Harp	FFSL
Jody Kimball	CVTD
Jay Downs	SED/CCA
Travis Peterson	Cache County Fire
Rob Hammer	Cache County Fire
Sharidean Flint	Hyde Park
Jim Brackner	River Heights
Jennifer Parker	USFS
Steve Bowman	UGS
Randy Eck	Providence City
Jeff Gilbert	Cache MPO
Shari Phippen	Nibley City
John Croft	UDEM
Rick Williams	Cache EM
Craig W Buttars	Cache County
Bob Fotheringham	Cache County
Justin Maughan	Nibley City
Mark nielson	Logan City
Kimberly Giles	UDEM
Susan Smart	Logan City Fire Dept
Joe Hansen	Cornish Town
Stephanie Miller	Hyrum City
Chris Bradshaw	Hyrum State Park
Jon Keller	North Logan PD
Judy Crockett	USU EM
Will Lusk	Logan City Fire/EM
Marlowe Adkins	Richmond City
Thomas Bailey	Wellsville City

AGENDA

PRE-DISASTER MITIGATION PLAN UPDATE – BEAR RIVER REGION

RICH COUNTY WORKING GROUP - MITIGATION STRATEGIES MEETING

Wednesday, December 17, 2014 – 4:00 PM to 6:30 PM

Bear Lake Pizza (Catered by Bear Trapper Steakhouse)
240 S. Bear Lake Blvd.
Garden, UT 84028

4:00 PM	**Welcome and Introductions – Zac Covington**
4:05 PM	**Potential Loss Analysis – Zac Covington**
4:20 PM	**Mitigation Strategies for Geologic Hazards** ***Steve Bowman and Richard Giraud, Utah Geological Survey***
4:50 PM	**Mitigation Strategies for Severe Weather** ***Brian McInerney, National Weather Service***
5:10 PM	**Mitigation Strategies for Wildfire Hazards** ***Jennifer Hansen and Blaine Hamp, Utah Forestry, Fire, and State Lands***
5:40 PM	**Mitigation Strategies for Flooding** ***John Crofts, Utah Department of Public Safety***
6:00 PM	**Dinner / Next Steps**
6:30 PM	**Adjourn**

RICH COUNTY MITIGATION STRATEGIES MEETING

Wednesday, December 17, 2014 – 4:00 PM to 6:30 PM
Bear Lake Pizza
Attendance List

NAME	ORGANIZATION
Melinda Hislop	Bear Lake CVB
Joey Stocking	Bear Lake Rendezvous Chamber of Com.
Steve Bowman	UGS
Brian Mcwerney	NGUS
James Turner	USFS
John Croft	UDEM
Dale Stacey	Rich County Sheriff
Mitch Paulsen	BLRC
Kimberly Giles	UDEM
Bryce Nielson	Rich County
Jennifer Hansen	FFSL

AGENDA

PRE-DISASTER MITIGATION PLAN UPDATE – BEAR RIVER REGION

REGIONAL DRAFT PDMP FINDINGS AND PRE-ADOPTION MEETING

Thursday, May 28th, 2015 – 11:00 AM to 1:15 PM

Training Room #2 - 2nd Floor
Cache County Sheriff's Complex
1225 West Valley View Highway
Logan, UT

11:00 AM	**Welcome and Introductions** *Rick Williams, Cache County Emergency Management*
11:15 AM	**Presentation on DRAFT PDMP Plan and Findings** *Zac Covington and Zach Maughan, BRAG staff*
12:00 PM	**LUNCH (Provided)**
12:30 PM	**Plan Adoption and Implications for Local Governments** *Eric Martineau, Utah Division of Emergency Management*
1:00 PM	**Public Comment Period and Plan Adoption Timeline** *Zac Covington*
1:15 PM	**Adjourn**

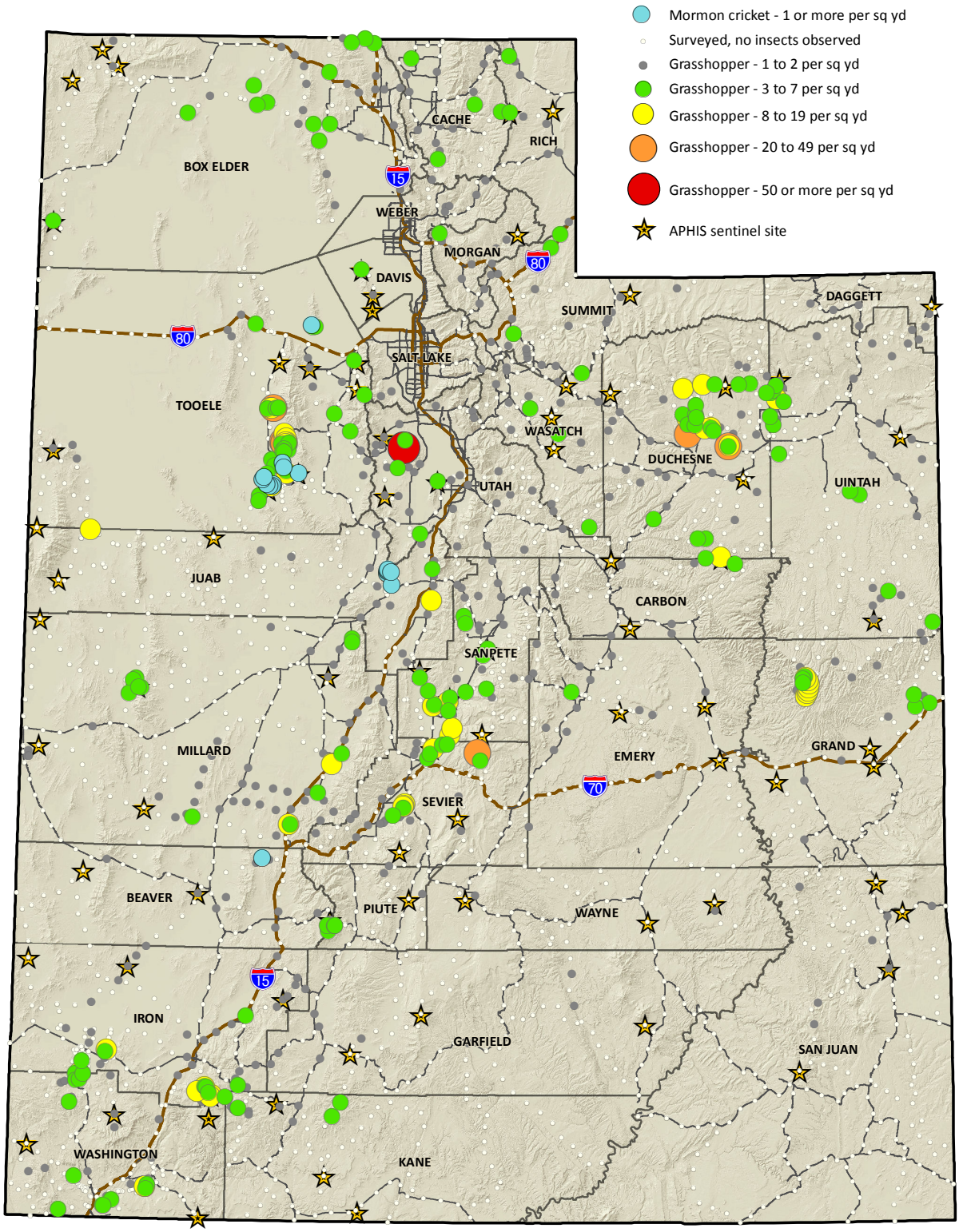
REGIONAL DRAFT PLAN PRESENTATION MEETING
Thursday, May 28th, 2015 – 11:00 AM to 1:15 PM
Cache County Sheriff's Complex
ATTENDANCE LIST

NAME	ORGANIZATION
Shari Phippen	Nibley city
Marlowe Adkins	Richmond City
Mark Nielsen	Logan
Chris Harrild	Cache County
Paul Fulgham	Tremonton City
Shawn Warnke	Tremonton City
Nick Tanner	Nibley city
Eric Martineau	UDEM
Jason Winn	CCFD
Bryce Wheelwright	Willard City
Bryce Nielson	Rich County
Kevin Potter	Box Elder County
Marsha Anderson	Box Elder County
Chris Bradshaw	State Parks
Scott Lyons	Box Elder County
Marcus Wager	Box Elder County
Judy Crockett	USU EM
Jody Kimball	CVTD
Dwight Slaugh	USBR
Cordell Batt	North Logan City
Nic Tree	Portage
Tam Davis	Portage
James Brackner	River Heights City
Alyssa Petersen	Paradise Town
Rick Williams	Cache County Em
Mitch Poulsen	Rich County
Derek Oyler	Brigham City
Troy Herold	SITLA
Bob Fotheringham	Cache Coutny
Jay Downs	Cache County Em
Brian Carver	Brag
Bianca Peterson	Bear River Health
Zach Maughan	Brag

APPENDIX J - 2014 UTAH GRASSHOPPER AND CRICKET INFESTATION MAP AND DATA

(www.ag.utah.gov)

2014 Grasshopper and Mormon Cricket Survey



Grasshopper Infested Acreage By Year															
County	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Box Elder	55,000	120,400	120,000	94,710	6,570	15,200	15,270	13,644	18,918	62,151	118,727	43,334	49,139	30,882	14,773
Cache	19,000	64,500	17,000	2,200	26,380	2,170	10,490	10,616	3,856	22,442	47,869	14,393	16,246	3,840	5,489
Rich		12,400		32,140	68,830	4,000				2,192	3,519	6,030	29,003	1,280	2,212
Mormon Cricket Infested Acreage By Year															
County	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Box Elder			108,300	125,900	276,620	499,550	966,340	98,276	30,326	3,892			1,829		
Cache		8,100	4,400	8,400	8,260										
Rich						2,530									

***Utah Mormon Cricket and Grasshopper Report 2014**
Clinton E. Burfitt – UDAF: State Entomologist
Gregory C. Abbott – USDA APHIS: Domestic Programs Coordinator

APPENDIX K - HISTORIC NATURAL HAZARD EVENTS

Box Elder County Severe Weather Events 1947-2015								
Inj = Injuries, PrD = Property Damage, CrD = Crop Damage, Mag = Magnitude, Dth = Deaths								
Location or County	**Date**	**Time**	**Type**	**Mag**	**Dth**	**Inj**	**PrD**	**CrD**
Brigham City/ Willard	8/6, 8/8/1947	-	Cloudburst flooding, fruit orchard damages	-	-	-	-	-
Perry	5/17/1949	-	Flash Flood, Mt. Baldy, 50 farms, orchards, roads damaged	-	-	-	-	-
Willard	8/10/1952	-	Cloudburst east of Willard Mtn., hail, US 91 covered with mud	-	-	-	-	-
1 Box Elder	5/11/1958	1600	Tstm Wind	0 kts.	0	0	0	0
2 Box Elder	5/30/1958	1600	Tstm Wind	0 kts.	0	0	0	0
3 Box Elder	6/12/1958	1130	Hail	0.75 in.	0	0	0	0
4 Box Elder	6/12/1958	1130	Hail	0.75 in.	0	0	0	0
5 Box Elder	7/30/1958	1500	Hail	1.00 in.	0	0	0	0
6 Box Elder	7/30/1958	1500	Hail	1.00 in.	0	0	0	0
7 Box Elder	6/9/1960	1600	Hail	1.00 in.	0	0	0	0
Brigham City	6/14/1960	-	Heavy rain storm, large hail stones, crop damage	-	-	-	-	-
8 Box Elder	7/9/1962	1530	Tornado, Grouse Creek	F	0	0	0K	0
Howell	8/8, 8/9, 8/10/1968	-	Cloudburst in Blue Creek/Howell area, flooding, farmland damage	-	-	-	-	-
9 Box Elder	8/14/1968	1435	Tornado, Collingston	F	0	0	0K	0
Brigham City	6/24/1969	-	Cloudburst Flooding, local businesses damaged	-	-	-	-	-
10 Box Elder	6/5/1970	1620	Tornado	F	0	0	0K	0
11 Box Elder	4/28/1979	1540	Tstm Wind	0 kts.	0	0	0	0
12 Box Elder	7/24/1982	2115	Tstm Wind	0 kts.	0	0	0	0
13 Box Elder	7/24/1982	2200	Tstm Wind	65 kts.	0	0	0	0
14 Box Elder	3/15/1984	1815	Tstm Wind	60 kts.	0	0	0	0
15 Box Elder	6/29/1984	1500	Tstm Wind	56 kts.	0	0	0	0
16 Box Elder	8/16/1984	1725	Tornado, between Tremonton and Snowville	F0	0	0	0K	0
17 Box Elder	8/16/1984	1729	Tornado, between Tremonton and Snowville	F0	0	0	0K	0
Box Elder County	10/22/1985	-	Waterspout, Great Salt Lake	-	-	-	-	-
18 Box Elder	7/26/1986	1830	Tstm Wind	52 kts.	0	0	0	0
19 Box Elder	7/26/1986	1830	Tstm Wind	52 kts.	0	0	0	0
20 Box Elder	9/8/1986	1744	Tstm Wind	56 kts.	0	0	0	0
21 Box Elder	9/9/1986	1055	Hail	1.00 in.	0	0	0	0
22 Box Elder	9/9/1986	1100	Hail	1.00 in.	0	0	0	0
23 Box Elder	8/25/1987	1235	Tornado, Plymouth	F0	0	0	0K	0
24 Box Elder	7/27/1988	1625	Tstm Wind	52 kts.	0	0	0	0
25 Box Elder	8/19/1989	1500	Hail	0.75 in.	0	0	0	0
Box Elder County	8/24/1989	-	Waterspout, Willard Bay	-	-	-	-	-
26 Box Elder	8/23/1990	1905	Tstm Wind	60 kts.	0	0	0	0

27 Box Elder	3/5/1991	55	Tstm Wind	70 kts.	0	0	0	0
28 Box Elder	9/10/1991	1300	Tornado, Brigham City	F0	0	0	0K	0
29 Box Elder	5/8/1992	1615	Tstm Wind	60 kts.	0	0	0	0
30 Box Elder	8/16/1992	1945	Tstm Wind	65 kts.	0	0	0	0
31 Box Elder	9/23/1992	1750	Tstm Wind	75 kts.	0	0	0	0
32 Lakeside	4/1/1993	1600	Tstm Wind	50 kts.	0	0	0	0
33 Lakeside	4/1/1993	1645	Tstm Wind	52 kts.	0	0	0	0
34 Tremonton	4/1/1993	1730	Tstm Wind	52 kts.	0	0	0K	0
35 Lakeside	5/3/1993	1855	Tstm Wind	50 kts.	0	0	0	0
36 Salt Lake City	5/3/1993	1855	Tstm Wind	56 kts.	0	0	0	0
37 Box Elder	8/11/1993	1900	Tstm Wind	50 kts.	0	0	0	0
38 Brigham City	4/23/1994	1535	Tstm Wind	0 kts.	0	0	0	0
39 Brigham City	5/22/1995	1615	Hail	1.00 in.	0	0	0	0
40 Yost	6/5/1995	1508	Hail	0.75 in.	0	0	0	0
41 Box Elder	7/21/1995	1950	Hail	1.00 in.	0	0	0	0
42 Brigham City Area	5/16/1996	9:35 PM	Urban/sml Stream Fld	N/A	0	8	40K	0
43 Promontory	6/9/1997	9:29 AM	Funnel Cloud	N/A	0	0	0	0
44 Yost	7/10/1997	2:22 PM	Hail	1.75 in.	0	0	30K	30K
45 (Bmc)Brigham City	8/10/1997	7:40 PM	Tstm Wind	58 kts.	0	0	5K	0
46 Thatcher	9/6/1997	8:20 PM	Hail	0.88 in.	0	0	0	0
47 Riverside	9/11/1997	1:30 PM	Hail	0.75 in.	0	0	5K	0
48 Promontory	6/3/1998	3:15 PM	Funnel Cloud	N/A	0	0	0K	0K
49 Promontory	6/3/1998	3:15 PM	Hail	0.75 in.	0	0	0K	0K
50 Thatcher	8/26/1998	3:00 PM	Hail	0.75 in.	0	0	0K	2K
51 Countywide	4/27/1999	12:00 PM	Heavy Rain	N/A	0	0	0	0
52 Central Portion	8/30/1999	2:00 PM	Dry Microburst	N/A	0	0	0	0
Box Elder County	9/19/1999	-	2 Tornados near Park Valley	-	-	-	-	-
53 Lakeside	7/14/2001	5:00 PM	Tstm Wind	50 kts.	0	0	0	0
54 Central Portion	8/14/2001	3:35 PM	Hail	0.75 in.	0	0	0	0
55 Countywide	8/20/2001	4:45 PM	Tstm Wind	53 kts.	0	0	0	0
56 Central Portion	6/2/2002	1:00 PM	Tstm Wind	70 kts.	0	0	2K	2K
57 Snowville	9/6/2002	8:00 PM	Hail	0.75 in.	0	0	0	0
58 Kelton	9/12/2002	6:00 PM	Funnel Cloud	N/A	0	0	0	0
59 Lakeside	9/16/2002	10:30 AM	Tstm Wind	63 kts.	0	0	0	0
60 Tremonton	6/20/2003	4:50 PM	Tstm Wind	52 kts.	0	0	10K	0
61 Countywide	8/22/2003	1:45 PM	Tstm Wind	62 kts.	0	0	0	0
62 Brigham City	6/21/2004	2:00 PM	Hail	0.01 in.	0	0	24K	0
63 Lucin	8/1/2004	10:45 AM	Tstm Wind	58 kts.	0	0	0K	0
64 Lakeside	8/1/2004	12:15 PM	Tstm Wind	66 kts.	0	0	0K	0
65 Promontory	8/2/2004	3:37 PM	Tstm Wind	58 kts.	0	0	0K	0
66 Brigham City	4/27/2005	12:00 PM	Heavy Rain	N/A	0	0	0	0
67 Etna	5/16/2005	4:15 PM	Tstm Wind	63 kts.	0	0	0	0
68 Lakeside	7/29/2005	4:30 PM	Tstm Wind	61 kts.	0	0	0	0
69 Promontory Pt	9/23/2005	7:15 PM	Tstm Wind	64 kts.	0	0	0	0
70 Lakeside	6/7/2006	4:45 PM	Tstm Wind	65 kts.	0	0	0	0
71 Lakeside	6/9/2006	4:15 PM	Tstm Wind	73 kts.	0	0	0	0
72 Brigham City	7/4/2006	5:00 PM	Tstm Wind	72 kts.	0	0	0	0
73 Lakeside	4/8/2007	12:30 AM	Tstm Wind	53 kts.	0	0	0K	0K
74 Saline	4/8/2007	12:30 AM	Tstm Wind	53 kts.	0	0	0K	0K
75 Willard	6/16/2007	21:31 PM	Tstm Wind	56 kts.	0	0	0K	0K
76 Promontory Pt	7/7/2007	20:45 PM	Tstm Wind	51 kts.	0	0	0K	0K
77 Saline	7/15/2007	17:00 PM	Tstm Wind	57 kts.	0	0	0K	0K
78 Grouse Creek	7/17/2007	16:42 PM	Tstm Wind	55 kts.	0	0	0K	0K
79 Plymouth	7/25/2007	12:00 PM	Tornado	F0	0	0	0K	0K

80 Honeyville	8/5/2007	17:00 PM	Tstm Wind	50 kts.	0	0	15K	0K
81 Lucin	8/22/2007	15:10 PM	Hail	1.00 in.	0	0	0K	0K
82 Promontory	9/4/2007	17:15 PM	Tstm Wind	53 kts.	0	0	0K	0K
83 Lakeside	8/31/2008	14:00 PM	Tstm Wind	56 kts.	0	0	0K	0K
84 Lakeside	8/31/2008	14:15 PM	Tstm Wind	69 kts.	0	0	5K	0K
Box Elder	12/2/2008	1940	High Wind	55	0	0	0	0
Box Elder	12/13/2008	400	Winter Storm		0	0	0	0
Box Elder	12/13/2008	400	Winter Storm		0	0	0	0
Box Elder	12/13/2008	800	Winter Storm		0	0	0	0
Box Elder	12/19/2008	300	Winter Storm		0	0	0	0
Box Elder	12/19/2008	600	Winter Storm		0	0	0	0
Box Elder	12/21/2008	700	Winter Storm		0	0	0	0
Box Elder	12/21/2008	900	Heavy Snow		0	0	0	0
Box Elder	12/21/2008	1400	Heavy Snow		0	0	0	0
Box Elder	12/24/2008	1030	Avalanche		2	0	0	0
Box Elder	12/24/2008	1200	Winter Storm		0	0	0	0
Box Elder	12/24/2008	2200	Winter Storm		0	0	0	0
Box Elder	12/24/2008	2300	Winter Storm		0	0	0	0
Box Elder	1/23/2009	100	Heavy Snow		0	0	0	0
Box Elder	2/9/2009	100	Heavy Snow		0	0	0	0
Box Elder	2/9/2009	300	Heavy Snow		0	0	0	0
Box Elder	2/9/2009	300	Heavy Snow		0	0	0	0
Box Elder	2/16/2009	2100	Heavy Snow		0	0	0	0
Box Elder	2/17/2009	130	Heavy Snow		0	0	0	0
Box Elder	3/3/2009	345	High Wind	76	0	0	0	0
Box Elder	3/4/2009	1810	High Wind	55	0	0	30000	0
Box Elder	3/9/2009	300	Heavy Snow		0	0	0	0
Box Elder	3/9/2009	500	Heavy Snow		0	0	0	0
Box Elder	3/22/2009	1715	High Wind	56	0	0	0	0
Box Elder	3/25/2009	100	Winter Storm		0	0	0	0
Box Elder	3/29/2009	700	High Wind	63	0	0	50000	0
Box Elder	3/29/2009	900	Winter Storm		0	0	0	0
Box Elder	3/31/2009	1000	Winter Storm		0	0	0	0
Box Elder	4/1/2009	0	Winter Storm		0	0	0	0
Box Elder	4/1/2009	240	High Wind	63	0	0	0	0
Box Elder	4/2/2009	1400	Heavy Snow		0	0	0	0
Box Elder	4/23/2009	2050	High Wind	64	0	0	0	0
PERRY	5/3/2009	1855	Hail	0.75	0	0	0	0
WILLARD	5/3/2009	1950	Tornado		0	0	25000	0
Box Elder	5/4/2009	0	High Wind	62	0	0	0	0
Box Elder	5/19/2009	1900	High Wind	60	0	0	0	0
TREMONTON	6/1/2009	1713	Hail	0.75	0	0	0	0
Box Elder	7/4/2009	1635	High Wind	53	0	0	0	0
Box Elder	7/12/2009	2235	High Wind	56	0	0	0	0
HOWELL ARPT	7/19/2009	1710	Thunderstorm Wind	52	0	0	0	0
Box Elder	7/19/2009	1845	High Wind	65	0	0	0	0
Box Elder	8/6/2009	2005	High Wind	60	0	0	2000	0
CROPLEY	8/13/2009	2110	Thunderstorm Wind	54	0	0	0	0
Box Elder	8/13/2009	2150	High Wind	68	0	0	0	0
SALINE	8/13/2009	2345	Thunderstorm Wind	56	0	0	0	0
Box Elder	9/29/2009	1900	Winter Storm		0	0	0	0
Box Elder	9/30/2009	130	High Wind	51	0	0	0	0
Box Elder	10/27/2009	150	High Wind	56	0	0	0	0
Box Elder	12/12/2009	0	Winter Storm		0	0	0	0
Box Elder	12/12/2009	0	Winter Storm		0	0	0	0

Box Elder	12/12/2009	1000	Winter Storm		0	0	0	0
Box Elder	1/18/2010	1700	Winter Storm		0	0	0	0
Box Elder	1/18/2010	1800	Winter Storm		0	0	0	0
Box Elder	1/22/2010	1000	Winter Storm		0	0	0	0
Box Elder	1/24/2010	1300	Avalanche		1	0	0	0
Box Elder	1/29/2010	1400	Avalanche		1	0	0	0
Box Elder	3/30/2010	700	High Wind	70	0	0	0	0
Box Elder	3/30/2010	1145	High Wind	64	0	0	0	0
Box Elder	3/30/2010	1930	High Wind	50	0	0	0	0
Box Elder	3/31/2010	300	Winter Storm		0	0	0	0
Box Elder	4/1/2010	0	Winter Storm		0	0	0	0
Box Elder	4/2/2010	2100	Winter Storm		0	0	0	0
Box Elder	4/4/2010	1350	Avalanche		1	0	0	0
Box Elder	4/5/2010	0	Winter Storm		0	0	0	0
Box Elder	4/5/2010	1800	Winter Storm		0	0	0	0
Box Elder	4/12/2010	1105	High Wind	55	0	0	0	0
SALINE	4/21/2010	500	Thunderstorm Wind	52	0	0	0	0
Box Elder	4/27/2010	1325	High Wind	72	0	0	250000	0
Box Elder	4/27/2010	1755	High Wind	54	0	0	0	0
Box Elder	5/4/2010	30	High Wind	56	0	0	0	0
Box Elder	5/28/2010	1300	High Wind	51	0	0	0	0
LAKESIDE	6/9/2010	1900	Thunderstorm Wind	50	0	0	0	0
Box Elder	6/12/2010	900	High Wind	52	0	0	35000	0
Box Elder	6/16/2010	1205	High Wind	56	0	0	0	0
GROUSE CREEK	7/27/2010	1730	Thunderstorm Wind	52	0	0	0	0
LAKESIDE	8/5/2010	1645	Thunderstorm Wind	54	0	0	0	0
CURLEW JCT	8/6/2010	1520	Thunderstorm Wind	65	0	0	0	0
KELTON	8/6/2010	1600	Thunderstorm Wind	54	0	0	0	0
LAKESIDE	8/6/2010	1630	Thunderstorm Wind	52	0	0	0	0
SALINE	8/6/2010	1700	Thunderstorm Wind	62	0	0	0	0
Box Elder	8/22/2010	1535	High Wind	60	0	0	0	0
LAKESIDE	9/14/2010	1330	Thunderstorm Wind	52	0	0	0	0
LAKESIDE	9/14/2010	1500	Thunderstorm Wind	51	0	0	0	0
Box Elder	10/24/2010	1000	Winter Storm		0	0	0	0
Box Elder	10/25/2010	0	High Wind	63	0	0	0	0
Box Elder	11/14/2010	1700	Winter Storm		0	0	0	0
Box Elder	11/16/2010	1115	High Wind	59	0	0	0	0
Box Elder	11/20/2010	100	Winter Storm		0	0	0	0
Box Elder	11/20/2010	500	Winter Storm		0	0	0	0
Box Elder	11/20/2010	1045	High Wind	57	0	0	0	0
Box Elder	11/23/2010	1400	Blizzard		0	0	0	0
Box Elder	11/23/2010	1515	High Wind	55	0	0	0	0
Box Elder	11/23/2010	1530	Blizzard		0	0	0	0
Box Elder	11/23/2010	1600	Blizzard		0	0	0	0
Box Elder	11/27/2010	1600	Winter Storm		0	0	0	0
Box Elder	11/27/2010	1700	Winter Storm		0	0	0	0
Box Elder	12/14/2010	1200	Winter Storm		0	0	0	0
Box Elder	12/18/2010	100	Winter Storm		0	0	0	0
Box Elder	12/28/2010	2300	Winter Storm		0	0	0	0
Box Elder	12/28/2010	2300	Winter Storm		0	0	0	0
Box Elder	12/28/2010	2300	Winter Storm		0	0	0	0
Box Elder	2/1/2011	1200	High Wind	55	0	0	0	0
Box Elder	2/7/2011	1645	High Wind	60	0	0	0	0
Box Elder	2/16/2011	1200	Winter Storm		0	0	0	0
Box Elder	2/16/2011	1240	High Wind	65	0	0	0	0
Box Elder	2/16/2011	1300	High Wind	59	0	0	0	0

Box Elder	2/16/2011	1800	Winter Storm		0	0	0	0
Box Elder	2/19/2011	1500	Winter Storm		0	0	0	0
Box Elder	2/24/2011	1000	Winter Storm		0	0	0	0
Box Elder	2/25/2011	0	Winter Storm		0	0	0	0
Box Elder	2/25/2011	100	Winter Storm		0	0	0	0
Box Elder	3/5/2011	2200	Winter Storm		0	0	0	0
Box Elder	3/7/2011	1430	Winter Storm		0	0	0	0
Box Elder	3/7/2011	1830	High Wind	55	0	0	0	0
Box Elder	3/21/2011	1135	High Wind	60	0	0	0	0
Box Elder	3/21/2011	1600	Winter Storm		0	0	0	0
Box Elder	4/2/2011	1650	High Wind	56	0	0	0	0
Box Elder	4/5/2011	1650	High Wind	56	0	0	0	0
Box Elder	4/7/2011	500	Winter Storm		0	0	0	0
Box Elder	4/7/2011	1100	Winter Storm		0	0	0	0
Box Elder	4/7/2011	1500	Winter Storm		0	0	0	0
Box Elder	4/13/2011	1610	High Wind	62	0	0	0	0
LAKESIDE	4/21/2011	1130	Thunderstorm Wind	63	0	0	0	0
Box Elder	4/21/2011	1200	High Wind	62	0	0	0	0
TREMONTON	4/21/2011	1210	Thunderstorm Wind	52	0	0	3000	0
LAKESIDE	4/25/2011	1630	Thunderstorm Wind	54	0	0	0	0
Box Elder	5/15/2011	600	High Wind	50	0	0	5000	0
Box Elder	5/15/2011	1115	High Wind	70	0	0	0	0
Box Elder	6/1/2011	1940	High Wind	50	0	0	0	0
Box Elder	6/6/2011	1000	High Wind	63	0	0	0	0
Box Elder	6/6/2011	1442	High Wind	52	0	0	0	0
Box Elder	6/6/2011	1600	High Wind	69	0	0	0	0
Box Elder	6/28/2011	1600	High Wind	56	0	0	0	0
Box Elder	6/29/2011	1150	High Wind	63	0	0	0	0
KELTON	7/9/2011	1630	Thunderstorm Wind	51	0	0	0	0
WHEELON STATION	7/10/2011	1810	Thunderstorm Wind	66	0	0	0	0
Box Elder	10/5/2011	1000	High Wind	63	0	0	0	0
Box Elder	10/5/2011	2300	Winter Storm		0	0	0	0
Box Elder	10/16/2011	2020	High Wind	50	0	0	0	0
Box Elder	11/12/2011	600	Winter Storm		0	0	0	0
Box Elder	11/25/2011	1415	High Wind	56	0	0	0	0
Box Elder	11/30/2011	2355	High Wind	56	0	0	0	0
Box Elder	12/1/2011	0	High Wind	58	0	0	0	0
Box Elder	12/1/2011	220	High Wind	89	0	3	68000000	0
Box Elder	12/30/2011	2030	High Wind	63	0	0	0	0
Box Elder	1/18/2012	1500	Winter Storm		0	0	0	0
Box Elder	1/21/2012	0	Winter Storm		0	0	0	0
Box Elder	1/21/2012	415	High Wind	62	0	0	0	0
Box Elder	1/21/2012	1400	Winter Storm		0	0	0	0
Box Elder	2/3/2012	415	High Wind	56	0	0	0	0
Box Elder	2/22/2012	400	High Wind	77	0	0	0	0
Box Elder	2/22/2012	2145	High Wind	72	0	0	0	0
Box Elder	2/25/2012	755	High Wind	57	0	0	0	0
Box Elder	2/29/2012	300	Winter Storm		0	0	0	0
Box Elder	2/29/2012	700	Winter Storm		0	0	0	0
Box Elder	3/1/2012	0	Winter Storm		0	0	0	0
Box Elder	3/1/2012	0	Winter Storm		0	0	0	0
Box Elder	3/2/2012	15	High Wind	60	0	0	0	0
Box Elder	3/6/2012	1345	High Wind	57	0	0	15000	0
Box Elder	3/17/2012	0	High Wind	76	0	0	0	0
Box Elder	3/17/2012	505	High Wind	63	0	0	0	0
Box Elder	3/17/2012	1447	High Wind	51	0	0	0	0

Box Elder	3/18/2012	0	Winter Storm		0	0	0	0
Box Elder	3/26/2012	515	High Wind	55	0	0	0	0
Box Elder	3/26/2012	800	High Wind	68	0	0	0	0
Box Elder	3/31/2012	1205	High Wind	61	0	0	0	0
Box Elder	3/31/2012	2000	High Wind	87	0	0	0	0
Box Elder	4/1/2012	0	High Wind	61	0	0	0	0
Box Elder	4/1/2012	0	High Wind	87	0	0	0	0
Box Elder	4/11/2012	1355	High Wind	71	0	0	0	0
Box Elder	4/26/2012	1550	High Wind	70	0	0	0	0
Box Elder	5/4/2012	2105	High Wind	59	0	0	0	0
Box Elder	6/5/2012	145	High Wind	64	0	0	0	0
Box Elder	6/9/2012	1355	High Wind	54	0	0	0	0
Box Elder	6/18/2012	1400	High Wind	62	0	0	15000	0
Box Elder	6/23/2012	1255	High Wind	52	0	0	0	0
LAKESIDE	7/10/2012	1045	Thunderstorm Wind	55	0	0	1000	0
LAKESIDE	8/31/2012	2015	Thunderstorm Wind	68	0	0	0	0
Box Elder	10/16/2012	1300	Strong Wind	44	0	0	8000	0
Box Elder	10/16/2012	1400	High Wind	56	0	0	0	0
Box Elder	10/16/2012	1655	High Wind	73	0	0	0	0
Box Elder	10/22/2012	1415	High Wind	51	0	0	0	0
Box Elder	10/22/2012	1600	Winter Storm		0	0	0	0
Box Elder	10/25/2012	400	Winter Weather		0	0	50000	0
Box Elder	11/9/2012	25	High Wind	51	0	0	0	0
Box Elder	11/9/2012	500	Winter Storm		0	0	0	0
Box Elder	11/9/2012	600	Winter Storm		0	0	10000	0
Box Elder	12/2/2012	725	High Wind	59	0	0	0	0
Box Elder	12/2/2012	1800	High Wind	71	0	0	0	0
Box Elder	12/16/2012	100	Winter Storm		0	0	0	0
Box Elder	12/16/2012	1500	Winter Storm		0	0	0	0
Box Elder	12/23/2012	2100	Winter Storm		0	0	0	0
Box Elder	1/10/2013	1000	Winter Storm		0	0	0	0
Box Elder	1/10/2013	1300	Winter Storm		0	0	0	0
Box Elder	1/10/2013	1500	Winter Storm		0	0	0	0
Box Elder	1/24/2013	700	Ice Storm		0	0	0	0
Box Elder	1/27/2013	500	Winter Storm		0	0	0	0
Box Elder	1/27/2013	600	Winter Storm		0	0	0	0
Box Elder	1/27/2013	700	Winter Storm		0	0	0	0
Box Elder	1/29/2013	100	Winter Storm		0	0	0	0
Box Elder	2/23/2013	200	Winter Storm		0	0	0	0
Box Elder	2/23/2013	600	Winter Storm		0	0	0	0
Box Elder	2/23/2013	600	Winter Storm		0	0	0	0
Box Elder	3/21/2013	425	High Wind	64	0	0	0	0
Box Elder	4/8/2013	1100	Winter Storm		0	0	0	0
Box Elder	4/8/2013	2230	High Wind	55	0	0	0	0
Box Elder	4/8/2013	2355	High Wind	65	0	0	85000	0
Box Elder	4/22/2013	830	High Wind	59	0	0	0	0
Box Elder	5/4/2013	2351	High Wind	52	0	0	0	0
SALINE	6/12/2013	1845	Thunderstorm Wind	54	0	0	0	0
Box Elder	6/13/2013	1615	High Wind	54	0	0	0	0
KELTON	7/3/2013	2315	Thunderstorm Wind	55	0	0	0	0
SALINE	7/4/2013	100	Thunderstorm Wind	51	0	0	0	0
LAKESIDE	7/5/2013	1645	Thunderstorm Wind	61	0	0	0	0
KELTON	7/7/2013	1615	Thunderstorm Wind	53	0	0	0	0
PLYMOUTH	7/7/2013	1650	Thunderstorm Wind	50	0	0	0	0
Box Elder	8/10/2013	1900	Wildfire		0	0	350000	0
SALINE	9/6/2013	1545	Thunderstorm Wind	52	0	0	0	0

SALINE	9/17/2013	1815	Thunderstorm Wind	63	0	0	0	0
WILLARD	9/17/2013	1830	Thunderstorm Wind	50	0	0	0	0
Box Elder	9/24/2013	1915	High Wind	52	0	0	0	0
Box Elder	10/28/2013	300	High Wind	63	0	0	0	0
Box Elder	11/21/2013	1200	High Wind	74	0	0	300000	0
Box Elder	12/2/2013	1900	Winter Storm		0	0	0	0
Box Elder	12/7/2013	200	Winter Storm		0	0	0	0
Box Elder	12/7/2013	500	Winter Storm		0	0	0	0
Box Elder	12/9/2013	0	Cold/Wind Chill		0	0	40000	0
Box Elder	12/19/2013	0	Winter Storm		0	0	0	0
Box Elder	12/19/2013	200	Winter Storm		0	0	0	0
Box Elder	12/19/2013	400	Winter Storm		0	0	0	0
Box Elder	1/9/2014	600	Winter Storm		0	0	0	0
Box Elder	1/11/2014	1800	Winter Storm		0	0	0	0
Box Elder	1/29/2014	1100	Winter Storm		0	0	0	0
Box Elder	2/5/2014	300	Winter Storm		0	0	0	0
Box Elder	2/12/2014	900	Winter Storm		0	0	0	0
Box Elder	2/16/2014	1000	High Wind	55	0	0	0	0
Box Elder	3/1/2014	0	Winter Storm		0	0	0	0
Box Elder	3/1/2014	700	High Wind	51	0	0	0	0
Box Elder	3/10/2014	1800	High Wind	59	0	0	0	0
Box Elder	3/17/2014	700	High Wind	59	0	0	0	0
Box Elder	3/17/2014	800	High Wind	70	0	0	0	0
Box Elder	3/17/2014	1200	High Wind	50	0	0	15000	0
Box Elder	4/22/2014	1230	High Wind	71	0	0	0	0
Box Elder	4/22/2014	1630	High Wind	63	0	1	150000	0
Box Elder	5/11/2014	935	High Wind	54	0	0	0	0
Box Elder	5/11/2014	1932	High Wind	50	0	0	0	0
PLYMOUTH	6/12/2014	1910	Thunderstorm Wind	55	0	0	0	0
Box Elder	6/16/2014	2200	Winter Weather		0	0	0	0
WILLARD	6/17/2014	1000	Funnel Cloud		0	0	0	0
PROMONTORY PT	7/14/2014	1815	Thunderstorm Wind	63	0	0	0	0
GROUSE CREEK	8/8/2014	1550	Thunderstorm Wind	53	0	0	0	0
LAKESIDE	8/12/2014	1730	Thunderstorm Wind	54	0	0	0	0
LAKESIDE	9/27/2014	115	Thunderstorm Wind	56	0	0	0	0
Box Elder	10/12/2014	300	High Wind	56	0	0	0	0
Box Elder	11/1/2014	1045	High Wind	70	0	0	0	0
Box Elder	11/10/2014	500	High Wind	55	0	0	0	0
Box Elder	11/22/2014	1000	Winter Storm		0	0	0	0
Box Elder	11/22/2014	1400	High Wind	60	0	0	0	0
Box Elder	12/12/2014	600	High Wind	55	0	0	0	0
Box Elder	12/20/2014	200	Winter Storm		0	0	0	0
Box Elder	12/22/2014	1415	High Wind	65	0	0	0	0
Box Elder	12/25/2014	100	Winter Storm		0	0	0	0
Box Elder	12/25/2014	100	Winter Storm		0	0	0	0
Box Elder	12/28/2014	400	Winter Storm		0	0	0	0
Box Elder	12/28/2014	500	Winter Storm		0	0	0	0
Box Elder	12/28/2014	700	Winter Storm		0	0	0	0
Box Elder	12/29/2014	2300	High Wind	68	0	0	75000	0
TOTALS:					**5**	**12**	**$69,514,000**	**0**

Sources: Numbered events from the National Climatic Data Center (2008), 1950-2008 data; Other data from the State of Utah Office of Emergency Services (1976), 1939-1976 data, and from the Utah Center for Climate and Weather (2005).

Cache County Severe Weather Events 1950-2015								
Inj = Injuries, PrD = Property Damage, CrD = Crop Damage, Mag = Magnitude, Dth = Deaths								
Location or County	**Date**	**Time**	**Type**	**Mag**	**Dth**	**Inj**	**PrD**	**CrD**
Cache County	12/13/2008	12:00 AM	Winter Storm		0	0	0	0
Cache County	12/13/2008	600	Winter Storm		0	0	0	0
Cache County	12/19/2008	300	Winter Storm		0	0	0	0
Cache County	12/19/2008	700	Winter Storm		0	0	0	0
Cache County	12/21/2008	700	Winter Storm		0	0	0	0
Cache County	12/21/2008	1300	Heavy Snow		0	0	0	0
Cache County	12/24/2008	1030	Avalanche		2	0	0	0
Cache County	12/24/2008	1200	Winter Storm		0	0	0	0
Cache County	12/24/2008	2300	Winter Storm		0	0	0	0
Cache County	1/23/2009	100	Heavy Snow		0	0	0	0
Cache County	2/9/2009	100	Heavy Snow		0	0	0	0
Cache County	2/16/2009	2100	Heavy Snow		0	0	0	0
Cache County	3/3/2009	345	High Wind	76	0	0	0	0
Cache County	3/9/2009	100	Heavy Snow		0	0	0	0
Cache County	3/9/2009	500	Heavy Snow		0	0	0	0
Cache County	3/25/2009	100	Winter Storm		0	0	0	0
Cache County	3/29/2009	900	Winter Storm		0	0	0	0
Cache County	3/31/2009	1000	Winter Storm		0	0	0	0
Cache County	4/1/2009	0	Winter Storm		0	0	0	0
Cache County	4/2/2009	1400	Heavy Snow		0	0	0	0
Cache County	9/29/2009	1900	Winter Storm		0	0	0	0
Cache County	12/12/2009	100	Winter Storm		0	0	0	0
Cache County	12/12/2009	1000	Winter Storm		0	0	0	0
Cache County	12/21/2009	1300	Winter Storm		0	0	0	0
Cache County	1/18/2010	1700	Winter Storm		0	0	0	0
Cache County	1/20/2010	2200	Winter Storm		0	0	0	0
Cache County	1/22/2010	1000	Winter Storm		0	0	0	0
Cache County	1/24/2010	1300	Avalanche		1	0	0	0
Cache County	1/29/2010	1400	Avalanche		1	0	0	0
Cache County	3/30/2010	700	High Wind	70	0	0	0	0
Cache County	3/30/2010	1335	High Wind	65	0	0	0	0
Cache County	3/31/2010	300	Winter Storm		0	0	0	0
Cache County	4/1/2010	0	Winter Storm		0	0	0	0
Cache County	4/2/2010	2100	Winter Storm		0	0	0	0
Cache County	4/4/2010	1350	Avalanche		1	0	0	0
Cache County	4/5/2010	0	Winter Storm		0	0	0	0
Cache County	4/5/2010	1800	Winter Storm		0	0	0	0
Cache County	4/27/2010	2336	High Wind	52	0	0	0	0
Cache County	10/24/2010	1000	Winter Storm		0	0	0	0
Cache County	11/14/2010	1700	Winter Storm		0	0	0	0
Cache County	11/20/2010	100	Winter Storm		0	0	0	0
Cache County	11/23/2010	1400	Blizzard		0	0	0	0
Cache County	11/23/2010	1500	Blizzard		0	0	0	0
Cache County	11/27/2010	1700	Winter Storm		0	0	0	0
Cache County	11/27/2010	1700	Winter Storm		0	0	0	0
Cache County	12/14/2010	1200	Winter Storm		0	0	0	0
Cache County	12/18/2010	100	Winter Storm		0	0	0	0
Cache County	12/28/2010	2300	Winter Storm		0	0	0	0

Cache County	2/16/2011	1200	Winter Storm		0	0	0	0
Cache County	2/16/2011	1800	Winter Storm		0	0	0	0
Cache County	2/19/2011	1500	Winter Storm		0	0	0	0
Cache County	2/24/2011	1000	Winter Storm		0	0	0	0
Cache County	2/25/2011	200	Winter Storm		0	0	0	0
Cache County	3/5/2011	2200	Winter Storm		0	0	0	0
Cache County	3/7/2011	1630	Winter Storm		0	0	0	0
Cache County	3/21/2011	1600	Winter Storm		0	0	0	0
Cache County	4/7/2011	1100	Winter Storm		0	0	0	0
Cache County	6/6/2011	1600	High Wind	69	0	0	0	0
Cache County	10/5/2011	2300	Winter Storm		0	0	0	0
Cache County	11/12/2011	600	Winter Storm		0	0	0	0
Cache County	11/18/2011	700	Winter Storm		0	0	0	0
Cache County	1/18/2012	1500	Winter Storm		0	0	0	0
Cache County	1/21/2012	0	Winter Storm		0	0	0	0
Cache County	1/21/2012	1530	High Wind	50	0	0	0	0
Cache County	2/22/2012	400	High Wind	77	0	0	0	0
Cache County	2/29/2012	300	Winter Storm		0	0	0	0
Cache County	2/29/2012	630	Winter Storm		0	0	0	0
Cache County	3/1/2012	0	Winter Storm		0	0	0	0
Cache County	3/1/2012	0	Winter Storm		0	0	0	0
Cache County	3/17/2012	0	High Wind	76	0	0	0	0
Cache County	3/18/2012	0	Winter Storm		0	0	0	0
Cache County	3/26/2012	800	High Wind	68	0	0	0	0
Cache County	3/31/2012	2000	High Wind	87	0	0	0	0
Cache County	4/1/2012	0	High Wind	87	0	0	0	0
Cache County	10/16/2012	1655	High Wind	73	0	0	0	0
Cache County	10/22/2012	1600	Winter Storm		0	0	0	0
Cache County	10/23/2012	200	Winter Weather		0	0	20000	0
Cache County	11/9/2012	500	Winter Storm		0	0	0	0
Cache County	12/2/2012	1800	High Wind	71	0	0	0	0
Cache County	12/16/2012	100	Winter Storm		0	0	0	0
Cache County	12/23/2012	2100	Winter Storm		0	0	0	0
Cache County	12/24/2012	0	Winter Storm		0	0	0	0
Cache County	1/10/2013	1000	Winter Storm		0	0	0	0
Cache County	1/27/2013	600	Winter Storm		0	0	0	0
Cache County	1/27/2013	800	Winter Storm		0	0	0	0
Cache County	2/23/2013	200	Winter Storm		0	0	0	0
Cache County	2/23/2013	730	Winter Storm		0	0	0	0
Cache County	4/8/2013	1100	Winter Storm		0	0	0	0
Cache County	12/7/2013	200	Winter Storm		0	0	0	0
Cache County	12/19/2013	0	Winter Storm		0	0	0	0
Cache County	12/19/2013	0	Winter Storm		0	0	0	0
Cache County	1/9/2014	600	Winter Storm		0	0	0	0
Cache County	1/11/2014	1800	Winter Storm		0	0	0	0
Cache County	1/29/2014	1100	Winter Storm		0	0	0	0
Cache County	2/5/2014	300	Winter Storm		0	0	0	0
Cache County	2/5/2014	400	Winter Storm		0	0	0	0
Cache County	2/12/2014	900	Winter Storm		0	0	0	0
Cache County	3/1/2014	0	Winter Storm		0	0	0	0
Cache County	3/17/2014	700	High Wind	59	0	0	0	0

Cache County	3/17/2014	900	High Wind	50	0	0	80000	0
Cache County	4/22/2014	1625	High Wind	56	0	0	250000	0
Cache County	6/16/2014	2200	Winter Weather		0	0	0	0
Cache County	11/10/2014	300	High Wind	55	0	0	0	0
Cache County	11/22/2014	1000	Winter Storm		0	0	0	0
Cache County	12/20/2014	200	Winter Storm		0	0	0	0
Cache County	12/25/2014	100	Winter Storm		0	0	0	0
Cache County	12/25/2014	100	Winter Storm		0	0	0	0
Cache County	12/28/2014	400	Winter Storm		0	0	0	0
Cache County	12/28/2014	700	Winter Storm		0	0	0	0
(LGU)LOGAN-CACHE AI	7/12/2009	1955	Thunderstorm Wind	55	0	0	0	0
(LGU)LOGAN-CACHE AI	6/29/2011	1605	Thunderstorm Wind	50	0	0	0	0
(LGU)LOGAN-CACHE AI	6/12/2013	1950	Thunderstorm Wind	53	0	0	0	0
1 Cache	6/20/1969	1900	Hail	0.75 in.	0	0	0	0
10 Cache	8/25/1987	1305	Tornado, east of Benson	F0	0	0	0K	0
100 Cache	2/14/2005	9:00 PM	Heavy Snow	N/A	0	0	0	0
101 Cache	3/18/2005	6:00 AM	Heavy Snow	N/A	0	0	0	0
102 Cache	4/8/2005	6:00 PM	Strong Wind	55 kts.	0	0	20K	0
103 Cache	4/27/2005	12:00 PM	Heavy Rain	N/A	0	0	0	0
104 Cache	4/28/2005	3:00 PM	Flash Flood	N/A	0	0	0	0
105 Cache	4/28/2005	11:00 AM	Flood	N/A	0	0	0	0
106 Cache	6/6/2005	11:00 AM	Heavy Rain	N/A	0	0	0	0
107 Cache	1/1/2006	10:00 PM	Flash Flood	N/A	0	0	0	0
108 Cache	2/15/2006	1:50 AM	Heavy Snow	N/A	0	0	0	0
109 Cache	3/18/2006	5:00 AM	Heavy Snow	N/A	0	0	0	0
11 Cache	9/8/1987	1736	Tstm Wind	55 kts.	0	0	0	0
110 Cache	4/6/2006	8:00 AM	Heavy Snow	N/A	0	0	0	0
111 Cache	2/27/2007	6:00 AM	Heavy Snow	N/A	0	0	0K	0K
112 Cache	8/5/2007	17:15 PM	Tstm Wind	50 kts.	0	0	0K	0K
113 Cache	8/19/2007	13:37 PM	Tstm Wind	52 kts.	0	0	0K	0K
114 Cache	9/4/2007	16:36 PM	Flash Flood	N/A	0	0	0K	0K
115 Cache	1/31/2008	18:00 PM	Heavy Snow	N/A	0	0	0K	0K
116 Cache	1/31/2008	18:00 PM	Winter Storm	N/A	0	0	0K	0K
117 Cache	2/1/2008	12:00 AM	Heavy Snow	N/A	0	0	0K	0K
118 Cache	2/1/2008	12:00 AM	Winter Storm	N/A	0	0	0K	0K
119 Cache	2/3/2008	2:00 AM	Heavy Snow	N/A	0	0	0K	0K
12 Cache	11/1/1988	2335	Tstm Wind	64 kts.	0	0	0	0
120 Cache	2/3/2008	2:00 AM	Winter Storm	N/A	0	0	0K	0K
121 Cache	2/13/2008	11:00 AM	Winter Storm	N/A	0	0	0K	0K
13 Cache	9/17/1989	1630	Tornado, Cornish	F1	0	0	25K	0
14 Cache	5/7/1992	1908	Tstm Wind	75 kts.	0	0	0	0
15 Cache	6/12/1992	1935	Tstm Wind	0 kts.	0	0	0	0
16 Cache	10/6/1992	1345	Hail	1.00 in.	0	0	0	0
17 Cache	1/2/1993	530	Heavy Snow	N/A	0	0	0	0
18 Cache	1/11/1993	200	Heavy Snow	N/A	0	1	1K	0
19 Cache	1/14/1993	2200	Ice Storm	N/A	0	0	0	0
2 Cache	6/14/1979	2230	Tstm Wind	61 kts.	0	0	0	0
20 Cache	2/20/1993	1230	Heavy Snow	N/A	0	0	0	0
21 Cache	2/24/1993	1900	Heavy Snow	N/A	0	0	0	0
22 Wellsville	4/1/1993	1730	Tstm Wind	57 kts.	0	0	0	0
23 Utz001	4/12/1993	300	Heavy Snow	N/A	0	0	0	0

24 Cache	2/17/1994	600	Heavy Snow	N/A	0	1	0	0
25 Cache	2/17/1994	1800	High Winds	0 kts.	0	0	0	0
26 Cache	2/17/1994	2300	Flash Flood	N/A	0	0	0	0
27 Logan	4/23/1994	1500	Tstm Wind	58 kts.	0	0	0	0
28 Logan	7/5/1994	1710	Tstm Wind	52 kts.	0	0	0	0
29 Lewiston	7/5/1994	1715	Tstm Wind	57 kts.	0	0	0	0
3 Cache	8/15/1980	1300	Tstm Wind	50 kts.	0	0	0	0
30 Cache	2/21/1996	9:00 PM	Heavy Snow	N/A	0	0	100K	0
31 Cache	2/25/1996	5:00 PM	Heavy Snow	N/A	1	1	10K	0
32 Cache	3/5/1996	12:00 PM	Heavy Snow	N/A	0	1	20K	0
33 Cache	10/24/1996	11:00 AM	Winter Storm	N/A	0	20	1.0M	0
34 Cache	11/15/1996	12:00 PM	Heavy Snow	N/A	0	0	100K	0
35 Cache	12/1/1996	8:00 AM	Winter Storm	N/A	0	30	1.0M	0
36 Cache	12/3/1996	4:00 PM	Heavy Snow	N/A	0	25	0K	0
37 Cache	12/5/1996	1:00 PM	Heavy Snow	N/A	1	20	300K	0
38 Cache	12/20/1996	6:00 PM	Heavy Snow	N/A	0	3	50K	0
39 Cache	1/22/1997	9:00 PM	Heavy Snow	N/A	0	10	1K	0
4 Cache	5/6/1981	1245	Tornado, near Newton	F1	0	0	0K	0
40 Cache	3/31/1997	4:00 AM	Winter Storm	N/A	3	60	2.0M	0
41 Cache	4/23/1997	11:00 AM	Winter Storm	N/A	0	0	40K	0
42 Cache	5/15/1997	2:00 PM	Flood	N/A	0	0	120K	50K
43 Cache	9/6/1997	9:40 PM	Hail	1.00 in.	0	0	10K	0
44 Cache	10/23/1997	4:00 AM	Winter Storm	N/A	0	0	30K	0
45 Cache	12/7/1997	4:00 AM	Winter Storm	N/A	1	20	200K	0
46 Cache	12/23/1997	7:00 PM	Winter Storm	N/A	0	2	80K	0
47 Cache	1/4/1998	10:00 PM	Winter Storm	N/A	0	6	30K	0
48 Cache	1/11/1998	3:00 PM	Urban/sml Stream Fld	N/A	0	0	30K	0
49 Cache	1/15/1998	2:00 AM	Heavy Snow	N/A	2	18	200K	20K
5 Cache	11/14/1981	1652	Tstm Wind	54 kts.	0	0	0	0
50 Cache	1/19/1998	6:00 AM	Winter Storm	N/A	0	2	30K	5K
51 Cache	2/7/1998	1:00 AM	Heavy Snow	N/A	2	20	80K	20K
52 Cache	2/21/1998	6:00 AM	Winter Storm	N/A	0	40	900K	200K
53 Cache	3/5/1998	9:00 PM	Winter Storm	N/A	0	8	95K	5K
54 Cache	4/11/1998	11:00 AM	High Wind	52 kts.	0	0	0K	0K
55 Cache	4/12/1998	4:00 AM	Winter Storm	N/A	0	3	30K	3K
56 Cache	5/21/1998	2:50 PM	Tstm Wind	53 kts.	0	0	3K	2K
57 Cache	8/20/1998	5:15 PM	Funnel Cloud	N/A	0	0	0K	0K
58 Cache	8/26/1998	1:30 PM	Tstm Wind/hail	0 kts.	0	0	10K	5K
59 Cache	11/5/1998	12:00 PM	Winter Storm	N/A	0	0	90K	0
6 Cache	4/11/1982	2030	Tstm Wind	50 kts.	0	0	0	0
60 Cache	11/8/1998	12:00 PM	Winter Storm	N/A	0	10	500K	0
61 Cache	11/23/1998	12:00 PM	High Wind	0 kts.	0	0	100K	0
62 Cache	12/4/1998	6:00 AM	Winter Storm	N/A	0	0	50K	0
63 Cache	12/19/1998	6:00 PM	Winter Storm	N/A	0	10	100K	0
64 Cache	12/21/1998	6:00 AM	Extreme Cold	N/A	0	0	20K	0
65 Cache	1/20/1999	12:00 PM	Winter Storm	N/A	0	0	10K	0
66 Cache	1/23/1999	7:00 PM	Heavy Snow	N/A	0	0	0	0
67 Cache	1/26/1999	12:00 PM	Winter Storm	N/A	0	4	50K	0
68 Cache	4/1/1999	12:00 AM	Winter Storm	N/A	0	35	170K	0
69 Cache	4/8/1999	9:00 PM	Winter Storm	N/A	0	19	10K	0
7 Cache	7/4/1986	1410	Tstm Wind	64 kts.	0	0	0	0

70 Cache	4/27/1999	12:00 PM	Heavy Rain	N/A	0	0	0	0
71 Cache	8/11/1999	2:00 PM	Funnel Cloud	N/A	0	0	0	0
72 Cache	11/21/1999	9:00 AM	Heavy Snow	N/A	0	0	0	0
73 Cache	12/2/1999	6:00 PM	Heavy Snow	N/A	0	2	200K	0
74 Cache	12/7/1999	10:00 AM	Heavy Snow	N/A	0	0	0	0
75 Cache	12/10/1999	3:00 AM	Heavy Snow	N/A	0	0	0	0
76 Cache	12/13/1999	6:00 PM	Heavy Snow	N/A	0	0	0	0
77 Cache	12/20/1999	12:00 PM	Heavy Snow	N/A	0	0	0	0
78 Cache	1/1/2000	12:00 PM	Winter Storm	N/A	0	2	20K	0
79 Cache	1/4/2000	9:00 AM	Heavy Snow	N/A	0	5	30K	0
8 Cache	2/13/1987	2147	Tstm Wind	61 kts.	0	0	0	0
80 Cache	1/11/2000	3:00 PM	High Wind	78 kts.	0	0	10K	1K
81 Cache	11/14/2000	9:00 PM	Heavy Snow	N/A	0	6	50K	0
82 Cache	4/28/2001	7:30 PM	Dry Microburst	N/A	0	0	100K	5K
83 Cache	10/23/2001	9:00 AM	High Wind	62 kts.	0	0	0	0
84 Cache	12/2/2001	12:00 PM	Winter Storm	N/A	0	0	50K	10K
85 Cache	1/27/2002	7:00 AM	Winter Storm	N/A	0	38	720K	0
86 Cache	4/17/2002	6:00 PM	Heavy Snow	N/A	0	0	0	0
87 Cache	6/2/2002	2:40 PM	Tstm Wind	60 kts.	0	0	1K	1K
88 Cache	7/18/2002	1:00 PM	Funnel Cloud	N/A	0	0	0	0
89 Cache	1/10/2003	9:00 AM	Heavy Snow	N/A	0	0	0	0
9 Cache	5/29/1987	1245	Tornado, south of Lewiston	F2	0	0	3K	0
90 Cache	3/1/2003	8:00 AM	Winter Storm	N/A	0	0	0	0
91 Cache	8/22/2003	2:50 PM	Tstm Wind	60 kts.	0	0	50K	0
92 Cache	10/30/2003	6:00 AM	Heavy Snow	N/A	0	0	0	0
93 Cache	11/21/2003	8:00 AM	Winter Storm	N/A	0	0	550K	0
94 Cache	12/25/2003	6:00 AM	Winter Storm	N/A	0	0	1.5M	0
95 Cache	12/28/2003	12:00 PM	Winter Storm	N/A	2	0	320K	0
96 Cache	4/28/2004	5:00 AM	Heavy Snow	N/A	0	0	1K	0
97 Cache	5/10/2004	11:00 AM	Strong Wind	49 kts.	0	0	1K	0
98 Cache	7/9/2004	3:00 PM	High Wind	77 kts.	0	0	82K	0
99 Cache	1/7/2005	2:00 PM	Heavy Snow	N/A	0	0	0	0
BALLARD JCT	9/17/2013	1810	Thunderstorm Wind	63	0	0	0	0
Cache County	3/4/1907	-	Tornado, near Lewiston	-	-	-	-	-
Clarkston	8/22/1958	-	Cloudburst storm, flooding, homes/roads damaged	-	-	-	-	-
CLARKSTON	5/6/2014	1455	Hail	0.75	0	0	0	0
Logan	5/30/1958	-	Wind/Hail Storm, windows, road rails, and crops damaged	-	-	-	-	-
LOGAN	2/16/2011	1744	Thunderstorm Wind	53	0	0	0	0
LOGAN	7/1/2011	0	Flood		0	0	10000	0
MENDON	1/19/2012	600	Flood		0	0	100000	0
NEWTON	6/26/2009	1655	Hail	1.75	0	0	0	0
NIBLEY	5/13/2011	200	Flood		0	0	500000	0
Providence	8/18/1959	-	Heavy cloudburst, damage to property and homes, also rock and mud slides in Logan Canyon	-	-	-	-	-
PROVIDENCE	6/8/2009	1605	Hail	0.75	0	0	0	0
PROVIDENCE	6/15/2011	400	Flood		0	0	200000	0
PROVIDENCE	6/25/2011	1800	Flood		0	0	100000	0
PROVIDENCE	7/1/2011	0	Flood		0	0	30000	0
RICHMOND	8/16/2010	1730	Thunderstorm Wind	50	0	0	35000	0
RICHMOND	7/9/2011	1740	Thunderstorm Wind	52	0	0	55000	0

RIVER HGTS	4/18/2011	1600	Flood		0	0	50000	0
RIVER HGTS	5/8/2011	0	Flood		0	0	50000	0
RIVER HGTS	6/23/2011	0	Flood		0	0	100000	0
Smithfield	6/6 – 6/7/1964	-	Intense storm, town flooded by Summit Creek, houses damaged	-	-	-	-	-
UTIDA	6/24/2011	1730	Hail	1	0	0	0	0
WELLSVILLE	6/30/2009	1826	Thunderstorm Wind	52	0	0	0	0
WELLSVILLE	9/17/2013	1820	Thunderstorm Wind	52	0	0	0	0
Young Ward	1/22/1943	-	Tornado	F2	-	-	-	-
TOTALS:					**17**	**422**	**$1,580,000**	**0**

Sources: Numbered events from the National Climatic Data Center (2008), 1950-2008 data; Other data from the State of Utah Office of Emergency Services (1976), 1939-1976 data, and from the Utah Center for Climate and Weather (2005).

Rich County Severe Weather Events 1950-2015								
Inj = Injuries, PrD = Property Damage, CrD = Crop Damage, Mag = Magnitude, Dth = Deaths								
Location or County	**Date**	**Time**	**Type**	**Mag**	**Dth**	**Inj**	**PrD**	**CrD**
1 Rich	5/25/1954	1300	Tornado, Laketown	F1	0	0	25K	0
2 Rich	6/23/1965	1644	Tornado, Woodruff	F1	0	0	3K	0
3 Rich	7/21/1987	1330	Hail	1.25 in.	0	0	0	0
4 Randolph	5/27/1994	1807	Tstm Wind	56 kts.	0	0	0	0
5 Randolph	7/5/1994	1636	Tstm Wind	50 kts.	0	0	0	0
6 Randolph	7/5/1994	1738	Tstm Wind	56 kts.	0	0	0	0
7 Rich	3/11/1995	1040	Flooding	N/A	0	0	0	0
8 Bear Lake	9/17/1996	7:45 AM	4 Waterspouts	N/A	0	0	0	0
Bear Lake	5/26/1998	-	Waterspout	-	-	-	-	-
9 Randolph	6/28/1998	9:55 PM	Tstm Wind	61 kts.	0	0	0K	1K
10 Laketown	10/4/1998	12:00 PM	Waterspout	N/A	0	0	0K	0K
11 Countywide	4/27/1999	12:00 PM	Heavy Rain	N/A	0	0	0	0
12 Woodruff	8/14/1999	9:30 PM	Dry Microburst	N/A	0	0	2K	2K
13 Randolph	7/16/2002	3:15 PM	Hail	0.75 in.	0	0	0	0
Woodruff	5/21/2004	-	Tornado	-	-	-	-	-
14 Randolph	6/28/2005	3:10 PM	Tstm Wind	58 kts.	0	0	0	0
15 Garden City	9/3/2007	16:45 PM	Tstm Wind	51 kts.	0	0	0K	0K
16 Garden City	9/4/2007	17:45 PM	Tstm Wind	52 kts.	0	0	2K	0K
Rich County	12/13/2008	400	Winter Storm		0	0	0	0
Rich County	12/19/2008	300	Winter Storm		0	0	0	0
Rich County	12/21/2008	700	Winter Storm		0	0	0	0
Rich County	12/24/2008	1030	Avalanche		2	0	0	0
Rich County	12/24/2008	1200	Winter Storm		0	0	0	0
Rich County	1/23/2009	100	Heavy Snow		0	0	0	0
Rich County	2/9/2009	100	Heavy Snow		0	0	0	0
Rich County	2/16/2009	2100	Heavy Snow		0	0	0	0
Rich County	3/3/2009	345	High Wind	76	0	0	0	0
Rich County	3/9/2009	500	Heavy Snow		0	0	0	0
Rich County	3/25/2009	100	Winter Storm		0	0	0	0
Rich County	3/29/2009	900	Winter Storm		0	0	0	0
Rich County	3/31/2009	1000	Winter Storm		0	0	0	0
Rich County	4/1/2009	0	Winter Storm		0	0	0	0
Rich County	4/2/2009	1400	Heavy Snow		0	0	0	0
Rich County	9/29/2009	1900	Winter Storm		0	0	0	0
Rich County	12/12/2009	1000	Winter Storm		0	0	0	0
Rich County	1/18/2010	1700	Winter Storm		0	0	0	0
Rich County	1/22/2010	1000	Winter Storm		0	0	0	0
Rich County	1/24/2010	1300	Avalanche		1	0	0	0
Rich County	1/29/2010	1400	Avalanche		1	0	0	0
Rich County	3/30/2010	700	High Wind	70	0	0	0	0
Rich County	3/31/2010	300	Winter Storm		0	0	0	0
Rich County	4/1/2010	0	Winter Storm		0	0	0	0
Rich County	4/2/2010	2100	Winter Storm		0	0	0	0
Rich County	4/4/2010	1350	Avalanche		1	0	0	0
Rich County	4/5/2010	0	Winter Storm		0	0	0	0
Rich County	10/24/2010	1000	Winter Storm		0	0	0	0
Rich County	11/14/2010	1700	Winter Storm		0	0	0	0
Rich County	11/20/2010	100	Winter Storm		0	0	0	0
Rich County	11/23/2010	1400	Blizzard		0	0	0	0
Rich County	11/27/2010	1700	Winter Storm		0	0	0	0
Rich County	12/14/2010	1200	Winter Storm		0	0	0	0

Rich County	12/18/2010	100	Winter Storm		0	0	0	0
Rich County	12/28/2010	2300	Winter Storm		0	0	0	0
Rich County	2/16/2011	1200	Winter Storm		0	0	0	0
Rich County	2/19/2011	1500	Winter Storm		0	0	0	0
Rich County	2/24/2011	1000	Winter Storm		0	0	0	0
Rich County	3/5/2011	2200	Winter Storm		0	0	0	0
Rich County	3/21/2011	1600	Winter Storm		0	0	0	0
Rich County	4/7/2011	1100	Winter Storm		0	0	0	0
Rich County	6/6/2011	1600	High Wind	69	0	0	0	0
WOODRUFF	6/29/2011	1340	Thunderstorm Wind	56	0	0	1000	0
Rich County	10/5/2011	2300	Winter Storm		0	0	0	0
Rich County	11/12/2011	600	Winter Storm		0	0	0	0
Rich County	1/18/2012	1500	Winter Storm		0	0	0	0
Rich County	1/21/2012	0	Winter Storm		0	0	0	0
Rich County	2/22/2012	400	High Wind	77	0	0	0	0
Rich County	2/29/2012	300	Winter Storm		0	0	0	0
Rich County	3/1/2012	0	Winter Storm		0	0	0	0
Rich County	3/17/2012	0	High Wind	76	0	0	0	0
Rich County	3/18/2012	0	Winter Storm		0	0	0	0
Rich County	3/26/2012	800	High Wind	68	0	0	0	0
Rich County	3/31/2012	2000	High Wind	87	0	0	0	0
Rich County	4/1/2012	0	High Wind	87	0	0	0	0
Rich County	10/16/2012	1655	High Wind	73	0	0	0	0
Rich County	10/22/2012	1600	Winter Storm		0	0	0	0
Rich County	11/9/2012	500	Winter Storm		0	0	0	0
Rich County	12/2/2012	1800	High Wind	71	0	0	0	0
Rich County	12/16/2012	100	Winter Storm		0	0	0	0
Rich County	12/23/2012	2100	Winter Storm		0	0	0	0
Rich County	1/10/2013	1000	Winter Storm		0	0	0	0
Rich County	1/27/2013	600	Winter Storm		0	0	0	0
Rich County	2/23/2013	200	Winter Storm		0	0	0	0
Rich County	4/8/2013	1100	Winter Storm		0	0	0	0
Rich County	12/7/2013	200	Winter Storm		0	0	0	0
Rich County	12/19/2013	0	Winter Storm		0	0	0	0
Rich County	1/9/2014	600	Winter Storm		0	0	0	0
Rich County	1/11/2014	1800	Winter Storm		0	0	0	0
Rich County	1/29/2014	1100	Winter Storm		0	0	0	0
Rich County	2/5/2014	300	Winter Storm		0	0	0	0
Rich County	2/12/2014	900	Winter Storm		0	0	0	0
Rich County	3/1/2014	0	Winter Storm		0	0	0	0
Rich County	3/17/2014	700	High Wind	59	0	0	0	0
Rich County	6/16/2014	2200	Winter Weather		0	0	0	0
Rich County	11/22/2014	1000	Winter Storm		0	0	0	0
Rich County	12/20/2014	200	Winter Storm		0	0	0	0
Rich County	12/25/2014	100	Winter Storm		0	0	0	0
Rich County	12/28/2014	400	Winter Storm		0	0	0	0
Rich County	12/28/2014	700	Winter Storm		0	0	0	0
TOTALS:					**5**	**0**	**$1,000**	**0**

Sources: Numbered events from the National Climatic Data Center (2008), 1950-2008 data; Other data from the Utah Center for Climate and Weather (2005).

APPENDIX L - RADON RISK MAPS AND INFORMATION

Courtesy of the Bear River Health Department

Basic Radon Information Summary

- Many lung cancer victims never smoked tobacco products - and were never around second-hand smoke. Their lung cancers have been scientifically proven to have originated from radon gas exposure. Radon is odorless and colorless. It is estimated that 21,000 people die each year in the U.S. from lung cancer caused by radon. Radon-induced lung cancer is highly preventable.

- Radon gas is present throughout the U.S. Radon comes from the natural radioactive decay of uranium. It is estimated that the top 6 feet of soil for an average acre of land contains about 50 lbs. of uranium. Radon gas enters homes and radioactively decays - creating radon decay products (RDPs). RDPs are carried by dust, cigarette smoke, etc. - deep into our lungs where they emit alpha particles (a type of radiation) that damage our DNA - causing lung cancer.

- Radon gas enters homes through tiny (hair-like) pores in concrete slabs and basement walls. As air tends to rise in homes (especially in the winter-time). This air movement (chimney-effect) draws radon into homes. When the outside ground is frozen, has a snow-cover or is saturated with water - a "lid" is created over the ground outside - so radon more easily enters our homes. Wintertime radon gas levels measured in homes are often double summertime levels.

- Radon gas is very common within areas of the BRHD's jurisdiction. US-EPA recommends corrective action when radon gas (year-round average) measures at or above 4pCi/L (units pronounced "pea-co-cure-ease" per liter). Many homes in Box Elder, Cache and Rich counties have tested much higher than 4pCi/L. The % of homes over 4pCi/L (as of July 2014 for people who used Utah DEQ radon test kits) are: Box Elder = 59.0%, Cache = 50.3% and Rich = 59.1%). Highest radon levels found: Box Elder = 71.1pCi/L, Cache = 152.5pCi/L and Rich = 30.8pCi/L.

- Homes next door to each other can have very different levels of radon (due to differing geology beneath every home). Testing of bare ground for radon before building a home is impossible (see RRNC info for new homes on next/back page). Everyone needs to test for radon gas in existing homes. Testing is the only way to know if dangerous levels of radon are present.

- Bear River Health Department is now selling Utah DEQ $7 (BRHD's cost) easy to use short-term radon test kits at 4 BRHD offices: **North Logan** (85 E. 1800 N.); **Brigham City** (992 S. 88 W.); **Tremonton** (440 W. 600 N.) and **Randolph** (275 N. Main Street). These (and other radon kits) may also be ordered on-line through the Utah DEQ radon web-site: www.radon.utah.gov.

(Please see next page/back page)

- The most common way to stop radon gas from entering homes is "sub-slab depressurization." With SSDP - a diamond-bit is used to drill a 3" or 4" hole into and to below the concrete slab. About 5 gal. of soil (sand/gravel) is excavated. Then, 3" or 4" PVC piping is sealed in the hole and connected so that radon vents above the roof. SSDP creates a pathway of least resistance for radon to exit soil beneath homes (so only a tiny amount of radon enters homes). A fan may be connected to increase flow (about 5-10 cents/day). SSDP systems cost about $1,200-$1,500.

- BRHD recommends that homeowners considering radon mitigation get several competitive bids from radon mitigators - and to only use currently certified National Radon Proficiency Program (NRPP) radon mitigators (see current list at www.radon.utah.gov.) Many NRPP mitigators will warranty that radon in mitigated homes will not exceed 2.7pCi/L for 15 years (or longer) – including the warranty being transferable to new owners for the life of the warranty.

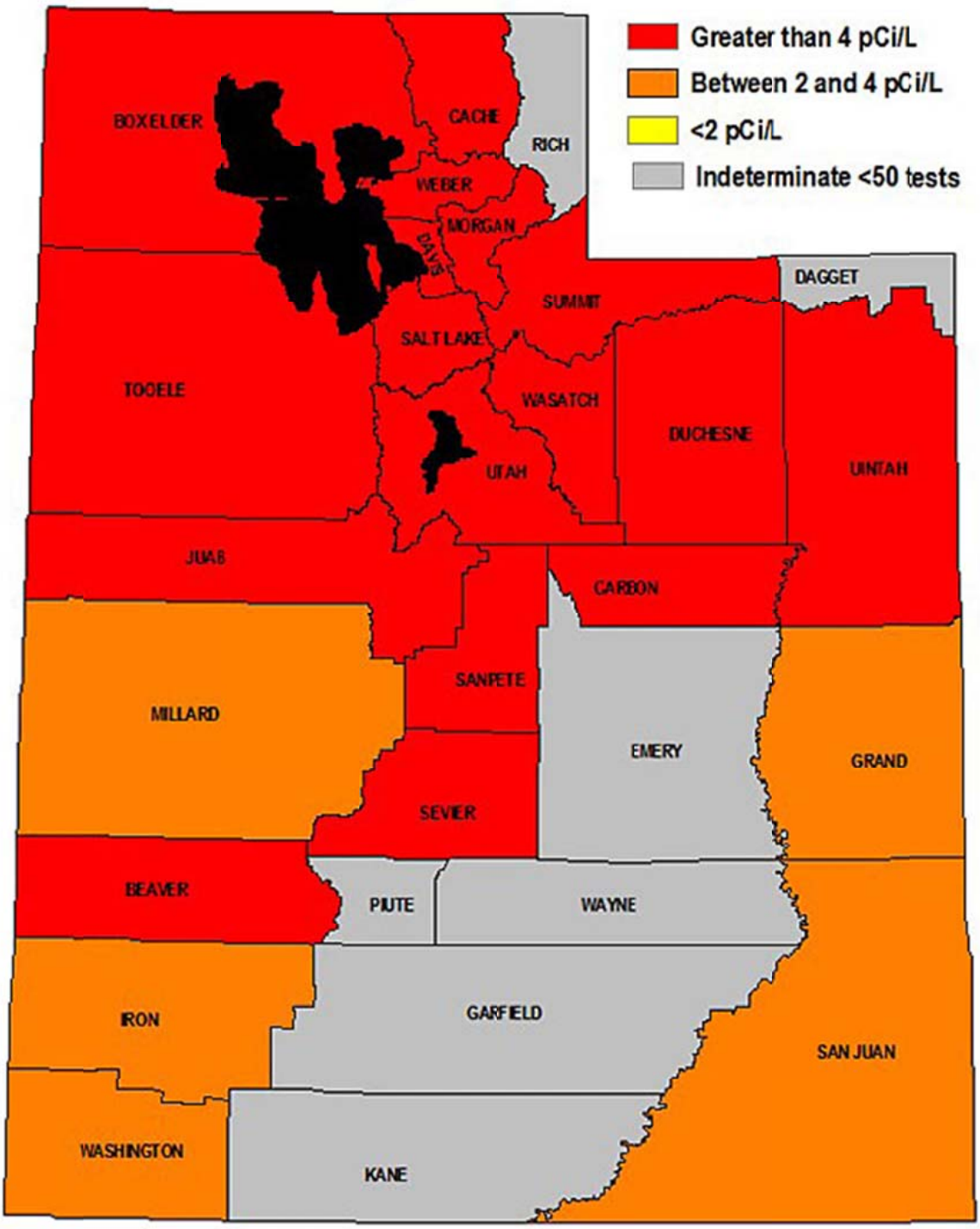
- The modern and smart way to prevent radon gas from entering a new home is to build-in radon resistant new construction (RRNC) features. With trained mitigators in the construction crew, RRNC costs can be 1/2 the cost of doing mitigation. RRNC can be more efficient and attractive (with pipes carrying radon completely hidden under concrete and inside walls). Because of high radon levels in almost every community within BRHD's jurisdiction, BRHD strongly encourages everyone building a new home to consider installing RRNC features in it. (Please go to www.radon.utah.gov to watch a short video showing how RRNC is installed.)

- Home buyers are increasingly asking for radon mitigated homes (radon <4pCi/L). And with new construction, more people are asking their builders to install RRNC features. When such mitigated/RRNC homes are sold, people are often getting their mitigation/RRNC costs back.

- Older homes are often drafty (poor insulation, cracks, open windows, evaporative coolers); and such conditions allow outdoor air to dilute radon levels. Newer homes are often very energy efficient ("tight" - more insulation, less cracks and AC) - which keeps more radon inside homes.

- Please contact Mark Stevens-BRHD (435-792-6578) for radon information/answers to your questions. And view current radon test results for your community, and find other useful radon info at: www.brhd.org (Scroll down/click on Environmental Health, and then click on Radon.)

- Please go to www.epa.gov/radon for many extensive radon information guides. You will also see radon research references documenting how radon has been scientifically proven to cause approximately 21,000 lung cancer deaths in the U.S. each year. Most of these deaths could have been prevented with radon mitigation (<4pCi/L) - or with RRNC features in new homes.



This map represents radon test results reported (by zip code only) to the Utah Department of Environmental Quality (DEQ) - as of approx. July 2014. This map is helpful in encouraging all Utah home builders (and their clients) to strongly consider the advantages of installing Radon Resistant New Construction (RRNC) features in all new homes. (RRNC features can be ½ the cost of doing mitigation after a home is built.) ***This DEQ map should never be used to predict radon levels in existing homes.*** Because the geology beneath every home is different, similar homes next door to each other can have greatly differing radon levels. ***Every existing home needs to be tested for radon -*** and when high levels are found - mitigated by currently certified National Radon Proficiency Program (NRPP) mitigators only.

(Bear River Health Department Annotated Short-Term Radon Test Results From DEQ July 2014 Data)

Utah Dept. of Environmental Quality – Division of Radiation Control

Short-Term Radon Test Results by County, Community & Zip Code (as of July 2014)

* 4 picocuries (pronounced "pea-co-cure-ease") per liter (pCi/L) is the US-EPA's recommended radon action level.
Note: all homes should be tested for radon. Homes next door to each other frequently have very different radon readings.

BOX ELDER COUNTY

Communities in Zip Code >	Zip Code	<4 pCi/L*	>=4 pCi/L*	Maximum	Average	Total Tests
Bear River City	84301	100.0%	0.0%	3.7	2.7	3
Brigham City, Bushnell, Perry	84302	38.3%	61.7%	71.1	8.1	368
Beaverdam, Collinston, Wheelon	84306	62.5%	37.5%	13.3	5.4	8
Corinne, Promontory	84307	100.0%	0.0%	2.8	1.6	3
Beeton, Deweyville,	84309	14.3%	85.7%	38.7	13.4	7
Fielding	84311	75.0%	25.0%	10.9	4.8	4
Garland	84312	76.2%	23.8%	10.4	2.9	21
Crystal Sprs, Honeyville, Madsen	84314	30.0%	70.0%	11.7	6.5	10
Mantua	84324	18.8%	81.3%	38.1	15.0	16
Park Valley, Rosette	84329	100.0%	0.0%	2.7	2.7	1
Plymouth	84330	100.0%	0.0%	0.8	0.8	1
Portage	84331	0.0%	100.0%	8.5	8.5	1
Riverside	84334	50.0%	50.0%	5.0	3.2	2
Penrose, Thatcher, Tremonton	84337	59.0%	41.0%	24.9	4.2	39
Willard	84340	30.0%	70.0%	20.3	6.1	50
All Short-Term Test Results - Box E. County		41.0%	59.0%	71.1	7.5	534

CACHE COUNTY

Communities in Zip Code >	Zip Code	<4 pCi/L*	>=4 pCi/L*	Maximum	Average	Total Tests
Clarkston	84305	100.0%	0.0%	0.7	0.7	1
Hyde Park	84318	36.3%	63.7%	40.9	7.6	91
Hyrum	84319	54.7%	45.3%	32.0	5.3	64
Cove, Lewiston	84320	51.7%	48.3%	14.8	6.0	29
Logan, Nibley, River Heights	84321	57.0%	43.0%	112.6	6.0	628
Logan, Utah State University	84322	85.7%	14.3%	4.9	1.9	7
Logan	84323	64.7%	35.3%	19.2	5.9	17
Mendon, Petersboro	84325	50.0%	50.0%	19.9	5.3	42
Millville	84326	35.1%	64.9%	19.6	6.2	37
Newton	84327	42.9%	57.1%	10.7	5.6	7
Avon, Paradise	84328	17.9%	82.1%	67.6	14.6	28
Providence	84332	36. 1%	63.9%	87.0	8.9	191
Richmond	84333	55.3%	44.7%	18.2	4.7	38
Benson, Smithfield	84335	46.5%	53.5%	42.4	6.9	172
Trenton	84338	100.0%	0.0%	1.7	1.3	4
College Wd., Wellsville, Young Wd.	84339	35.1%	64.9%	152.5	21.1	77
Logan, North Logan	84341	51.6%	48.4%	52.2	6.4	304
All Short-Term Test Results – Cache County		49.5%	50.5%	152.5	7.3	1737

RICH COUNTY

Communities in Zip Code >	Zip Code	<4 pCi/L*	>=4 pCi/L*	Maximum	Average	Total Tests
Garden C., Pickleville, Swan Cr.	84028	100.0%	0.0%	2.1	1.3	5
Laketown, Meadowv., Round V.	84038	0.0%	100.0%	30.8	11.7	11
Randolph	84064	71.4%	28.6%	21.2	5.7	7
All Short-Term Results - Rich County		43.5%	56.5%	30.8	7.6	23

Why Do Radon Levels Inside a Home Fluctuate So Much?

Air Pressure Differentials Caused by Building Induced Soil Suction & Stack Effect from Heating

- Buildings can create vacuums that suck in soil gases/radon. These vacuums (referred to as **A**ir **P**ressure **D**ifferentials **APD's**) may be very small. But even small APD's between the house air pressure and the soil gas pressure - can greatly change radon readings inside a home.

- When indoor air is warmer than outside air, it rises up and exits through the upper portion of the house. This air is replaced by soil gases which contain radon. The warmer the house and the colder it is outside – the greater is the stack (chimney) effect drawing radon into a home.

- APD's and the stack effect are the greatest factors causing radon levels to rise or fall inside a home. Because APD's and the stack effect are usually higher at night and lower during the day – indoor radon levels are usually higher at night and lower in the day (diurnal APD/stack effect).

Use of Home Air Exhaust Devices

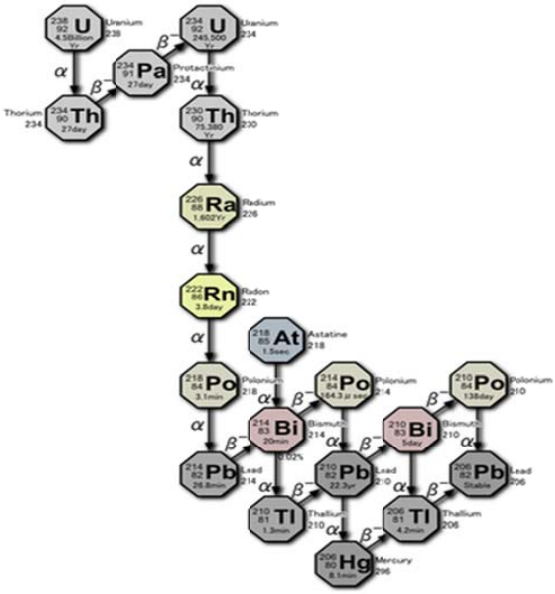
- When exhaust devices push air out of a home, the home's partial vacuum is increased - causing more soil gases and radon to be sucked in.
- Estimated air flows (**c**ubic **f**eet per **m**inute – cfm) of home devices that exhaust air to the outside:
    - Open wood fireplace 170cfm
    - Central vacuum cleaner 110cfm
    - Clothes dryer 100cfm
    - Bathroom fan 24-90cfm
    - Open wood stove 65cfm
    - Gas combustion appliances 21-72cfm
      (furnaces, space heaters, ranges, water heaters, etc.)
    - Air-tight wood stove 30cfm

Rain, Winds and Other Natural Forces

- Light rain and gentle winds have little effect on indoor radon concentrations.
- Severe storms and high winds can have a great effect on indoor radon levels.
- Rain can block soil pathways and either raise or reduce indoor radon concentrations.
- Indoor radon concentrations are usually higher during heavy rain events and winter seasons.
- High winds can raise or lower indoor radon. When wind blows on side of house with most door(s)/ window(s), it creates more positive indoor pressure which pushes radon out. When it blows on side with least door(s)/window(s), it creates more negative indoor pressure, which sucks more radon in.
- Barometric pressure changes can change soil gas pressures and amount of radon entering a home.
- Indoor radon levels are usually higher in the wintertime because: 1. - the heating system is pulling air up and out of the home (stack effect); and 2. - frozen ground/soil saturation caps/blocks soil gas/ radon from normal exiting into the atmosphere from outside soil - causing soil gas/radon pressures to rise. Thus entering the home becomes the pathway of least resistance for soil gas/radon to follow.
- Daily radon variation (sometimes 2-3 fold) is usually greater in the summer than in the winter. because of more variations in soil surface temperatures during the summer than in the winter.
- An activated sump pump can pump some radon out with the water (and lower indoor radon levels).

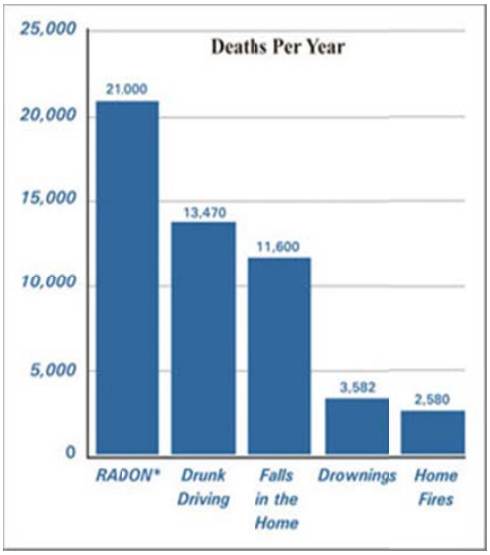
Brief Scientific (Technical) Explanation of How Radon Causes Lung Cancer

Radon is a colorless/odorless gas - a radioactive byproduct and part of the natural radioactive decay of uranium 238. Radon has a half-life of 3.8 days, decaying by emission of alpha particles and beta radiation to polonium, bismuth, and lead in successive steps (shown in the chart below).



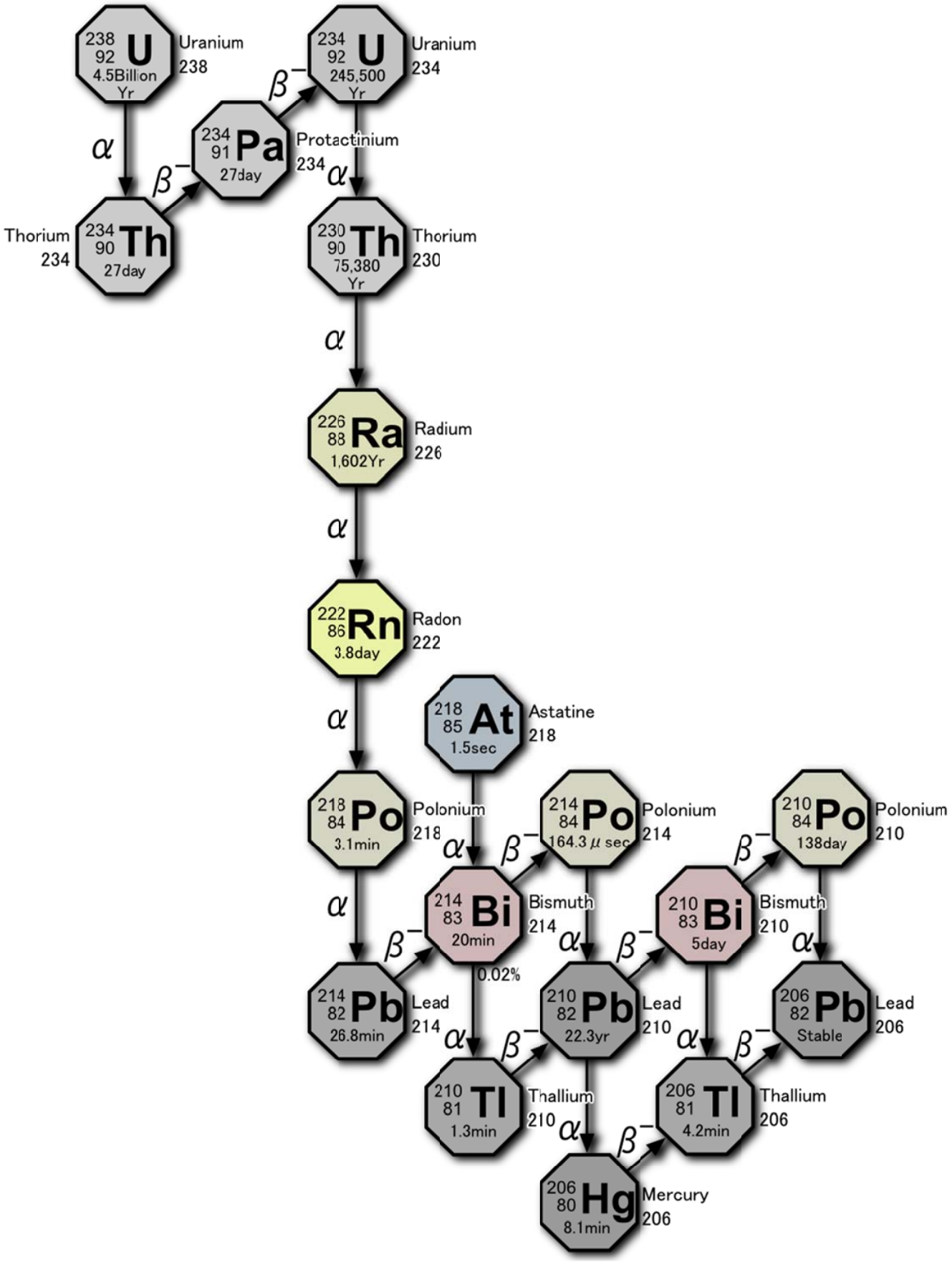
Radon 222 emits an alpha particle (alpha) and decays further into isotopes of polonium, lead, and bismuth [the most important being polonium isotopes 218 and 214 with a combined 13.7 million electron volts (MeV) of energy]. These isotopes are called radon decay products (RDPs). RDPs float around in the air during their minutes/seconds of existence, often become attached to dust particles, enter our lungs, and emit alphas which cause harm. (Details continue below-right.)

The top 6 feet of soil in an average acre of land contains about 50 lbs. of uranium that will decay into radon and RDPs. On average, about six atoms of radon emerge from every square inch of soil per second. Radon in outside air is diluted rapidly, but if it enters through basement floors and is trapped in tight houses, it can reach dangerous concentrations. Being an atom, radon can easily penetrate through concrete. As concrete cures, the water that was originally part of the concrete mix migrates to the surface and evaporates, leaving behind tiny capillaries (tubes). These tubes are thinner than a human hair, but large enough for radon gas atoms to pass through. Cement sealers, plastic sheeting, etc. also don't stop radon from entering homes. Only by creating a partial vacuum beneath concrete (sub-slab depressurization) and venting radon through piping (often with an exhaust fan) to above the roof - can radon be largely prevented from entering homes.



The US-EPA estimates radon causes many thousands of cancer deaths in the United States each year.

RDPs, being electrically charged solid particles often stick to the surfaces of our bronchial tubes where they can do the most harm (cells lining bronchial tubes are among the most sensitive cells of the body). When RDP alphas are emitted, they dump a lot of energy (MeV) into and severely damage the DNA of these cells. Passage of a single alpha has the potential to cause irreparable damage in cells that are not killed. If not properly repaired, DNA damage from the linear energy transfer (LET) in this type of interaction - can be preserved and incorporated into the genetic structure of transcribed DNA. Since LET-induced DNA mutations can sometimes exist through 50 cellular generations (or more) - at some point the mutational insult becomes too cytotoxic for the cell to continue correct replications, resulting in cancerous tumors. It is also believed that alphas induce oncogenes (make genes that may cause cancer) and damage tumor-suppressor genes, and that this results in chromosomes being fractured/improperly repaired. Also, the rebounding RDP atoms also release a lot of energy which damages DNA in adjacent cells. Because alphas/rebounding atoms are so harmful, they are a 100 times more likely to cause cancer than other radiation types. US-EPA estimates radon causes about 21,000 U.S. deaths each year. Only cigarette smoking causes more lung cancer deaths per year than radon.


238 92 U 4.5Billion Yr
Uranium 238
234 92 U 245,500 Yr
Uranium 234
234 91 Pa 27day
Protactinium 234
234 90 Th 27day
Thorium 234
230 90 Th 75,380 Yr
Thorium 230
226 88 Ra 1,602Yr
Radium 226
222 86 Rn 3.8day
Radon 222
218 85 At 1.5sec
Astatine 218
218 84 Po 3.1min
Polonium 218
214 84 Po 164.3 μ sec
Polonium 214
210 84 Po 138day
Polonium 210
214 83 Bi 20min
Bismuth 214
210 83 Bi 5day
Bismuth 210
0.02%
214 82 Pb 26.8min
Lead 214
210 82 Pb 22.3yr
Lead 210
206 82 Pb Stable
Lead 206
210 81 Tl 1.3min
Thallium 210
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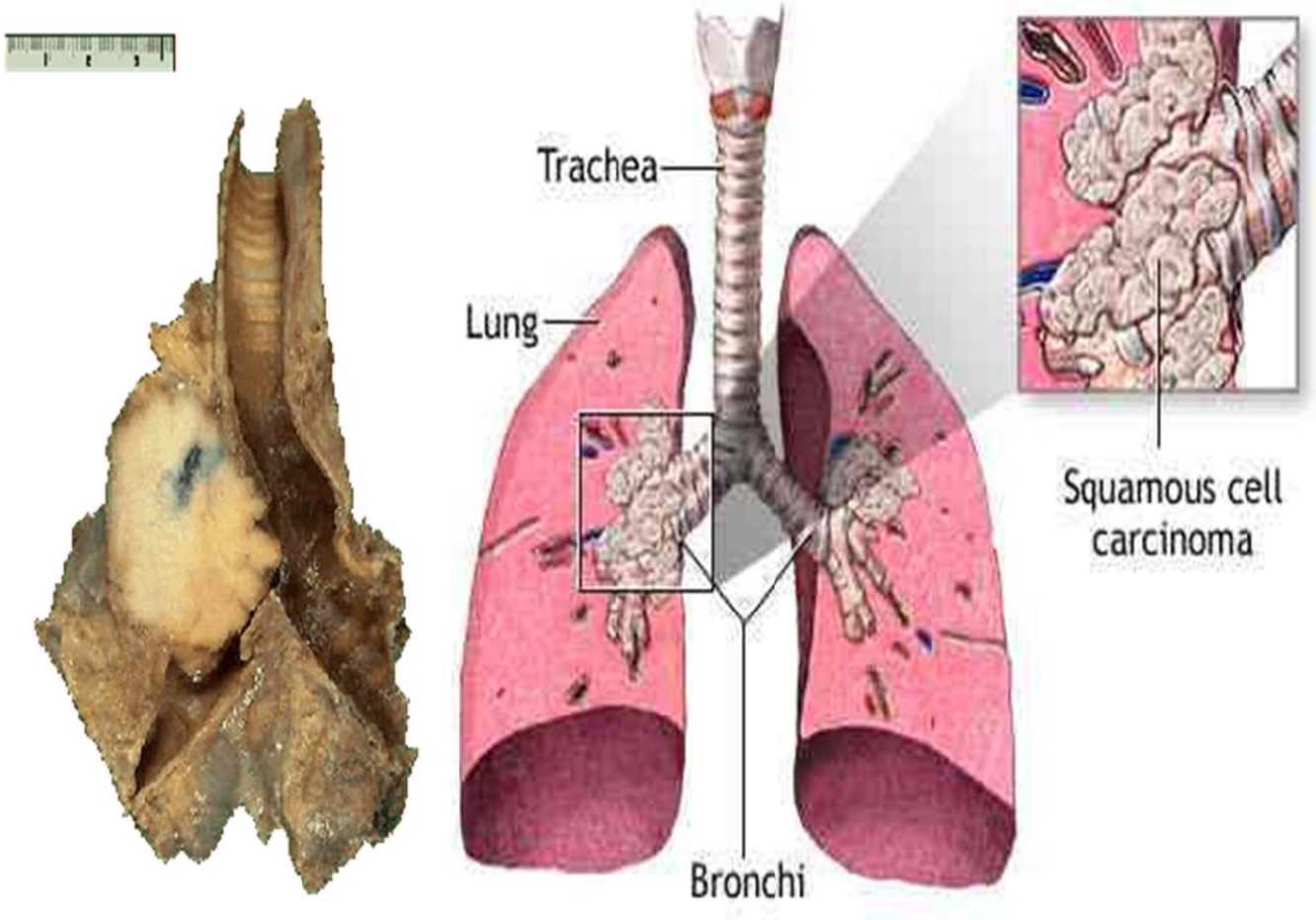
206 80 Hg 8.1min
Mercury 206


Trachea
Lung
Bronchi
Squamous cell carcinoma