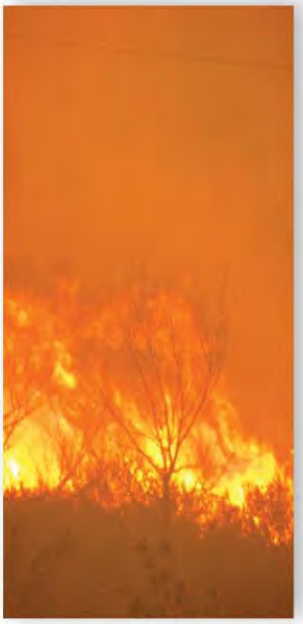
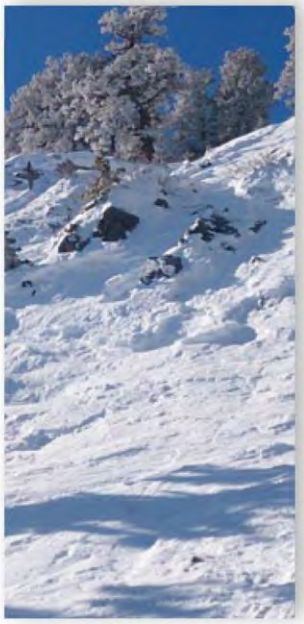
WEBER COUNTY

WEBER COUNTY

Pre-Disaster Mitigation Plan

2015






Prepared by:

J·U·B ENGINEERS, INC.

Weber County
Pre-Disaster Mitigation Plan

Assistance and guidance provided by the
Utah Department of Public Safety – Division of Emergency Management

August 2015

TABLE OF CONTENTS

TABLES, MAPS & FIGURES

FEMA Approval Letter

EXECUTIVE SUMMARY

Plan Mission

Weber County developed the Pre-Disaster Mitigation (PDM) Plan in partnership with jurisdictions within the County to substantially and permanently reduce the County's vulnerability to natural hazards. The Plan is intended to promote sound public policy and protect or reduce the vulnerability of the citizens, critical facilities, infrastructure, private property and the natural environment within the County. This can be achieved by increasing public awareness, documenting resources for risk reduction and loss-prevention and identifying activities to guide the development of a less vulnerable and more sustainable community.

Plan Update

This Plan represents an update of the Wasatch Front Regional Council's PDM Plan that was approved by the cities, counties, the State and by FEMA in 2009. All of the demographic data, maps, vulnerability assessments and mitigation strategies have been revised to reflect the changes throughout the County. Development pressures in hazard areas will continue to increase the risk to residents. The entire plan was reviewed and analyzed by the planning team throughout the planning process and again at the final draft stage before submittal to the State and FEMA.

Plan Organization

The Plan was developed and organized within the rules and regulations established under 44 Code of Federal Regulations (CFR), Section 201.6. The Plan contains a discussion on the purpose and methodology used to develop the Plan, a profile on communities within Weber County, as well as a hazard identification study and a vulnerability analysis of eleven hazards. The 2015 Plan will also examine how climate change has affected the potential hazards to Weber County. To assist in the explanation of the above-identified contents there are several appendices included which provide more detail on specific subjects. This is intended to improve the ability of communities of Weber County to respond to emergencies and disasters. It will also document valuable local knowledge on the most efficient and effective ways to reduce loss.

Plan Funding

The Plan has been funded and developed under the PDM Program provided by the Federal Emergency Management Agency (FEMA) and the Utah Department of Public Safety, Division of Emergency Management (DEM).

Plan Participation

Plan participation was completed as a result of a collaborative effort between the Weber County, DEM, city emergency managers, fire departments, sheriff's offices, public works departments, planning commissions, assessor's offices, city and county geographic information systems (GIS) departments, special service districts, school districts, elected officials, public employees and citizens of the cities and towns within Weber County. Meetings were held with stakeholders from the communities during the Plan development phase. Additionally, through public hearings, workshops and draft Plan displays, ample opportunity was provided for public participation. Any comments, questions and discussions resulting from these activities were given strong consideration in the development of this Plan.

Hazards Identification

The PDM Plan will address the hazards addressed in the 2009 plan: earthquake, flood, landslide, problem soils, wildfire, dam failure, severe weather and drought. Since 2009, Weber County had a serious presidentially-declared disaster with severe flooding along the Weber River in 2011. The increase in the recurrence of natural disasters has highlighted the need to address how the hazards identified may be impacted by with climate change in the 2015 PDM Plan.

- Earthquake
- Flood
- Drought
- Landslide
- Wildfire
- Dam Failure
- Severe Weather
- Insect Infestation
- Radon
- Problem Soils
- Epidemic/Pandemic

Acknowledgements

Weber County would like to extend their appreciation to the following agencies, which assisted in the development of this Plan.

- Utah Division of Emergency Management
- Federal Emergency Management Agency
- National Weather Service
- National Climate Data Center
- Utah Army Corps of Engineers
- Utah Geologic Survey
- Utah Division of Forestry, Fire and State Lands
- Utah Department of Agriculture and Food
- Utah Avalanche Center
- School Districts
  - Ogden School District
  - Weber School District
- Special Service Districts
  - Bona Vista Water District
  - Pineview Water
  - Central Weber Sewer District
  - Roy Water Conservancy District
- Weber Area Council of Governments
- Weber Area Dispatch
- Weber County Municipalities

  - Farr West
  - Harrisville
  - Hooper
  - Huntsville
  - Marriott-Slaterville
  - North Ogden
  - Ogden
  - Plain City
  - Pleasant View
  - Riverdale
  - Roy
  - South Ogden
  - Uintah
  - Washington Terrace
  - West Haven
- Weber County Emergency Manager, Lance Peterson
- Weber County Sheriff's Office - Emergency Services Division
- Weber County elected officials
- Weber County Planning Commission
- Weber County GIS Department
- Weber-Morgan Health Department
- North View Fire District
- Weber Fire District

THIS PAGE INTENTIONALLY LEFT BLANK

PART I. INTRODUCTION

The State of Utah is vulnerable to natural and man-made hazards that threaten the health, welfare and security of our citizens. The cost of response to and recovery from potential disasters can be substantially reduced when attention is turned to mitigating their impacts and effects before they occur or re-occur.

Hazard mitigation is defined as any cost-effective action that has the effect of reducing, limiting, or preventing vulnerability of people, property, and/or the environment to potentially damaging, harmful, or costly hazards. Hazard mitigation actions, which can be used to eliminate or minimize the risk to life and property, fall into three categories: first, those that keep the hazard away from people, property and structures; second, those that keep people, property and structures away from the hazard; and third, 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 actions must be practical, cost effective, environmentally and politically acceptable. Actions taken to limit the vulnerability of society to hazards must not in themselves be more costly than the anticipated damages.

Capital investment decisions must be considered in conjunction with natural hazard vulnerability. Capital investments can include homes, roads, public utilities, pipelines, power plants, chemical plants, warehouses and public works facilities. These decisions can influence the degree of hazard vulnerability of a community. Once a capital facility is in place, few opportunities will present themselves over the useful life of the facility to correct any errors in location or construction with respect to hazard vulnerability. It is for these reasons that zoning ordinances, which could restrict development in high vulnerability areas, and building codes, which could ensure that new buildings are built to withstand the damaging forces of hazards, are the most useful mitigation approaches a city can implement.

Often, hazard mitigation is a neglected aspect within emergency management. When local governments place a low priority on mitigation implementation activities relative to the perceived threat, some important mitigation measures may be neglected in favor of higher priority activities. Mitigation success can be achieved, however, if accurate information is portrayed through complete hazard identification and impact studies, followed by effective mitigation management. Hazard mitigation is the key to greatly reducing long-term risk to people and property from natural 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.

A. Purpose

The purposes of this Plan are (1) identify threats to the community, (2) create mitigation strategies to address those threats, (3) develop long-term mitigation planning goals and objectives, and (4) to fulfill federal, state and local hazard mitigation planning obligations. Mitigation actions in particular would serve to minimize conditions that have an undesirable impact on our citizens, the economy, environment and the well-being of Weber County. This Plan is intended to enhance the awareness and to provide mitigation strategies for elected officials, agencies and the public of these hazards and their associated threat to life

and property. The Plan also details what actions can be taken to help prevent or reduce hazard vulnerability to each jurisdiction.

B. Scope

The Weber County Pre-Disaster Mitigation (PDM) Plan was developed in accordance with the requirements of the FEMA Section 322 regulations, the Utah Division of Emergency Management (DEM) and local planning agencies. The 2009 Wasatch Front Regional Council Plan included Davis, Morgan, Salt Lake, Tooele and Weber Counties. The 2015 update provides an assessment of hazards and mitigations specific to Weber County. The goal of this Plan is to assist the Weber County in reducing the costs of natural disasters by providing comprehensive hazards identification, risk assessment, vulnerability analysis, mitigation strategy an implementation schedule. Regulations set forth by FEMA were followed during the development of this Plan. All participating jurisdictions are listed on pages 13-14. Future monitoring, evaluating, updating and implementation will occur annually or following any natural disaster. A major revision will occur every five years. Annual or any interim Plan review, updates and revisions will be considered as found necessary.

C. Authority

Federal

Public Law (PL) 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 added that provide for the availability of significant mitigation measures in the aftermath of Presidential declared disasters. Civil Preparedness Guide 1-3, Chapter 6- Hazard Mitigation Assistance Programs, places emphasis on hazard mitigation planning directed toward hazards with high impact and threat potential.

President Clinton signed the Disaster Mitigation Act of 2000 (DMA 2000) into law on October 30, 2000. Section 322 defines mitigation planning requirements for state, local and tribal governments. Under Section 322, states are eligible for an increase in the federal share of hazard mitigation, if they submit a mitigation plan (which is a summary of local and/or regional mitigation plans) that identifies natural hazards, risks, vulnerabilities and actions to mitigate risks.

State

Some examples of legislation enhancing the ability of government and persons to mitigate, respond and recover from natural disasters include the Governor's Emergency Operation Directive, The Robert T. Stafford Disaster Relief and Emergency Assistance Act, amendments to Public Law 93-288, as amended, Title 44, CFR, Federal Emergency Management Agency Regulations, as amended, State Emergency Management Act of 1981, Utah Code 53-2, 63-5, Disaster Response Recovery Act, 63-5A, Executive Order of the Governor 11, and the Emergency Interim Succession Act, 63-5B.

County

Local governments play an essential role in implementing effective mitigation. For the purposes of this Plan, local governments include not only cities and counties, but also special service districts with elected boards. Each local government will review all present or potential damages, losses and related impacts associated with natural hazards to determine the need or requirement for mitigation action and planning. The Weber

County Commission, Emergency Manager and local officials will be responsible for carrying out plans and policies are the county commissioners and city or town mayors and administrators. Local governments must be prepared to participate in the post-disaster hazard mitigation team process and pre-mitigation planning as outlined in this document in order to effectively protect their citizens. All jurisdictions in Weber County participated in the development of this plan.

Association of Governments

The Association 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.

D. Goals and Objectives

The goals and objectives of the PDM Plan include coordinating with local governments to develop a regional planning process that meets each planning component identified in the FEMA Region VIII Crosswalk document, Utah Division of Emergency Management (DEM) planning expectation and local input. Another goal is to meet the need of reducing risk from natural and technological hazards in Utah through the implementation of and updating of regional plans.

Short Term Local Goals

The following general goals were used in the development of the PDM Plan. They are shown from highest to lowest priority.

1. Life safety protection.
2. Eliminate and/or reduce property damage.
3. Protect emergency response capabilities (critical infrastructure).
4. Protect/create communication and warning systems.
5. Protect emergency medical services and medical facilities.
6. Ensure mobile resource survivability.
7. Protect critical facilities.
8. Ensure government continuity.
9. Protect developed property, homes, businesses, industry, education opportunities and the cultural fabric of a community. Combine hazard loss reduction efforts with the environmental, social and economic needs of the community.
10. Protect natural resources and the environment.
11. Promote public awareness through education of community hazards and mitigation measures.
12. Preserve and/or restore natural features.

Long Term Local Goals

1. Eliminate or reduce long-term risk to human life and property.
2. Aid private and public sectors in understanding the risks they may be exposed to and identify mitigation strategies to reduce those risks.
3. Avoid risk of exposure to natural and technological hazards.
4. Minimize the impacts of risks that cannot be avoided.
5. Mitigate the impacts of damage as a result of identified hazards.
6. Accomplish mitigation strategies in such a way that negative environmental impacts are minimized.
7. Provide a basis for prioritizing and funding mitigation projects.
8. Establish a regional platform to enable the community to take advantage of shared goals and resources.

Objectives

The following objectives are meant to serve as a measure upon which individual hazard mitigation strategies can be evaluated. These objectives become especially important when two or more projects are competing for limited resources.

1. Identify persons, agencies or organizations responsible for implementation.
2. Project a time frame for implementation.
3. Explain how the project will be financed including the conditions for financing and implementation (as information is available).
4. Identify alternative measures, should financing not be available.
5. Be consistent with, support, and help implement the goals and objectives or hazard mitigation plans already in place.
6. Projects should significantly reduce potential damages to public and/or private property and/or reduce the cost of state and federal recovery for future disasters.
7. Projects should be practical, cost-effective and environmentally sound after consideration of the options.
8. Projects should address a repetitive problem, or one that has the potential to have a major impact on an area or population.
9. Projects should meet applicable permit requirements.
10. Discourage development in hazardous areas.
11. Projects should contribute to short and long term solutions.
12. Project benefits should outweigh the costs.
13. Projects should have manageable maintenance and modification costs.
14. Projects should accomplish multiple objectives when possible.
15. Projects should be implemented using existing resources, agencies and programs when possible.

PART II. ADOPTION PROCESS AND DOCUMENTATION

The Weber County PDM Plan was developed as a multi-jurisdictional Plan. Therefore, to meet the requirements of Section 322 of the local hazard planning regulations, the final Plan must be adopted by each of the municipalities or jurisdictions involved. This section documents the adoption process of each local government in order to demonstrate compliance with this requirement. The Plan will be adopted following FEMA Region VIII approval. Tables 2-1 and 2-2 identify the jurisdictions that participated in the planning process and will adopt the Plan. Each of these jurisdictions presented the draft plan to their city councils or boards in August 2015 and will seek plan approval from their governing bodies following FEMA approval. A sample of the adoption resolution is given at the end of this section. Each of these jurisdictions also participated in and adopted the previous PDM Plan in 2009. Every jurisdiction participated in the PDM Planning process, by attending meetings, collecting demographic and background information, and supplying mitigation strategies to address the hazards impacting their community. The Plan was presented to the city/town councils or managing boards of the jurisdictions for approval.

PARTICIPATING JURISDICTIONS						
Jurisdiction Name	**Jurisdiction Contact**	**Requirements Met (Y/N)**				
		A. Planning Process	**B. HIRA**	**C. Mitigation Strategy**	**D. Plan Review**	**E. Adoption Resolution**
WEBER COUNTY	Lance Peterson, Emergency Manager	Y	Y	Y	Y	Date
Farr West City	Lou Waikart					
Harrisville City	Lt. Keith Wheelwright	Y	Y	Y		Date
Hooper City	Ray Strong			Y		Date
Huntsville Town	Mayor Jim Truett	Y				
Marriott-Slaterville City	Bill Morris, City Administrator	Y	Y	Y		Date
North Ogden City	Officer Paul Rhoades	Y	Y	Y		Date
Ogden City	Ryan Perkins	Y	Y	Y		Date
Plain City	Jeremy Crowton	Y	Y	Y		Date
Pleasant View City	Melinda Greenwood	Y	Y	Y		Date
Riverdale City	Matthew Hennessy	Y	Y	Y		Date
Roy City	Jason Poulsen	Y	Y	Y		
South Ogden City	Cameron West, Fire Chief	Y	Y			
Uintah City	William Pope	Y	Y	Y		
Washington Terrace City	Kasey Bush	Y	Y	Y		
West Haven City	Stephanie Carlson	Y	Y	Y		
SPECIALIZED SERVICE DISTRICTS						
Bona Vista Water Improvement District	Jerry Allen	Y	Y	Y		
Central Weber Sewer Improvement District	Lance Wood	Y	Y	Y		Date

PARTICIPATING JURISDICTIONS						
Jurisdiction Name	**Jurisdiction Contact**	**Requirements Met (Y/N)**				
		A. Planning Process	**B. HIRA**	**C. Mitigation Strategy**	**D. Plan Review**	**E. Adoption Resolution**
Hooper Water Improvement District						
Ogden City School District	Zac Williams	Y	Y	Y		
North View Fire District	David Wade	Y	Y	Y		
Pineview Water Systems	Terel Grimley	Y	Y	Y		
Roy Water Conservancy District	Rodney Banks	Y	Y	Y		
Weber Fire District	David Austin, Fire Chief	Y	Y	Y		
Weber Human Services	Kevin Eastman	Y	Y	Y		
Weber School District	Nate Taggart	Y	Y	Y		
Wolf Creek Water District						

Table 2-1. Participating Jurisdictions

Example Adoption Resolution

(LOCAL COMMUNITY)

(STATE)

RESOLUTION NO. _____

A RESOLUTION OF THE (LOCAL COMMUNITY) ADOPTING THE *2015 Weber County Pre-Disaster Mitigation Plan*

WHEREAS the (local governing body) recognizes the threat that natural hazards pose to people and property within (local community); and

WHEREAS the (local community) has prepared a multi-hazard mitigation plan, hereby known as (title and date of mitigation plan) in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS (*2015 Weber County Pre-Disaster Mitigation Plan*) identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in (local community) from the impacts of future hazards and disasters; and

WHEREAS adoption by the (local governing body) demonstrates their commitment to the hazard mitigation and achieving the goals outlined in the (*2015 Weber County Pre-Disaster Mitigation Plan*).

NOW THEREFORE, BE IT RESOLVED BY THE (LOCAL COMMUNITY), (STATE), THAT:

Section 1. In accordance with (local rule for adopting resolutions), the (local governing body) adopts the *2015 Weber County Pre-Disaster Mitigation Plan*.

ADOPTED by a vote of ____ in favor and ____ against, and ____ abstaining, this _____ day of _____, _____.

By: _____

(print name)

ATTEST:

By: _____

(print name)

APPROVED AS TO FORM:

By: _____

(print name)

PART III. PLANNING PROCESS

This updated Plan was prepared by Weber County Emergency Personnel supported by the local working group members and other state and local personnel. Local agencies that have aided in the process include: the county geographic information systems (GIS) department, elected officials, local officials, emergency managers, fire and sheriff's departments, planning departments, public works departments and local governmental agencies. The planning process was based on Section 322 requirements of the Disaster Mitigation Act of 2000 (DMA 2000) and supporting guidance documents developed by FEMA and the Utah Division of Emergency Management (DEM).

The planning process included the following steps:

Step 1: Organize Resources

Weber County was a sub-applicant to the Utah DEM which a FEMA PDM Planning Grant to update their Pre-Disaster Mitigation Plan. After the grant award, Weber County then advertised a Request for Proposals and through the procurement process selected J-U-B ENGINEERS, Inc., a local civil engineering and planning firm. J-U-B's role in the planning process was to update the 2009 WFRC plan to focus solely on Weber County and its jurisdictions using information from Weber County Emergency Management staff and emergency managers from the various municipalities and districts.

Emergency Managers from the various municipalities and districts in Weber County meet monthly to discuss hazard mitigation and emergency response efforts within the County. During the PDM planning process,
Table 3-1 identifies the representatives from each jurisdiction that informed the planning process, identified local hazards and developed mitigation strategies.

Name	Organization
Brad Bartholomew	Utah Division of Emergency Management
Eric Martineau	Utah Division of Emergency Management
Lance Petersen	Weber County Emergency Management
Eli Johnson	Weber County Emergency Management
Jared Anderson, PE	Weber County Engineering
Chad Meyerhoffer, PE	Weber County Engineering
David Austin, Fire Chief	Weber Fire District
Paul Sullivan, Deputy Chief	Weber Fire District
Lou Waikart	Farr West City
Lt. Keith Wheelwright	Harrisville City
Ray Strong	Hooper City
Mayor Jim Truett	Huntsville Town
Bill Morris	Marriott-Slaterville City
Paul Rhodes	North Ogden City
Robert Scott	North Ogden City
Ryan Perkins	Ogden City
Jeremy Crowton	Plain City
Melinda Greenwood	Pleasant View City
Matthew Hennessy	Riverdale City
Jason Poulsen	Roy City

Cameron West, Fire Chief	South Ogden City
William Pope	Uintah City
Kasey Bush	Washington Terrace City
Tom Hanson	Washington Terrace City
Stephanie Carlson	West Haven City
David Wade	North View Fire District
Jerry Allen	Bona Vista Water
Terel Grimley	Pineview Water
Lance Wood	Central Weber Sewer District
Rodney Banks	Roy Water Conservancy District
Zac Williams	Ogden School District
Nate Taggart	Weber School District
Kevin Eastman	Weber Human Services
Greg Seegmiller, PE	Civil Engineer, J-U-B ENGINEERS, Inc.

Table 3-1. Plan Participants and Stakeholders

Step 2: Public Officials Outreach

A draft copy of the plan was submitted to each of the city/town councils or managing boards of the jurisdictions involved for review and comments. Each participating jurisdiction was supportive of the grant application process and the planning process and ultimately approved the plan.

Step 3: Data Review and Acquisition

The 2009 PDM Plan was reviewed by Weber County and the consulting engineer and it was determined that Plan sections would need to be updated and revised. Contact was made with the GIS technician and planning commission staff to assess available data. Mapping data layers obtained included some or all of the following: local roads, plot maps, county tax assessor's data, hazard data, flood maps, topographic data, aerial photographs and land development data. Local emergency managers provided revised data and through a consensus process developed the revised mitigation strategies based on current data.

Step 4: County Hazard Identification and Profile

These steps were conducted by gathering data on the hazards that threaten the planning region. This information was gathered from local, state and federal agencies, organizations, newspapers and other local media accounts, state and local weather records, conversations with the public and local officials, surveys, interviews and meetings with key informants within the planning area. County-level mitigation planning meetings were held during this process and are explained in further detail in Table 3-2. During these meetings, attendees had the opportunity to review hazard information and provide comment. These meetings also provided a forum for discussion on the background information that was needed to gain a general understanding of the geography, geology, recreation and natural resources of the planning region.

Step 5: County Vulnerability Assessment

This step was conducted through a review of local base maps, topographical maps, floodplain maps, United States Geological Survey (USGS) and Utah Geological Survey (UGS) maps, Automated Geographic Reference Center (AGRC) maps, FEMA hazard maps and climate maps from the National Climatic Data Center (NCDC). A detailed vulnerability assessment was completed with the use of GIS software for the County. The FEMA modeling program

Hazards United States – Multi-Hazards (HAZUS-MH) was used to determine vulnerability to earthquakes and floods. Loss estimation methodology was developed by the core planning team, with assistance from the technical team, to determine vulnerability from each identified hazard. Transportation Analysis Zone (TAZ) and Census 2010 data were used to estimate the number of residents and households that could be affected by the hazard. Utah State sales tax and Equifax Business data were used to find the total number of businesses and annual sales vulnerable to hazards. HAZUS-MH infrastructure data was used to analyze the amount of infrastructure vulnerable to hazards.

Step 6: Review Existing Local Mitigation Actions

Emergency Managers from each jurisdiction in Weber County identified the existing actions taking place locally. Weber County officials provided descriptions of mitigation actions taken based on the 2009 plan. This step identified what goals are already established and adopted for the planning area and how they can be updated and continued.

Step 7: Risk Assessment Review

The Weber County Emergency Management staff were tasked with reviewing county risk assessments for accuracy and completeness and with developing mitigation strategies for all natural hazards threatening their respective county. Changes or additions were conveyed to the consulting planning team for revision.

Step 8: Mitigation Strategy Development

Developing the mitigation strategies was a process in which all of the previous steps were taken into account. Each participating county evaluated, identified and profiled the hazards, and vulnerability assessment completed by Weber County. For each Mitigation Strategy developed, the costs and benefits were considered to determine the best action to take given limited budgets allocated to hazard mitigation efforts at the local level.

Step 9: Prioritization of Identified Mitigation Strategies

DMA 2000 requires state, tribal, and local governments to show how mitigation actions were evaluated and prioritized. The prioritization process was completed by the core planning team, the technical team and the local planning teams over a series of planning meetings. Prioritization was accomplished using the STAPLEE method as explained in the FEMA How to Guide, Document 386-3. This process resulted in each Mitigation Strategy given a High, Medium or Low priority by the local planning teams.

Step 10: State Review

DEM conducted a formal PDM Plan review to ensure that the local plan met the requirements of DMA 2000. This DEM reviewed the Plans from September 1 to October 1, subsequent to submission to FEMA for final review and acceptance.

Step 12: Adoption

The Plan went through a public adoption process during August 2015. The plan was presented in public meetings, posted on the County website, and hard copies were made available at The Weber Center and the Sheriff's Office. Public comment was received for 30 days and the comments were considered and incorporated into the plan. The Plan was then adopted by the cities and counties listed in Table 2-1 of Part II, Adoption Process and Documentation.

Year	Date	Activity	Purpose
2014	**May 27**	Attended FEMA PDM Workshop	Understand and meet requirements for

Year	Date	Activity	Purpose
			plan update.
	May 27	Filed Letter of Intent with State DEM and began grant writing process	Funding for the new plan update.
	June 11	Secured matching funds for grant.	Funding for the new plan update.
	July	Attended Local Mitigation Planning Workshop	Gain understanding of the planning process to meet requirements.
	July 6	Initial draft of grant completed.	Funding for the new plan update.
	June - August	Received letters of commitment from Cities and Districts.	Demonstrate jurisdiction commitment to participating in the planning process.
	September 30	Meeting with Emergency Manager from jurisdictions	Discuss plan, requirements, process.
	November 18	Submitted FEMA PDM grant application with support letters from all Weber County municipalities.	Funding for the new plan update.
2015	**January 29**	Received Notice of Award from FEMA	
	February 20	Request for proposals for professional services to revise the 2009 PDM Plan	Identify a qualified consultant to complete the plan update, receive bids
	March 12 – April 1	Consultant selection – J-U-B Engineers	Consulting services.
		Meeting with District Emergency Managers	Discuss the plan, mitigation strategies and needed data.
	April 10	Project kick off meeting between consultant and Weber County Emergency Management	Establish project goals and timeline, expectations
	April	Update demographic, economic, background data for Weber County.	Provide current background data.
	May 1	Project progress meeting.	Assess progress, needs and timeline.
	May 12	Emergency managers meeting with municipal staff	Discuss the plan, mitigation strategies and needed data..
	May	Obtained current SHELDUS data.	Revision of Weber County hazards and risk assessments.
	May	Prepared new maps of Weber County, hazard mapping.	Revision of Weber County hazards and risk assessments.
	May 18	Meeting with Utah DEM.	Understanding of FEMA/State requirements for plan, data sources, general progress update and coordination.
	May 20-June 1	Conducted HIRA with new data.	Identify hazards in the county and jurisdictions.
	June	Obtained City and District background information, current mitigation strategies, planned mitigation strategies.	Include current information and updated mitigation strategies in the Plan.
	July 6	Meeting with Weber County Emergency Management, County Engineering, Consulting Engineer and Planner.	Assessed status of 2009 mitigation strategies, continued identification of future mitigation strategies.
	July 16	Draft plan to Weber County	Review for accuracy, completed information.
	July 23	Draft plan distributed to cities and districts.	Review for accuracy, completed information.
	August	Public City Council meeting presentations.	Make public and City Councils aware of the PDM Plan draft and to solicit public comment.
	September	Submit plan to DEM.	Review for compliance with DMA 2000 prior to FEMA submittal.

Table 3-2. Planning Process Timeline

Public Involvement

Public involvement opportunities were available and incorporated throughout the development of this Plan. A description of the plan's purpose and a draft plan were posted on Weber County's website with an email address by which to solicit public comment for 30 days. The comments received were reviewed and considered to inform the final plan. A brochure was created and copies were available at each city/town office throughout the County. The plan was presented a public meetings in each jurisdiction and reviewed by city/town councils for approval. Emergency managers, fire and sheriff departments, service districts, business leaders, educators, and other interested members that could be affected by a hazard within the County or other interested members, were all a part of the planning process.

Information Sources and Revision Process

Background information and data for this Plan was obtained from the sources listed below. From these sources, the consulting engineers and planners extracted relevant information and data. That information and data was subsequently submitted to the County Emergency Managers for their consideration and approval for inclusion into the Plan. Relevant information gathered from these sources was compiled by the Emergency Managers and incorporated into this Plan.

- Federal Emergency Management Agency (guidance)
- National Weather Service (hazard profile)
- National Climate Data Center (drought, severe weather)
- Utah Division of Emergency Management (GIS data, flood data, HAZUS data for flood and earthquake)
- Utah Geologic Survey (GIS data, geologic information)
- Utah Division of Forestry Fire and State Lands (fire data)
- Utah Avalanche Center, Snow and Avalanches, Annual Report 2006-2007 Forest Service
- Utah Department of Transportation (traffic data)
- Utah Automated Geographic Resource Center (GIS data)
- University of Utah Seismic Station (earthquake data)
- Utah State University (climate data)
- Weber Area Council of Governments
- Automated Geographic Reference Center (AGRC)
- Weber County Staff
- Utah Department of Agriculture and Food Insect Infestation Reports
- Utah Association of Special Districts
- SHELDUS: Spatial Hazards Data and Loses Database
- Weber County and municipalities (Emergency Operations Plan, histories, mitigation actions, public input, data: GIS, assessor, transportation, property and infrastructure, parcel, county projects, county plans)
- Earthquake Safety in Utah
- Utah Natural Hazard Handbook
- Utah Statewide Fire Risk Assessment Project
- A Strategic Plan for Earthquake Safety in Utah
- State of Utah 2014 Hazard Mitigation Plan

THIS PAGE INTENTIONALLY LEFT BLANK

PART IV. 2009 MITIGATION GOALS AND OBJECTIVES REVIEW

The 2009 Wasatch Front Pre-Disaster Mitigation Plan required each county to develop a prioritized set of mitigation goals, objectives and actions for each identified hazard. Below is a review of each of the Weber County goals and actions and a status update.

Dam Failure

Problem Identification: The failure of federal, state and private dams can impact Weber County. Debris basins of concern include Birch Creek, Glassman Way and Harrison Blvd.

OBJECTIVE #1 (Priority MEDIUM): Reduce the impact of catastrophic flooding due to dam failure

Action 1: Re-evaluate current high hazard dams and evaluate use of early warning sirens to warn public.

Time Frame: Ongoing
Funding: Local and State
Estimated Cost: Unknown
Staff: County Emergency Management
Jurisdictions : Countywide

Status: **Completed. Evaluated early warning sirens, found them to be cost-prohibitive and alternatives were developed including mass emergency notification systems, wireless emergency alerts, social media, etc.**

Action 2: Identify and fund dams needing armored concrete chutes.

Time Frame: Unknown; based on funding
Funding: Local and State
Estimated Cost: Unknown
Staff: Stormwater Management, County Engineer, State Engineer
Jurisdictions: Countywide

Status: Completed. Analysis of Utaba Dam owned by Weber County. Report completed by Weber County in 2013 identified that the spillway needs to be repaired/replaced.

Action 3: In partnership with the U. S. Bureau of Reclamation (BOR), develop accurate dam failure inundation maps for BOR dams.

Time Frame: Unknown, based on funding
Funding: Local, state and federal
Estimated Cost: Unknown
Staff: County Emergency Management, State, BOR
Jurisdictions: Countywide

Status: In progress. Weber County has worked with BOR and the County has received two updated inundation maps.

Earthquake

Problem Identification: Non-structural hazards in the Weber County schools are a threat to students, employees, and facilities while also causing increases in recovery time/activities following an earthquake.

Objective #1 (Priority HIGH): Reduce the impact of non-structural events following an earthquake

Action 1: Develop and implement a manual similar to Salt Lake City (SLC) school districts

Time Frame: Immediate
Funding: School Districts, State Earthquake Program Grant
Estimated Cost: Minimal if using SLC School District template
Staff: School Districts, County Emergency Management
Jurisdictions: Countywide

Status: This was determined to be an action for Weber and Ogden School District and has been included in the Districts' mitigation strategies.

Action 2: Develop a training document for schoolteachers showing non-structural mitigation activities for classrooms

Time Frame: Ongoing
Funding: County Emergency Services, State Earthquake Program
Estimated Cost: Minimal
Staff: County Emergency Services, School District
Jurisdictions: Countywide

Status: This was determined to be an action for Weber and Ogden School District and has been included in the Districts' mitigation strategies.

Problem Identification: Critical facilities (public safety, utilities, water/wastewater, schools, hospitals), need to be made less vulnerable from the impacts of earthquakes to allow for a more timely and efficient response and recovery.

Objective #2 (Priority HIGH): Reduce the vulnerability of critical facilities

Action 1: Develop an earthquake vulnerability study for identified critical facilities, including schools, public safety facilities, hospitals and utilities.

Time Frame: 5-10 years
Funding: Pre-Disaster Mitigation Grant
Estimated Cost: Unknown
Staff: Local Emergency Planning Committee (LEPC)
Jurisdictions: Countywide

Status: In progress.

Action 2: Study hazardous materials Tier 2 sites for possible seismic retrofit

Time Frame: 2 years
Funding: Federal grants
Estimated Cost: Unknown
Staff: LEPC
Jurisdictions: Countywide

Status: In progress.

Action 3: Complete vulnerability analysis and develop mitigation plan for Weber Basin Water Conservancy District (WBWCD) facilities.

Time Frame: 2 years
Funding: PDM grant and WBWCD funds
Estimated Cost: $300,000
Staff: WBWCD staff
Jurisdiction: WBWCD and U. S. Bureau of Reclamation

Status. Completed. WBWCD has completed a mitigation plan and has received FEMA funding for implementation.

Problem Identification: Areas of high liquefaction (western Weber county: Hooper, Farr West, West Warren, West Haven, Marriott-Slaterville, Plain City) are experiencing increased growth.

Objective #3 (Priority HIGH): Increased awareness of high liquefaction areas

Action: Include current liquefaction maps on the County website

Time Frame: Within 1 year
Funding: County Emergency Services, County Engineer
Estimated Cost: Minimal
Staff: County Emergency Services, County Engineer, GIS and Web
Jurisdictions: Jurisdictions with potential for liquefaction

Status: Completed. Weber County GIS has created a liquefaction map and it is available on Weber County's Geo Gizmo application.

Problem Identification: Development on identified fault traces increases the risk to life and property.

Objective #4 (Priority HIGH): Promote natural hazards ordinance limiting development in high-risk areas

Action: Make available copies of county natural hazards ordinance for cities within the county and educate citizens on its implementation

Time Frame: Within 1 year
Funding: County Emergency Services, County Engineer
Estimated Cost: Minimal
Staff: County Emergency Services and County Engineer
Jurisdictions: Countywide

***Status**: In progress. An update of the geologic hazards ordinance is underway. It is anticipated that it will be completed within three years.*

Flood

<u>Problem Identification:</u> Some communities not participating in the National Flood Insurance Program (NFIP).

Objective #1 (Priority MEDIUM): Make federal flood insurance available within communities and adopt flood loss prevention ordinances.

Action: Encourage the communities of Hooper, Farr West, Marriott-Slaterville, Washington Terrace and Huntsville to participate in the NFIP.

Time Frame: Ongoing
Funding: None required
Estimated Cost: Minimal
Staff: State Floodplain Manager, City Officials, Building Officials
Jurisdictions: Washington Terrace, Huntsville

Status: Completed. All communities are now participating in the NFIP.

<u>Problem Identification:</u> Stormwater continues to be a critical flood issue in the county. Stormwater drains are illegally connected to the sewer system in many areas.

Objective #2 (Priority HIGH): Implement and fund identified stormwater projects to lessen impact of flooding in the county.

Action 1: Include current stormwater plans and projects in hazard mitigation plan

Time Frame: Ongoing
Funding: Project specific; funding from County, Stormwater, State and Federal Programs
Estimated Cost: Dependant on project
Staff: County Stormwater, County Engineer, Stormwater Coalition
Jurisdictions: Countywide

Status: Completed. Stormwater management plans and projects are included in this 2015 plan update.

Action 2: Reduce stormwater infiltration into sewer system

Time Frame: 2-3 years
Funding: City/County funds, Stormwater
Estimated Cost: Minimal
Staff: Central Weber Sewer
Jurisdictions: Countywide

Status: In progress. Central Weber has been involved in the planning process and has developed mitigation strategies.

Action 3: Update Regional Stormwater Management Plan

Time Frame: Spring 2008
Funding: Weber County Stormwater monies
Estimated Cost: Unknown
Staff: County Engineer, City Stormwater Managers
Jurisdictions: Countywide

Status: In progress. Weber County Engineering is in the process of updating the county-wide stormwater management plan and it is anticipated that it will be adopted in December 2015.

Problem Identification: Weber County has an extensive canal system. A canal breach or overtopping has occurred and possible future occurrences continue to be a significant flood threat.

Objective #3 (Priority HIGH): Evaluate canals in the county that may cause flooding

Action 1: Identify canals in the county that have the potential to cause damage due to flooding

Time Frame: Two years
Funding: County Emergency Management, State Mitigation Program Grant
Estimated Cost: Dependent on scope of study
Staff: County Stormwater, County Engineer
Jurisdictions: Countywide, Special Service Districts

Status: Completed. The County now has GIS maps of all canals in the County as per Utah legislation.

Action 2: Identify areas of stormwater entering canals

Time Frame: Ongoing
Funding: County Emergency Management, water districts
Estimated Cost: Unknown
Staff: County Stormwater, County Engineer, County Emergency Management
Jurisdictions: Countywide

Status: Completed. Water Districts and Canal Companies are required by state legislation to provide municipalities with mapping of canal locations and areas of storm water entering canals.

Action 3: Create sub-committee under Stormwater Coalition to handle canal flooding issues

Time Frame: November 2009
Funding: Stormwater Coalition
Estimated Cost: Minimal
Staff: Stormwater Coalition
Jurisdictions: Countywide

Status: Completed. Due to new Utah legislation, the canal companies are now required to address flooding issues.

Problem Identification: Several infrastructure additions and upgrades are needed to mitigate the flood threat.

Objective #4 (Priority HIGH): Add/upgrade mitigation infrastructure

Action 1: Levee needed on Lower Weber River

Time Frame: 3-5 years
Funding: Federal and State grants; Local match
Estimated Cost: Unknown
Staff: County Engineer
Jurisdictions: Countywide

Status: In progress. After the 2011 flooding disaster, repairs were made but more funding will be needed to complete repairs.

Action 2: Bridge widening needed on Ogden River at Washington and Lincoln Boulevards

Time Frame: 3-5 years
Funding: Federal and State grants; Local match
Estimated Cost: Unknown
Staff: Ogden City
Jurisdictions: Ogden City

Status: Completed. Ogden City not only widened the bridge but utilized a holistic approach to increase the capacity above 1,800 cfs., added bike/pedestrian walkways, and improved transportation.

Action 3: Mitigate flooding on hot springs/sloughs

Time Frame: 3-5 years
Funding: Local funds
Estimated Cost: Unknown
Staff: County Engineer
Jurisdictions: Countywide

Status: In progress. These projects have been identified in the Weber County Stormwater Master Plan which will be adopted in 2015.

Severe Weather

Problem Identification: Most disaster declarations are generated from weather related incidents. Weber County continues to be impacted by snowstorms, hail, thunderstorms/lightning, tornadoes, heavy rain and avalanche.

Objective #1 (Priority MEDIUM): Reduce impact to life and property from severe weather related incidents

Action 1: Establish and support countywide National Weather Service (NWS) StormReady program

Time Frame: Two years
Funding: County Emergency Management
Estimated Cost: Dependent on scope of study
Staff: County Emergency Management, NWS Salt Lake City Forecast Office
Jurisdictions: Countywide

Completed: Weber County has been identified as a StormReady Community as part of the Community Rating System requirements.

Action 2: Identify areas of avalanche risk. Develop and post signs for avalanche danger

Time Frame: Ongoing
Funding: County Emergency Management, County/City Planners, County/City Engineers, Road Dept/Public Works
Estimated Cost: Minimal, for signs and placement of signs
Staff: County/City Engineers, Road Department/Public Works
Jurisdictions: Countywide

Status: Completed. In Weber County's assessment it was determined that avalanche is not a serious risk to County infrastructure. The majority of avalanche prone areas are on U.S. Forest Service lands or private property.

Slope Failure

Problem Identification: Weber County has a significant number of landslide hazard areas.

Objective #1 (Priority HIGH): Re-evaluate current county landslide map

Action: Update current landslide map and supporting data

Time Frame: Unknown; based on funding
Funding: Local and State
Estimated Cost: Unknown
Staff: County/City Engineering
Jurisdictions: Countywide

Status: Completed. New data was obtained by USGS when they created new maps to be included in the Geo Gizmo application for Weber County.

Objective #2 (Priority HIGH): Develop a county landslide pre-stabilization ordinance for landslide areas in the Norwood Tuff soils area of the Ogden Valley 6:1 or steeper.

Action: Require land stabilization engineered design for properties subject to slope failure in identified risk areas.

Time Frame: Ongoing
Funding: County, Property Owners,
Estimated Cost: Unknown
Staff: County Engineer, Engineering Consultants, UGS
Jurisdictions: Jurisdictions prone to landslide hazard

Status: Completed. New data was obtained by USGS when they created new maps to be included in the Geo Gizmo application for Weber County.

Objective #3 (Priority LOW): Reduce risks from debris flow hazard

Action 1: Add debris basins to master plans

Time Frame: January 2008
Funding: Local
Estimated Cost: Minimal
Staff: County Engineering, County Emergency Services
Jurisdictions: Countywide

Status: In progress. As development is proposed, county ordinances require an analysis regarding the need for debris basins is conducted.

Action 2: Educate cities on debris basins

Time Frame: 1-2 years
Funding: Local
Estimated Cost: Minimal
Staff: County Engineering, County Emergency Services
Jurisdictions: Countywide

Status: In progress. All cities use the county ordinance regarding debris basins.

Objective #4 (Priority HIGH): Evaluate hazards to the Weber Aqueduct and develop a long-term mitigation plan.

Action: Develop long-term mitigation plan.

Time Frame: 2-3 years
Funding: WBWCD, PDM grant, U.S. Bureau of Reclamation
Estimated Costs: Unknown
Staff: WBWCD
Jurisdiction: WBWCD

Status: No longer applicable. This action falls under the responsibility of Weber Basin Water Conservancy District to include in their mitigation plan

Wildland Fire

<u>Problem Identification:</u> The Wildland-Urban Interface (WUI) continues to be of concern in the Uintah Highlands, Wolf Creek, North Ogden and several areas in Ogden Valley.

Objective #1 (Priority MEDIUM): Reduce potential impact to life and property in WUI areas

Action 1: Develop and implement a strong land use ordinance that addresses fuel reduction in areas at risk from fire.

Time Frame: Ongoing
Funding: County/City Emergency Management, Planning and Zoning, County/City Attorneys, Public Officials
Estimated Cost: Minimal
Staff: County/City Emergency Management, Planning and Zoning, County/City Attorneys, Public Officials
Jurisdictions: Countywide

Status: Ongoing. Weber County adopted the statewide WUI Code.

Action 2: Encourage communities to participate in the Fire Wise Community programs

Time Frame: Ongoing
Funding: County Emergency Management, County/City Planners, County/City Engineers, Road Dept/Public Works
Estimated Cost: Minimal
Staff: Contractors, County/City Fire, Local participation
Jurisdictions: Countywide

Status: Ongoing. Projects have been completed on the city level in North Ogden, Pole Patch, Pleasant View to reduce fuel

Action 3: Create County ordinance adopting 2006 Wildland-Urban Interface Code

Time Frame: 60 days
Funding: County funds
Estimated Cost: Minimal
Staff: Weber Fire District
Jurisdictions : Countywide

Status: Completed.

Action 4: Urge cities to adopt the 2006 Wildland-Urban Interface Code

Time Frame: 60 days
Funding: County funds
Estimated Cost: Minimal
Staff: Weber Fire District
Jurisdictions: Countywide

Status: Completed. Cities and fire districts that have WUI interface have adopted the WUI Code.

Objective #2 (Priority MEDIUM): Organize community to reduce wildfire hazard

Action 1: Create Wildfire Community Councils

Time Frame: 4-5 years
Funding: Utah Division of Forestry, Fire, and State Lands
Estimated Cost: Unknown
Staff: Weber Fire District
Jurisdictions: Countywide

Status: In progress. Causey Estates, Nordic Valley, Pole Patch, Pineview Estates, Uintah Highlands have implemented these community councils to date.

Additional Actions Taken

From April to July of 2011 the Weber and Ogden Rivers experienced flows of more than double the average peak flows. The Weber River's average peak flow is approximately 2800 cfs; during the 2011 runoff it was flowing at 4,580 cfs. (USGS, 2011). The sustained flows lasted for nearly four months causing significant damage to bridges, trails, the river channel, businesses, recreational facilities, homes and agricultural lands. A Major Disaster Declaration was issued in August 2011.

To repair damaged areas and mitigation against further damage, Weber County has committed its own resources and funding and also received an Emergency Watershed Protection grant from NRCS to complete emergency watershed projects. Some of these projects are described below.

The 2011 flooding left silt deposits and debris throughout the river. Over the last four years, Weber County has actively removed this silt and debris from more than 16 miles of the Weber River.

Silt and Debris Removal Efforts

As a flood control measure, the County enlarged gates at the Ogden Waterfowl Management Area to allow for greater flood water capacity.

Ogden Waterfowl Management Area Gates


Ogden Waterfowl Management Area Gates

In direct response to the 2011 flooding, Weber County spent nearly $2 million to complete bank repair and stabilization projects at approximately 30 locations along the Lower Weber River.



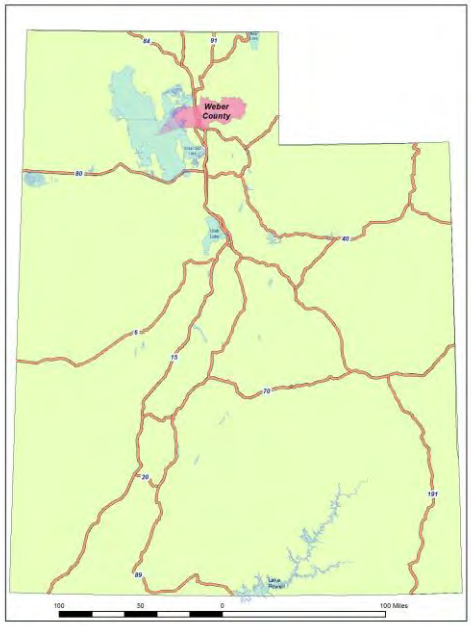

Lower Weber River Bank Stabilization and Repair

During the 2011 flood, water topped the un-engineered levee that was constructed in 1933. To prevent this from happening in the future, Weber County constructed the Little Weber Diversion. This structure diverts water away from three large businesses in western Weber County: two dairies that gross 1 million per month in revenue and one commercial wholesale nursery that generates about 1 million per month in revenue. The channel is about a mile long and cost more than $8 million to construct.

Little Weber Diversion Structure

PART V. REGIONAL DATA

Weber County encompasses a variety of geographic features, demographic characteristics, and economic sectors which bring unique strengths and hazard profiles described in this section of the Plan.



Map 5-1. Weber County Location in Utah

Population

Table 5-1 identifies the population for each city using U.S. Census Bureau population estimates.

Municipality	Population	Growth (since 2010 Census)
Farr West	6,140	3.6%
Harrisville	5,915	5.9%
Hooper	7,957	10.2%
Huntsville	619	1.5%
Marriott-Slaterville	1,737	1.9%
North Ogden	18,019	3.9%
Ogden	84,249	1.7%
Plain City	6,049	9.8%
Pleasant View	8,571	7.3%
Riverdale	8,560	1.6%
Roy	37,773	2.3%

South Ogden	16,789	1.6%
Uintah City	1.327	0.1%
Washington Terrace	9,164	1.1%
West Haven	11,248	9.5%
Unincorporated	17,720	4.0%
TOTAL	240,475	4.0%

Table 5-1. Population Estimates
Source: US 2010 Census and 2013/2014 estimates

A. Geographic and Physiographic Background

Weber County is located in the north-central part of the state and is the second smallest county in terms of land area, yet the fourth most populous. Weber County has a total area of 662 square miles. The Great Salt Lake covers approximately 112 square miles of the county's area. Elevation ranges from 4200 feet at the Great Salt Lake to over 9,700 feet at Ben Lomond Peak.

The eastern half of Weber County is a high alpine valley and a mountain area, while the western portion is a flat, fertile plain formed by alluvial deposits from Lake Bonneville. The Weber River and its tributaries the Ogden River, Coldwater Creek, Burch Creek and several other smaller creeks, are the main river drainages. The Weber River drainage covers approximately 2,460 square miles. The county is bordered by Box Elder County on the west, Cache and Rich Counties on the north, Morgan County on the east and Davis County on the south.

B. Geology

Weber County is part of the Wasatch Front Region comprised of the Wasatch, Uintah, Oquirrh and Stansbury Mountain Ranges. Weber County is on the north end of the Wasatch Mountain Range which runs north-south and is the eastern border of the valley region of the Wasatch Front.

The geology of this region is a product of Miocene Epoch faulting and folding followed by a period of upheaval. The upheaval raised the valley 3,000 to 5,000 feet in a dome like manner during the Tertiary Period. This disturbance of the valley floor created a tension and a build-up of stress. To accommodate for the change, "block-faulting" occurred that allowed for the uplift of the mountain ranges and depression of the valley floor. This depression extends to the lowest portion of the Wasatch Front Region: the Great Salt Lake. Erosion is now the main geologic process of this area.

The Uintah and Wasatch Ranges are comprised of mainly tertiary lake deposits and tertiary and quaternary volcanic rocks as well as younger Precambrian sedimentary rocks. To the north of Salt Lake City, including the Weber County portion of the Wasatch Front, the hardest, highly altered metamorphosed rocks of schist and gneiss are found and date back about 2.6 billion years. Paleozoic marine sedimentary rocks surround the Precambrian areas of the Range. The Paleozoic sedimentary rocks have a very weak make-up and, in conjunction with Utah's heavy precipitation during the winter and summer months, many landslides, avalanches, debris flows, and rockfalls occur.

C. Climate

Northern Utah has a cold desert climate. Utah has hot dry summers and cold winters. However, Utah's climate is variable, wet in some areas of the state and dry in others. This variability is a function of latitude, elevation, topography, and distance from moisture sources. The Wasatch Front region's climate borders a semi-arid, mid-latitude steppe climate that occurs along the perimeter of the Great Basin Desert, and a humid continental climate found at slightly higher elevations in the Rocky Mountain foothills.

Northern Utah has four seasons, low annual precipitation, convective and frontal storms, dry summers, low humidity, and large annual and diurnal temperature extremes. The Wasatch Mountain Range brings most of the precipitation to the valley floor. The winter months bring heavy snow accumulation over the mountains that are favorable for winter sport activities.

Spring runoff is at its peak from April through June and can cause flooding along the lower streams. Flash flooding from summer thunderstorms affects smaller more localized areas in this region from summer thunderstorms.

The average annual precipitation in the Wasatch Mountain Range can be more than 40 inches, while the Great Salt Lake desert averages less than 5 inches annually. The average annual precipitation at the Salt Lake International Airport is 15.3 inches, with an average of 58.9 inches of snowfall. Utah is the second driest state in the nation.

The surrounding mountain ranges act as a barrier to the cold continental arctic masses. This also insulates the area during the day and cools the area rapidly at night. On clear nights, the colder air accumulates on the valley floor, while the foothills and benches remain relatively warm.

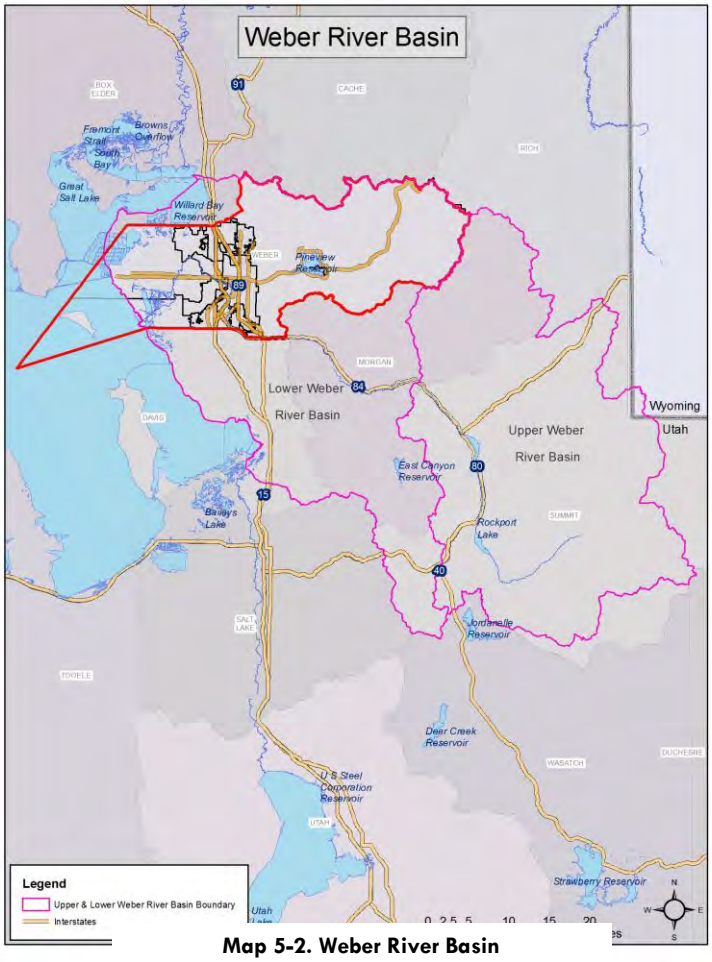
During the fall and winter months, smoke, haze, and fog can accumulate in the lower levels of stagnant air over the valley floor and can last for several weeks at a time. This is caused by areas of sinking air or high-pressure anticyclones settling over the Great Basin.

Average wind speeds are usually light to moderate, usually below 20 miles per hour. Strong winds can occur in localized areas, mainly in canyon mouths along the western slopes of the Wasatch Mountains. Dust storms can occur in the western portions of the region. Tornadoes have occurred in this region but are uncommon. Severe hailstorms have also occurred in the region during the spring and summer months.

D. Major Rivers

Most of Utah's water is from snowmelt that occurs during the spring and summer. Larger drainages or river basins are formed from the mountain ravines or depressions that merge into perennial rivers and then meet forming the larger drainages. Weber County is part of the Weber River Basin.

Agricultural irrigation is the primary use of developed water in Utah, but municipal, industrial, environmental and recreational uses are increasing and this competition will reform the way water is utilized. With the growing population, agricultural land has decreased, with residential and commercial development on the rise. According to the Utah Water Plan, the Weber River Basins is projected to lose a significant amount of agricultural land over the next few decades.



Map 5-2. Weber River Basin

Water and Drought

Utah is the second driest state in the nation and ranks second in per capita water use of public supplies. According to the Utah Division of Water Resources, Utah last experienced drought conditions from 1999 to 2004 on a statewide level. The Drought Palmer index shows Weber County in a Moderate Condition. This index is used to monitor drought conditions based upon rainfall data. Decreased flow from major rivers has led to a decline in most of the reservoir levels and in the Great Salt Lake. The latest drought is unusual because of the severity. The 2015 water year was one of the driest ever recorded (Snow pack projections-Ben Lomond Trail NRCS-USDA).

E. Development Trends

Weber County's residential growth has been moving west into agricultural lands near the Great Salt Lake. Growth pressures and the demand for a rural atmosphere also continue to inflate property values in the Ogden Valley. Development pressure in west Weber County has placed a premium on the availability of drinking and secondary water. The ground is so flat near the lake that sewage must be pumped to treatment plants. Septic systems are no longer permitted due to the negative impact to groundwater supplies. The planned Legacy Highway north extension, known as the West Davis Corridor, will further facilitate transportation into Weber County.

Population growth in Weber County is attributed primarily to residents having children. Some residential growth is attributed to in-migration due to the area's strong job market. Utah's population grew by 36,141 in 2014 with net migration to the state of 4,230 people. Weber County's population grew by 4% in 2014 compared with 1.4% statewide and 0.7% nationally.

Area	2010 Population	2020 Population	2030 Population	2040 Population	% Growth 2010-2040
Weber County	**231,236**	**258,423**	**300,477**	**349,009**	**50.9%**
Farr West City	5,928	6,835	7,238	8,163	37.7%
Harrisville City	5,567	6,314	7,741	8,146	46.3%
Hooper City	7,218	8,967	13,989	21,640	199.8%
Huntsville Town	608	666	727	688	13.1%
Marriott-Slaterville City	1,701	2,003	2,741	4,826	183.7%
North Ogden City	17,357	19,927	25,351	36,923	112.7%
Ogden City	82,825	90,971	100,123	102,059	23.2%
Plain City	5,476	6,431	8,727	10,694	95.3%
Pleasant View City	7,979	9,204	11,876	15,626	95.8%
Riverdale City	8,426	9,093	9,365	9,694	15%
Roy City	36,884	39,979	41,890	43,876	19%
South Ogden City	16,532	17,941	18,885	19,387	17.3%
Uintah City	1,322	1,502	1,851	1,749	32.3%
Washington Terrace City	9,067	9,857	10,446	13,456	48.4%
West Haven City	10,272	13,121	21,731	32,674	218.1%
Unincorporated Areas	14,074	15,613	17,796	20,408	45%

Table 5-2 Population Projections
Source: Governor's Office of Planning and Budget, 2013 Population Projections

Population increases are projected to occur mainly in the western, rural areas of Weber County as agricultural land is converted to residential uses. This change in land use will require a pro-active understanding of the hazards that exist in western Weber County and how best to make land use decisions in regards to new development.

F. Development Constraints/Opportunities

Influences on development are many and interrelated. A few are geographic, historic layout, transportation, household size, technology, employment trends and public policy. Development influences can encourage and/or discourage growth. For example, floodplains, wetlands, slopes and faults, sensitive species and transportation influences both attract and detract development.

Geographic

Geographic constraints on the urban area have created a linear region that stretches north to south, from Pleasant View on the north and south to Riverdale and Uintah. At its widest, the valley is only 15 miles wide. This unique geographic layout has resulted in the development of a transportation system that is focused on the north-south movement of goods and people.

Floodplains

There are a number of identified floodplains in the region that pose challenges, command respect and generate appeal for development. Weber County is bisected by numerous rivers and streams, which emanate from the mountains and flow westward into the Great Salt Lake. In Weber County, the Ogden/Weber River system is the most significant. There are other streams and canal systems, some flow through open channels while sections of others are enclosed in underground pipes.

Wetlands

Wetlands are those areas that are inundated or saturated with surface or groundwater at a frequency and duration sufficient to normally support a prevalence of vegetation typically adapted for life in saturated soil conditions. The greatest and most significant complex of wetlands in the intermountain area can be found adjacent to and surrounding the Great Salt Lake. These wetlands provide important habitat to resident wildlife and are also an internationally significant habitat. As many as one million migratory shorebirds and waterfowl utilize the Great Salt Lake wetlands during annual migrations across North America. A majority of these wetlands are found on the east side of the lake. The east side of the lake is where the lake receives most of the fresh water and also where development pressures are occurring.

Numerous rivers and streams flow into the lake, supplying this area with the fresh water needed to support wetlands plant and animal life. Wetlands can also be found adjacent to the streams, particularly in areas where the streams flow through relatively flat topography or low-lying areas.

Wetlands can be categorized according to their quality and type. Jurisdictional wetlands are those wetlands that are within the extent of the U.S. Army Corps of Engineers (USACE) regulatory overview.
For an area to be identified as a jurisdictional wetland, the area must exhibit positive indicators of wetland hydrology, hydrophytic vegetation and hydric soils. If wetlands provide a particularly rich habitat for a variety of wildlife species, it is usually considered to be of high quality, or have a high functional value. Also, wetlands can be classified according to their type, including marsh, wet meadow, riparian scrub, playa/mudflat and open water.

Wetland areas in Hooper, in western Weber County, contain the Ogden Bay Waterfowl Management Area. The Ogden Bay WMA is a State-owned and operated wetland area which houses American Avocets, Yellowlegs, Long-Billed Dowitcher, White-Faced Ibis and many more. According to the GOPB's projections, Hooper City is expected to grow 199% by 2040, which may impact wetlands and farmlands in the area.

Farmlands

Over the past several years, many acres of farmland in the area have been developed and converted for residential or other commercial use. There is a limited amount of prime/unique farmland and farmland of statewide importance in western Weber County and the Ogden Valley. Historically, development followed farmland in an agrarian economy.

If farmlands are located within incorporated city limits, it is presumed they will be eventually developed into urban type land uses. Currently, a majority of the acreage of these farmlands is being used to grow winter (dry farm) wheat and alfalfa.

Slopes and Faults

The steep slopes of the Wasatch Mountain Range were created by the Wasatch Fault, which runs the entire length of the urbanized areas. The Wasatch Fault and other faults in the area highlight the potential for earthquakes in the area and the need to consider their possible impact on infrastructure. As development continues to creep higher on the foothills of the Wasatch Mountains, slope stability, erosion and drainage problems will present engineering challenges in development design. Development is usually attracted more to the views of slopes and faults than repelled by the higher risk of soil instability.

Open Space

Open Space is a large influence to residential and commercial development. Generally, people are attracted to open space. The Wasatch Front Region is surrounded by relatively large amounts of open space. Some notable peaks in Wasatch Range just east of the Weber/Davis area are Ben Lomond Peak, Mount Ogden, Thurston Peak and Francis Peak. Numerous nationally-recognized winter and summer recreation areas for skiers, hikers and rock climbers are in close proximity. As a consequence, hundreds of thousands of people visit the public lands in the foothills and mountains of the Wasatch annually.

Over the past several years, population growth in the urbanized areas has impacted the open space resources of the Wasatch Range in a variety of ways. Two of these ways are mentioned here. First, there are many more people visiting the popular places in the adjacent mountains. This has jeopardized the environmental quality of the mountains by degrading surface and ground water quality. The Wasatch Range is a major source of water for the adjacent urbanized areas, and water quality degradation can have far-reaching effects. Secondly, many access points or trail heads to the canyon and other mountain destinations located on public lands that were commonly used in the past have been closed off to the public by private developments. The effect of this is that much of the public open space becomes inaccessible and the opportunity to visit these popular places becomes lost. Remaining access to non-private lands is channeled through an ever-decreasing number of public access points.

Not only can open space resources be found in the mountains of the Wasatch, but private and public open space is also found in the valleys in the form of farms, developed and natural parks, golf courses, water features and vacant land. In many instances, these resources may receive more intensive use than those found in the adjacent mountains. Recently, because of the rapid growth in the area, citizens as well as state and local political leaders have become concerned about the relatively rapid loss of private open space resources, such as farmland and vacant land. Urban growth has put considerable pressure on the farmlands that can still be found in, or adjacent to, the urbanized areas. Some individuals and lawmakers value farmlands and would like to see some of them preserved for future generations. Management and development of open space has many questions – how, where, and to what degree will these lands be preserved?

Some agricultural lands are receiving state designation as farmland preserves through the use of conservation easements and favorable tax treatments. These designations assist farmers in preserving their lands for future agricultural use and provide aesthetically pleasing open space today. However, as development pressure and property values increase, it may become increasingly difficult to keep many agricultural lands in agriculture preserves. Policy decisions relative to open space will affect land use and development patterns, and, as a consequence, will also affect long range plans for the region's transportation systems.

Hazardous Waste Sites

Currently there are numerous hazardous waste sites, or contaminant sources, located within the urbanized areas. Many of these sources are in relatively close proximity to transportation projects. Construction through potential contaminant sources may add health and safety concerns and affect construction budget expenditures. The impact of these sites on transportation facilities will need to be addressed during the design and construction phase of each highway or transit project.

There are potentially five types of contaminant sources: underground storage tanks, Title 3 sites, Toxic Release Inventory (TRI) 1990 sites, Resource Conservation and Recovery Act (RCRA) sites and Comprehensive Environmental Response Compensation and Liability Act (CERCLA) sites.

In 2014, the EPA implemented a new information system, the Superfund Enterprise Management System (SEMS) to replace the Comprehensive Environmental Response, Compensation and Liability Inventory System (CERCLIS) database. The SEMS documents hazardous waste sites where a release or potential threatened release, has been investigated. These sites are further defined as a location that has been reported to the Environmental Protection Agency and where it is probable that some environmentally hazardous materials are present. Also, the State of Utah Division of Solid and Hazardous Waste maintains databases for underground storage tank facilities, Leaking Underground Storage Tank (LUST) sites, and RCRA facilities.

The SEMS database identifies the following Superfund sites in Weber County.

Site Name	City	NPL (National Priority List) Status	Status Date
22nd Street and Pingree Avenue VOC Plume	Ogden	Not NPL	2/14/2012
HURCO Industries Solvent Plume	Ogden	Not NPL	10/9/2009
Ogden Defense Depot	Ogden	Final NPL	n/a
Ogden Gas Company	Ogden	Not NPL	4/16/2012
Ogden Industrial Park Plume	Ogden	Not NPL	3/20/2008
Ogden Iron Works South	Ogden	Not NPL	2/23/2010
Ogden Railroad Yard	Ogden	Not NPL	10/29/2010

Table 5-3. Superfund Sites in Weber County
Source: EPA Superfund Enterprise Management System 2014

Sensitive Species

Sensitive species are plants and animals, which are considered, threatened or endangered relative to extinction. There are currently 21 species in the Wasatch Front Urban Area that fall into the sensitive species category. The most notable of these are the peregrine falcon, bald eagle, and Ute ladies tresses which are all on the federal list of endangered and threatened species. Both peregrine falcon and bald eagle sightings have been reported over the past few years on a fairly regular basis. Some examples of other less notable sensitive species, which are known to inhabit certain areas of the Wasatch Front region, include the spotted frog, least chub, western burrowing owl, ferruginous hawk, white faced ibis, Bonneville cutthroat trout, pocket gopher and others. The likelihood of these and other sensitive species being present in the region will depend on whether or not suitable habitats exist.

Ground Water

Much of the water flowing in streams and interfluvial areas seeps into the ground. The foothills and the base of the mountains are the locations where much of this water seeps into the ground. These locations are referred to as aquifer recharge areas. Water is stored in aquifers of various types. A considerable amount of the Wasatch Front's water resources comes from these aquifers, which can be tapped through wells or natural artesian springs. Weber County receives an average of 16.44 inches of precipitation annually. Past and present human activities have affected these ground water resources in certain locations. If precautions are not taken, harmful substances found in landfills and industrial sites can be leached by rain and snow and find its way into the ground water resources.

Transportation

The growth and distribution of population and employment in Weber County will have a significant impact on the transportation demands. Transportation accessibility is one of the major, if not the most important determining factor, where people live and work. To a large extent, people will live and work where transportation exists. Future development patterns will influence and be influenced by transportation. It is better planning to first conceptually plan for major transportation requirements.

Major freeways and highways traveling through Weber County include: Interstate-15, Interstate-84, and US-89; all major freight and transportation corridors.

A majority of the population growth is expected to occur in western sections Weber County. Anticipated growth will increase the need for north-south travel in the Region. UTA's FrontRunner commuter rail currently extends north to Pleasant View in the and south to Provo with plans to extend to Brigham City. In addition, an extension of the Legacy Highway is planned for construction through western Davis County and Weber County.
The population and employment growth in Davis and Salt Lake Counties to the south and, to a lesser extent, Morgan County to the east and Box Elder County to the north, will increasingly affect travel demand in the Ogden/Layton Urbanized Area.

The growth and distribution of the Wasatch Front population and employment will continue to have a significant impact on the transportation needs of the future. Increases in regional population and employment translate into a growing demand for travel. In addition, the number of miles driven continues to increase. The amount and distribution of growth provide insights into the type, size and location of new transportation facilities required to meet present and future travel demand, including new highway projects, transit improvements, and transportation facilities for bicycles and pedestrians.

Household Size

Even with relatively large families, Utah is following the national downward trend in household size. As the population ages, birthrates fall and the household size decreases. The 2010 Census shows the average household size in Weber County as 2.9 persons, in comparison with 3.12 statewide and 2.63 nationally.

Technology

As technology develops, its influence on community development touches every aspect dramatically. Technology advances in communications have made it possible for telecommuting, reduced the requirement of a daily commute to a workplace; increased availability of reliable public transportation has changed where people live and work; advances in agriculture have allowed more food to be produced on less land; and technological advances allow developments on marginal sites.

Reclamation of Industrial Land

Much public and private land will remain undeveloped because of specific environmental constraints, such as steep slopes, prime wetlands, or hazardous substances. However, other environmentally challenging properties are now developable due to advances in technology. For example, Ogden City has been proactive in revitalizing industrial lands in by converting the Defense Depot Ogden from a military facility to a business industrial park improving land use and economic growth. Ogden City has cleaned up environmentally distressed areas along the Weber River to create the Business Exchange area to make light industrial commercial properties available for business.

Employment Trends

In the past 30 years, the County's economy has diversified, resulting in more widespread development. The region's economy was once heavily dependent on a limited number of industrial sectors, primarily mining and government/military (Hill Air Force Base, Internal Revenue Service, State of Utah).

No longer dependent on a limited number of sectors, the Region's economy is now based on the service sector and other industries, such as health care, education, and local government. Agriculture continues to decline in importance on a regional scale. The distribution of commercial and industrial development will remain much as it

is today. Much of the Region experienced minimal employment changes, up or down, during the past decade. Overall, large employment gains are occurring in suburban areas.

While Weber County's major employment sectors have remained steady, since 2009 plan there has been an increase in medical services jobs and a higher percentage of residents are employed by local and state government.

Public Policy

Under Utah State law, local cities and counties are responsible for setting land use policy in their areas. Projections for the Wasatch Urban Area Long Range Transportation Plan: 2007-2030 is based on individual city and county land use assumptions. A majority of the region is expected to be developed for residential uses. These local master plans call for relatively low-density residential and non-residential development patterns, with some pockets of denser activity. High-density office and commercial developments are focused mainly in the Ogden central business districts, with smaller commercial areas located in the surrounding areas. Retail businesses are located throughout the county, but are concentrated in the more developed communities of Ogden, Riverdale, Roy, North Ogden, Harrisville, and South Ogden.

A significant portion of Weber County is currently zoned for low-density residential development. Some higher densities are allowed in Ogden City, while the western areas of Weber County are zoned for lower housing densities.

In 2014, Weber County completed the Ogden Valley Maximum Zoning Density Study to calculate the final build-out in those unincorporated areas of Weber County. The plan found that final build-out could yield up to 24,116 dwelling units – approximately 20,500 units more than existed in 2014. The plan identifies constraint to growth such as providing culinary water and sanitary sewer. Disaster mitigation will also need to be a consideration as growth occurs in these rural, mountainous areas with limited access and evacuation points.

Future land use characteristics of the Ogden/Layton urban area will play a key role in determining future development trends. Large portions of western Weber and north Davis Counties are currently zoned for low-density residential development. Some higher density housing is being built in Ogden City's Canyon Road community. Industrial land uses are located at the redeveloped Business Depot Ogden, the Ogden City Industrial Park and the new Ogden Business Exchange in west Ogden.

Areas for commercial land uses include linear concentrations along major arterial roads including Riverdale Road, the southeastern portion of Harrison Blvd., 12th Street between Washington Blvd. Additional commercial nodes are dispersed throughout the Ogden/Layton Urbanized Area to serve adjoining residential communities.

Public policy is the greatest contributing factor in development. This report has briefly mentioned the general development trends in the region and county as well as the contributing and limiting influences on development. Ultimately, the many development constraints and influences are measured, weighed, compared, and balanced in public policy.

Development public policy is articulated in Master Plans (sometimes referred to as General Plans, Land Use Management Codes, and other planning documents). Master Plans and Land Use Management Codes are formally adopted by city or county councils whereas other planning documents may not receive formal adoption. All counties and cities continue to update their Master Plans and Land Use Management Codes. Weber County cooperated in producing the Wasatch Front Regional Open Space Plan. This Plan gives each county guidelines for preserving and developing open space. The urban counties in the region (Davis, Salt Lake,

and Weber) have been supportive of Envision Utah. Envision Utah is partially State-supported entity to advocate smart growth. Envision Utah defines "smart growth" as growth that requires minimal infrastructure and maximizes environmental and human benefits.

PART VI. CAPABILITIES ASSESSMENT

This assessment analyzes current capacity to mitigate the effects of natural hazards and emphasizes the capabilities and positive strategies that should be continued. Weber County has a diverse and strong capability to accomplish hazard mitigation. General capabilities of the County are addressed followed by any specific city capabilities.

The following areas were assessed to determine mitigation capabilities:

1. *Staff and Organization*
2. *Technical*
3. *Fiscal*
4. *Policies and Programs*
5. *Legal Authority*
6. *Political Willpower*

Staff and Organization

The assessment found that the County has extensive capabilities to accomplish mitigation. Most cities are also already protecting their citizens from natural hazards under one if not several departments within their governmental structure. Weber County and all cities receive their legal authority to govern from the State of Utah.

County Elected Officials

The Weber County Commission consists of three members elected at-large from the County. Two commission seats are elected at the same election, the other commission seat is elected two years later. All terms of office are four years. At this level of government, the Commissioners act as the legislative arm, and also as the administrative arm as well. Commissioners develop policies for the County, and then administer the functions effected by those policies.

County General Capabilities

Listed below is a general organizational list of county-level governmental administrations involved in pre-disaster mitigation:

- Elected officials
- County Emergency Management
- County Attorneys
- County Assessors
- County Clerks
- County Treasurer/Finance
- Public Works Department
- County Engineer
- County Health Department
- Police and Fire Departments
- Special Improvement Districts

Emergency Management

Lance Peterson is the Director of Weber County Emergency Management and Homeland Security, housed in the County Sheriff's Complex. Weber County Emergency Management is responsible for natural and man-made hazard mitigation, preparedness, and response and recovery operations. Mr. Peterson has identified more than twenty-seven planning initiatives for the County and has accomplished twenty two of those plans to date.

Local Emergency Planning Committee (LEPC)

The Weber County Local Emergency Planning Committee (LEPC) is committed to understanding and reducing the risks of natural or industrial emergencies to local residents through hazardous material awareness, preparedness, planning, response, and recovery.

The LEPC includes County and City governmental officials, local businesses, hospitals, fire departments, the Sierra Club and local citizens.

LEPC Mission:

- Educate the public regarding the potential risks of hazardous materials being stored in, or transported through, Weber County and to respond to inquiries under the Community Right-to-Know laws.
- Provide focus and support to local facilities and companies using hazardous materials and to foster dialog to plan for an effective response in the event of an accidental release.
- Assess the natural and technological hazards existing in Weber County for their impact on the lives, property, and environment of local residents.
- Adopt policies, rules, and procedures through resolution, to accomplish the goals and objectives of the Weber County LEPC.

LEPC Purpose and Objectives:

- To hold scheduled public meetings to establish short and long-range plans subject to Title III, the Hazardous Materials Emergency Preparedness Program.
- To provide support and focus on the hazardous materials in fixed facilities and transportation routes by performing a hazards analysis or updating the current analysis utilized.
- To give guidance in the development of the County Hazardous Materials Emergency Plan/Annex that utilizes the expertise, resources, and methods that are cost-effective and provide for timely reaction by the county.
- To receive notification from the public on area concerns and/or problems.
- To respond to Community Right-to-Know Act requests.
- To conduct post-incident evaluation of emergency-response with agencies that were involved.

Fire/Emergency Medical Services

Most cities in Weber County staff fire service organizations and all have fire service. Following a national trend, several multi-jurisdiction fire districts have been formed with the goal to better provide fire and emergency medical services.

Municipality	Fire Service
Farr West	Weber Fire District
Harrisville	North View Fire District

Municipality	Fire Service
Hooper	Weber Fire District
Huntsville	Weber Fire District
Marriott-Slaterville	Weber Fire District
North Ogden	North View Fire District
Ogden	Ogden City Fire Department
Plain City	Plain City Fire Department
Pleasant View	North View Fire District
Riverdale	Riverdale City Fire Department
Roy	Roy City Fire Department
South Ogden	South Ogden Fire Department
Uintah City	Uintah Fire Department
Washington Terrace	Washington Terrace Fire Department
West Haven	Weber Fire District
Unincorporated	Weber Fire District

Table 6-1. Fire Services by Municipality

Public Works

Divisions within public works often include streets, engineering, water, power, wastewater and sanitation. The public works departments within the County and larger cities are very sophisticated and currently account for much of the mitigation already taking place within the County. Several public works departments have storm water management sections and watershed management departments.

Health Care

The County's hospitals and health department provide medical emergency preparedness and response. The Weber County Health Department organizes, coordinates and directs emergency medical and health services. The Health Department assesses health hazards caused by damage to sewer, water, food supplies or other environmental systems. They also provide safety information, assess disaster related mental health needs and services, and provide crisis counseling for emergency workers. Short of a pandemic disease outbreak, the health departments within the County will likely continue to adequately staff, train and fund their missions.

Weber County contains two major hospitals: McKay-Dee Hospital at 4401 Harrison Boulevard in Ogden and Ogden Regional Medical Center at 5475 South 500 East in Washington Terrace. Representatives from these hospitals have attended County emergency planning meetings. The hospitals maintain their own emergency and hazard mitigation plans/procedures.

School Districts

The Weber School District and Ogden School Districts serve the students of Weber County. District administrators work closely with local public safety officials including law enforcement, fire emergency medical services, and public health to help to ensure that schools are well prepared for any kind of emergency. Emergency management representatives from each school district participated in the PDM

planning process, identified critical school facilities and developed mitigation strategies to address vulnerabilities.

Special Service Districts

For the purposes of this Plan, Special Service Districts (SSD) are defined as quasi-governmental agencies having taxing authority, providing a specific public service that may include; public transportation, fire, water, wastewater and sewer. These SSD's work closely with local public safety officials to ensure that these Districts are well prepared for any kind of emergency. In many cases, the districts participate in the county or city emergency preparedness committee for emergency coordination, planning and response.

Technical Capability

Throughout the plan update process, Weber County staff consulted with and utilized the technical expertise from a wide variety of resources listed below:

Technical Expertise

Weber County has full-time planners on staff and Weber County's existing planning documents informed the PDM planning process as well. The Emergency Management Department's expertise in emergency planning and response was vital in creating this plan. The County and most cities have building inspectors, housing specialists and engineers on staff.

Weber County contracted with J-U-B ENGINEERS, Inc. to assist in plan preparation efforts. J-U-B is a full service civil engineering and planning firm. Their engineering and planning expertise and knowledge of Weber County's geography and infrastructure were resources used in the preparation of this Plan update.

Geographic Information Systems (GIS)

Weber County's GIS staff coordinates data processing and computer capabilities for GIS. GIS is a geo-referenced set of hardware and software tools that are used to collect manage and analyze spatial data. (GIS capabilities are often found in other departments such as public works or information technology.) GIS is most beneficial when data from all departments and planning jurisdictions is inputted for analysis.

Weber County's capable GIS Staff includes the Division Manager, a GIS Specialist, Programmer and Technician. They continually create and update parcel information and GIS layers for data analysis. The GIS Department created many of the maps included in this Plan update.

GIS Staff		
GIS Division Manager Jim Quarles		
GIS Specialist Alison Corey	GIS Programmer James McBride	GIS Technician Derrick Dearden

Table 6-1. Weber County GIS Staff

Public Safety Communications (PSC)

Public safety communications networks assure emergency communications through radio, microwave, telephone, satellite, internet, e-mail, fax and amateur radio. One of the most beneficial capabilities of PSC is providing cross communication between equipment and frequencies. PSC coordinates dissemination of emergency information to the media, the public and emergency personnel; activates internal information

systems; acts as a liaison to elected officials; assists in the provision of emergency information and document the impact.

Public Works
Weber County's public works department provides engineering, transportation, GIS, water, wastewater, sanitation (in some cases electric power) expertise and capability. As a team, public works personnel identified the County's critical infrastructure, assessed the risks to County infrastructure and identified projects/strategies to mitigate the risks. The Public Works staff in each municipality followed the same process using their specialized knowledge and expertise.

Other Technical Capabilities

Utah Division of Emergency Management (DEM)
Utah DEM assisted Weber County in providing information on preparing for and responding to emergencies. The division serves as the liaison between local, state and federal emergency assistance. The division educates the public about earthquakes, hazardous materials, floods, communications, leadership, information technology, funding, coordination and supplies.

Weber County also used information from the 2014 State Hazard Mitigation Plan in this PDM Plan.

Governor's Office of Planning and Budget (GOPB)
The GOPB compiled the demographic and economic data which Weber County used in the planning process.

Fiscal Capability

Weber County, like most municipalities, has limited fiscal capabilities but the County has given priority to implement important mitigation actions. Weber County, and many of the cities within, have provided matching funds for federal grants in the past.

Utah State Code; Section 17-50-501 classifies counties into six categories based on population. The State of Utah grants graduated autonomy to counties according to class size. The lower numbered class counties receive more authority from the State to regulate their own affairs. Weber County is classified as a Class 2 County (Salt Lake County is a Class 1) due to its population being between 125,000 to 700,000.

Policies and Programs

Connecting local land use management with natural hazard planning is an effective way to mitigate a community's risk. Many communities have plans, ordinances, agreements, maps, training, warning systems, etc. in place that help them to become more disaster resistant. As part of this planning effort, land use plans were gathered from each Weber County municipality in order to coordinate existing activities so that individual objectives become part of an overall plan of action.

Land Management Tools

Ordinances

Zoning ordinances designate the use of land and structures for the purpose of protecting the health, safety and welfare of residents and businesses. A zoning ordinance divides all land within a jurisdiction into zones or related uses. The zoning ordinance is comprised of two parts; the text and maps. Specific zones are usually created for residential, commercial, industrial and government uses. The map defines the

boundaries of these zones and the text provides the regulations for uses that are permitted to exist in each of the zones.

Subdivision ordinances regulate all divisions and improvements of property including the division of land involving the dedications of new or changes of existing streets/roads.

Design controls regulate building and landscaping. Such controls can be tailored to require that new developments meet the specific needs of the area. For example, requiring flame resistant roofs in urban-rural wildland fire interface zones or requiring that trees and vegetation are planted on steep slopes to help mitigate landslide hazards.

Floodplain ordinances prevent building in special flood hazard areas and provide flood loss reduction measures to new and existing development. Floodplain management ordinances help to provide insurance to homes and businesses through the National Flood Insurance Program (NFIP). The NFIP's Community Rating System was implemented to encourage cities to manage floodplain activities that exceed the minimum NFIP standards. A community participating in the system will receive reductions in insurance premiums.

Building codes require certain standards of practice.

Easements

Easements can be a cost effective way to control development in hazard prone areas. Various land trusts can help secure easements that can then be conserved or preserved.

Planning

General plans serve as a guide for decision-making on rezoning and other planning proposals and as the goals and policies of municipalities attempting to guide land use in local jurisdictions. Each plan is recommended to include land use, transportation, environment, public service and facilities, rehabilitation, redevelopment, conservation, and economics. Also recommended are implementing recommendations including the use of zoning ordinances, subdivision ordinances, capital improvement plans, and other suitable actions that the municipality deems appropriate. General plans articulate the jurisdiction's vision while land use management codes implement that vision. General plans and land use management codes are being consulted, reviewed, and changed as necessary.

Emergency Operations Plans (EOPs) identify specific emergency actions undertaken by a jurisdiction to protect lives and property immediately before, during, and following an emergency. Weber County reviewed EOPs as part of this planning process.

Floodplain Management Plans identify steps and implementation strategies to effectively deal with floodplains. FEMA uses a scoring system is used to rate communities. Those with higher scores will receive higher discounts (in 5% increments) on flood insurance.

Storm Water Management Plans identify water policies for an entire watershed. Such policies can include: preservation of habitats, water quality and supply, open space development, land preservation, pollution prevention and construction regulations.

Environmental Reviews explain how development affects the land and its resources.

Capital Improvement Plans. Cities plan for costs related to infrastructure, public facilities, and public safety. These plans identify projects, prioritize them and identify ways of funding them. Such plans can include disaster reduction costs or mitigation measures in flood-prone areas or retrofitting buildings for seismic strengthening.

The jurisdictions in Weber County have incorporated various mitigation measures. The following tables identify, by City, existing land use ordinances, management practices and plans currently in place.

LOCAL PLANS																
	Farr West	Harrisville	Hooper	Huntsville	Marriott-Slaterville	North Ogden	Ogden	Plain City	Pleasant View	Riverdale	Roy	South Ogden	Uintah	Washington Terrace	West Haven	Weber County
Emergency Management Plan	N	Y	Y	N	Y	Y	Y	Y	Y	N	Y	Y	-	Y	Y	Y
Storm Water Management Plan	Y	Y	Y	N	Y	Y	Y	-	Y	Y	-	-	-	-	-	Y
Growth Management Plan	N	N	N	N	N	Y	Y	-	N	N	-	-	-	-	-	Y
Community Rating System Classification	-	-	-	-	-	Y	-	-	-	-	-	-	-	-	-	Y
General Plan Land Use Update	2013	2015	2014	2011	2001	2014	-	2007	2009	2011	2002	2008	2004	2006	2015	2003
General Plan Transportation Update	2009	2010	2011	2000	2008	2008	-	-	2009	2011	-	-	-	-	2015	2009
General Plan Housing Update	2009	2010	2014	2000	2007	2002	-	-	2009	2011	-	-	-	-	2015	2014

Table 5-3. Existing Plans, Weber County and Jurisdictions

Building Codes

International and national building codes have been adopted by all jurisdictions in the region. These codes are constantly in review for reasonable preparedness for disasters. Locally, building officials lobby for additions or exceptions to international and/or national building codes according to local conditions. Most insurance policies rely on the international and national building code standards for assurance.

The Insurance Services Office, Inc. manages the Building Code Effectiveness Grading System (BCEGS). This program was implemented in 1995 and assesses the building codes in effect in a particular community as well as how well the community enforces its building codes. The BCEGS program assigns each municipality a BCEGS grade of 1 to 10 with 1 showing exemplary commitment to building code enforcement. Insurance Services Inc. (ISO) developed advisory rating credits that apply to ranges of BCEGS classifications 1-3, 4-7, 8-9, 10. ISO gives insurers BCEGS classifications, BCEGS advisory credits, and related underwriting information.

Communities with effective, well-enforced building codes should sustain less damage in the event of a natural disaster, and insurance rates can reflect that. The prospect of lessening natural hazard related damage and ultimately lowering insurance costs provides an incentive for communities to enforce their building codes rigorously. FEMA also uses these scores in their competitive grant programs, giving a higher ranking to those projects with lower scores. The following table highlights the BCEGS scores for Weber County jurisdictions.

WEBER COUNTY	BCEGS Classification		Date
	Residential	Commercial	
Farr West	4	3	2007
Huntsville	3	3	2003
Marriott-Slaterville	2	2	2006
North Ogden	4	3	2004
Ogden	3	3	2004
Plain City	5	5	2003
Roy	3	4	2005
South Ogden	3	3	2005
Uintah	3	3	2003
Washington Terrace	2	2	2004
Weber County	3	3	2005

Table 5-4. Building Code Effectiveness Grading Reports, Weber County

Community Rating System

Weber County has been designated as a Class 9 county pending FEMA approval for the CRS program as of June 3, 2015.

North Ogden City became a Class 8 community on October 1, 1993.

Legal Authority

Local governments play an essential role in implementing effective mitigation. Each local government will review all present or potential damages, losses, and related impacts associated with natural hazards to determine the need or requirement for mitigation action and planning. In the jurisdictions, the local executive responsible for carrying out plans and policies are the county commissioners and city or town

mayors/city managers. Local governments must be prepared to participate in the post-disaster Hazard Mitigation Team process and the pre-mitigation planning as outlined in this document. The cities and counties of Utah have the authority, through policing, to protect the health, welfare, and safety of their residents.

Political Willpower

Weber County and city public officials have shown support for pre-disaster planning in the following ways:

Community Development Documents

Elected officials have adopted updated community development documents to reduce the risk of emergencies and disasters. Weber County has an updated Emergency Operation Plans, Land Use Management Codes, International Building Codes, and General Plans that include pre-disaster planning.

Emergency Planning Training Courses

Wasatch Front residents have supported emergency planning training sponsored by the State of Utah's Department of Emergency Management and local governments such as: CERT (Community Emergency Response Team), Local Emergency Planning Committees (LEPC), Hazardous Materials (HAZMAT), Site Plans and Ordinances, Real Estate Requirements, and Hazard Mitigation

Elected Officials

The Weber County Commission has supported this planning effort from the beginning. They approved the PDM grant application effort and have been very supportive of the PDM planning process. The plan was presented to the Commission on August 4.

PART VII. RISK ASSESSMENT

A. Hazard Identification

The first step in risk assessment is identifying the hazards that could affect the Weber County area. Hazard identification addresses the geographic extent, the intensity/magnitude of a hazard and the probability of its occurrence. Hazard identification was initiated through an extensive process that utilized the following:

- Weber County Emergency Management
- Consulting Planning Team
- Weber County Assessor
- Local Emergency Managers
- LEPC
- Public Works Staff
- Weber County GIS Personnel
- Community Stakeholders
- Public individuals
- Elected Officials
- Special Service Districts
- Utah Division of Emergency Management
- Utah Geological Survey
- Utah Automated Geographic Reference Center

The natural hazards in Table 7-1 have the potential of affecting Weber County. The identification process for each of the participating jurisdictions utilized those natural hazards that consistently affected each area prior to and during the planning process based on history of occurrences, future probability, and risk. Table 7-2 (page 51) identifies those hazards that are better analyzed on a regional level.

Weber County GIS, with help from local officials, created maps that identified the location of critical facilities and the municipalities affected by each identified hazard. Initial data from this study was also used to determine hazards that presented the greatest risk to each of the counties. The geographic extent of each hazard is identified through maps in every county section. The hazard intensity/magnitude and probability profiles are also found in the county section.

Municipal jurisdictions contributed to the risk assessment analyses performed for the County when located within an identified hazard boundary (See Section E). Drought, infestation and severe weather are considered regional hazards and have been profiled as such.

Hazard	How Identified	Why Identified
Earthquake	• Review of County Emergency Operations Plans • Review of past disaster declarations • Input from City and County Emergency Operations Managers, USGS, UGS, Utah DEM, and community members	• Utah has a 1/5 chance, of experiencing a large earthquake within the next fifty years. • Numerous faults throughout Utah including the Intermountain Seismic Zone. • Yearly, Utah averages approximately 13 earthquakes having a magnitude 3.0 or greater. • Earthquakes can create fire, flooding, hazardous materials incident, transportation, and communication limitations. • The Wasatch Front has recorded large earthquakes in the past and
Landslide	• Input from City and County Emergency Operations Managers, USGS, UGS, NCDC, Utah DEM, and community members	• Have caused damage in the past to residential and commercial infrastructure. • Can be life threatening. • Generally occurs in known historic locations therefore risks exist throughout much of the Wasatch Front. • To increase community awareness.
Wildland Fire	• Review of County Emergency Operations Plans • Review of Community Wildfire Plans • Input from County Emergency Managers, Utah DEM, Utah FFSL, Utah FS, NWS, FEMA, and local community members	• Serious threat to life and property. • Increasing threat due to urban growth in Wildland-Urban Interface (WUI) areas. • Secondary threat associated with flooding, drought, and earthquake. • Most of Utah is at risk, especially the growing counties of the Wasatch Front region. • Additional funding and resources offered by local and state agencies to reduce risk. • To increase community awareness.
Problem Soils	• Review of County Emergency Operations Plans • Input from community members, Utah DEM and UGS • Researched historical data	• Related to subsequent effects from earthquakes. • Have affected infrastructure and local economy in the past.
Dam Failure	• Review of County Emergency Operations Plans • Input from community members, Utah DWS, Dam Safety Section, Utah DHLS • Review of inundation maps	• Can cause serious damage to life and property and have subsequent effects such as flooding, fire, debris flow, etc.. • Many reservoirs located in the five county region of the Wasatch Front. • Threat to downhill communities. • Subsequent effects include flooding, fire, and debris flows. • To increase community awareness. • To incorporate mitigation measures into existing plans to help serve local residents.
Flood	• Review of past disaster declarations • Input from City and County Emergency Operations Managers, Utah DWS, UGS, Utah Army Corps of Engineers, Utah DEM, and community members • Review of Flood Insurance Studies, Floodplain maps, and Flood Insurance Rate Maps	• Several incidents have caused severe damage and loss of life. • Many of the rivers and streams are located near neighborhoods. • Many neighborhoods are located on floodplains, alluvial fans. • Topography and climate lead to cloudburst storms and heavy precipitation can result in flash flooding throughout most of the Wasatch Front.

Table 7-1. Local Hazards Identification

Hazard	How Identified	Why Identified
Drought	• Review of Utah State Water Plan • Input from community members, Utah DEM, NWS, NCC, and NCDC	• Affects local economy and residents. • Reduces available water in reservoirs impacting culinary, irrigation, and municipal water supplies. • Drought periods may extend several years. • Secondary threat associated with wildfire. • Utah is the nation's second driest state. • Can impact farming and ranching operations.
Infestation	• Review of Utah Department of Agriculture and Food Annual Insect Report and the Utah Forest Insect and Disease Report • Input from community members, UDAF, Utah FFSL, and the Utah State University Extension Service	• Consistently affects this region. • Declined forest health and agriculture losses. • Previous experiences have affected the residents of the Wasatch Front. • Results in economic loss. • Destruction can be severe and is very costly to mitigate. • To better understand mitigation and response techniques.
Severe Weather	• Review of County Emergency Operations Plans • Review of past disaster declarations • Input from City and County Emergency Operations Managers, Utah Avalanche, Forecast Center, Utah Department of Transportation, and community members	• Damage to communities, homes, infrastructure, roads, ski areas, and people. • Can cause property damage and loss of life. • Results in economic loss. • Lightning is number one cause of natural hazard death in Utah. • Can be costly to recover from. • Affects the young and old more severely.
Radon	• UGS Maps • Utah Division of Radiation Control Testing Data.	• Is odorless and colorless. • Can cause lung cancer over time.

Table 7-2. Regional Hazards Identification

The hazard identification process was aided through the use of FEMA How to Guidance documents, FEMA 386-1,2,3,7 FEMA Post Disaster Hazard Mitigation Planning Guidance DAP-12, Disaster Mitigation Act of 2000, 44 CFR Parts 201 and 206, Interim Final Rule, and FEMA Region VIII Crosswalk. The risk assessment process also utilized assistance from local GIS departments using the best available data.

	Farr West	Harrisville	Hooper	Huntsville	Marriott-Slaterville	North Ogden	Ogden	Plain City	Pleasant View	Riverdale	Roy	South Ogden	Uintah	Washington Terrace	West Haven	Unincorporated County
Earthquake	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Landslide				*		*	*		*	*	*	*	*	*		*
Wildland Fire	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Problem Soils																*

	Farr West	Harrisville	Hooper	Huntsville	Marriott-Slaterville	North Ogden	Ogden	Plain City	Pleasant View	Riverdale	Roy	South Ogden	Uintah	Washington Terrace	West Haven	Unincorporated County
Dam Failure									*							*
Flood	*	*	*	*	*	*	*	*	*	*			*			*
Drought	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Infestation	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Severe Weather																*

Table 7-3. City Hazard Identification

B. Hazard Profile

This section describes the causes and characteristics of each identified hazard, including its *severity* or *magnitude* (as it relates to the percentage of the jurisdiction that can be affected), *probability*, conditions that make the area prone to the hazard, hazard history, and maps of the hazard's geographic location or extent. The hazards were profiled based on history of occurrence, local input, county emergency operations plans, and county master or general plans, scientific reports, historical evidence, and hazard analysis plans. A risk assessment "Hazard Profile" table was created that highlights the above mentioned materials introducing each identified hazard. The probability of a hazard event was determined through the amount of risk to the county. The probability or likelihood of an occurrence is categorized into four categories: Highly Likely, Likely, Possible, and Unlikely.

In determining hazard magnitude a scale was used to identify the level of damage on a countywide basis from Catastrophic to Negligible (Table 7-4).

	Jurisdiction Affected	Risk
Catastrophic	More than 50%	Extreme or High
Critical	25-50 %	Moderate
Limited	10-25%	Moderate
Negligible	Less than 10%	Low

Table 7-4. Hazard Profile

The probability of a hazard event was determined through the amount of risk to the County. The probability or likelihood of an occurrence is categorized into four categories: Highly Likely, Likely, Possible, and Unlikely.

The geographical extent or location of the community that would be affected has been identified in the mapping portion of each county where geographic data was available. Hazard histories are provided for each county. These histories were taken from the Spatial Hazard Events and Losses Database for the United States (SHELDUS). Histories for each county were condensed into charts, tables and graphs in each county hazard profile section.

Maps were created using GIS applications to identify the location and extent of each identified hazard area. Hazard maps were created for every identified hazard within the region. The following risk assessment maps were created for Weber County:

Weber County Floodplain and Hydrologic Features
Seismic Activity
Weber River Basin
Landslide Susceptibility
Liquefaction Potential
Hospital and Medical Facility Locations
Rail/Hazmat Transportation
Tier 2 RMP Locations
Problem Soils
Wildfire
Airport Locations
Dam Locations
EOC Locations
Power Transmission
Schools

The following risk assessment maps were created at the regional level:

Drought
Infestation
Severe Weather
Radon

C. Vulnerability Analysis

The vulnerability analysis is based on asset identification and potential loss estimates for those jurisdictions located within identified hazard areas.

Asset Identification

The vulnerability analysis combines the data from each of the hazard profiles and merges it with community asset information to analyze and quantify potential damages from future hazard events. The asset inventory identifies buildings, roads, and critical facilities that can be damaged or affected by the hazard events. Critical facilities are of particular concern because of the essential products and services to the general public they provide. These critical facilities can also fulfill important public safety, emergency response, and/or disaster recovery functions. The critical facilities identified in this plan include hospitals, police and fire stations, schools, communication facilities, utility companies, water and wastewater treatment plants. In order to assess where and to what extent the identified hazards will affect the assets of each county, the locations of assets were identified and overlaid with the mapped hazards using GIS software.

Potential Loss Estimates

Potential dollar loss estimates were identified using this same method; therefore estimates were completed for existing infrastructure only. When data permitted, structure, content, and function of the identified vulnerable infrastructure was incorporated into the vulnerability assessments. Describing the vulnerability in terms of dollar losses provides the community and the state with a common framework in which to measure the effects of hazards on assets.

Future planned development was not analyzed due to the lack of data available in GIS format. However, countywide development trends have been identified and are addressed within Part VIII. Regional Hazards. Areas vulnerable to multiple structurally-threatening hazards are mapped in each chapter.

The core planning team and local planning team members estimated potential losses for the identified hazards by using the methodology explained in the FEMA document titled, Understanding Your Risks: Identifying Hazards and Estimating Losses, Utah DEM historical data and GIS data.

The information sources used to complete the vulnerability assessment portion of this Plan include; Utah DEM, County GIS department, County Assessor's Office, HAZUS-MH data, and the Utah Automated Geographic Reference Center (AGRC). This data was compiled into GIS layers that were used as overlays to identify critical facilities, municipalities, roads, and residents. The assets that have been identified are based on the best available data during the development of this Plan in GIS form.

Methodology

Geographic Information System (GIS) software was used as the basic analysis tool to complete the hazard analysis for the Weber County Pre-Disaster Mitigation Plan. For most hazards a comparison was made between digital hazard data and Transportation Analysis Zone (TAZ) demographic information.

Statewide digital data was obtained from Utah Automated Geographic Reference Center (AGRC) for problem soils only. The vulnerability assessment for each County estimates the number of homes, business, infrastructure and population vulnerable to each hazard and assigns a replacement dollar value to residential structures and infrastructure in each hazard area. The value of residential housing was calculated using estimated average residential housing values, as census estimates were unavailable. All the analysis takes place within the spatial context of a GIS. With the information available in spatial form, it is a simple task to overlay the natural hazards with census data to extract the desired information.

The methodology used to determine vulnerability for all hazards was identical. The number of households and population vulnerable to each hazard was determined using WFRC Transportation Analysis Zone (TAZ) data and Block Data from the 2010 Census data. The Block Data from the 2010 Census database, or TAZ data, was intersected with each of the mapped hazard layers in order to determine the number and location of residential housing units and population at risk from hazards. The methodology used assumes an even distribution of residential housing units and population across each census block. Point data from HAZUS MH was used to determine the number of businesses, and the annual sales of each business in each hazard area.

The number of acres for all hazards was determined for each city and the unincorporated county. Once an acre total was identified it was overlaid on the Census Block data or TAZ data to determine the total number of homes impacted. The number of homes impacted was then multiplied by the average housing value to determine the total value of potential loss. The 2010U.S. Census Bureau data shows 87,105 housing units with a median house value of $170,000 for Weber County. Content values are not included, which would raise the potential loss numbers for housing by approximately 50%.

In addition to the above methodology, earthquake was profiled using HAZUS-MH, which is shorthand for Hazards United States–Multi-hazards. The HAZUS-MH Earthquake Model is designed to produce loss estimates for use by federal, state, regional and local governments in planning for earthquake risk mitigation, emergency preparedness, response and recovery. The methodology deals with nearly all aspects of the built environment and a wide range of different types of losses.

Extensive national databases are embedded within HAZUS-MH, containing information such as demographic aspects of the population in a study region, square footage for different occupancies of buildings, and numbers and locations of bridges. Embedded parameters have been included as needed. Using this information, users can carry out general loss estimates for a region. The HAZUS-MH methodology and software are flexible enough that locally developed inventories and other data that more accurately reflect the local environment can be substituted, resulting in increased accuracy. 2007 TAZ data was aggregated to census blocks to update population data within HAZUS-MH.

Uncertainties are inherent in any loss estimation methodology. They arise in part from incomplete scientific knowledge concerning earthquakes and their effects upon buildings and facilities. They also result from the approximations and simplifications that are necessary for comprehensive analyses. Incomplete or inaccurate inventories of the built environment, demographics and economic parameters add to the uncertainty. These factors can result in a range of uncertainty in loss estimates produced by the HAZUS-MH Earthquake Model, possibly at best a factor of two or more.

The methodology has been tested against the judgment of experts and, to the extent possible, against records from several past earthquakes. However, limited and incomplete data about actual earthquake damage precludes complete calibration of the methodology. Nevertheless, when used with embedded inventories and parameters, the HAZUS-MH Earthquake Model has provided a credible estimate of such aggregated losses as the total cost of damage and numbers of casualties. The Earthquake Model has done less well in estimating more detailed results - such as the number of buildings or bridges experiencing different degrees of damage.

Such results depend heavily upon accurate inventories. The Earthquake Model assumes the same soil condition for all locations, and this has proved satisfactory for estimating regional losses. Of course, the geographic distribution of damage may be influenced markedly by local soil conditions. In the few instances where the Earthquake Model has been partially tested using actual inventories of structures plus correct soils maps, it has performed reasonably well.

The HAZUS Model estimates building losses, numbers of shelters required for displaced households, amounts of debris generated, and numbers of casualties

The potential impact of natural hazards on transportation and utilities was determined in a similar method as described above. Roads and utilities were overlaid on the hazard areas and the impacted utility and road segments were inventoried. Once the length of vulnerable infrastructure was determined it was multiplied by cost estimate information from HAZUS-MH.

In addition to the linear features, point data for critical facilities, dams, care facilities, schools, power generation facilities and substations were analyzed to determine if the feature was within a hazard area.

Limited availability of digital data presented a problem in completing the vulnerability assessment. Potential loss numbers were only determined for earthquakes, flood, landslides, dam failure, problem soils and wildfires in this Plan. Additional limitations to the above described analysis method include:

- Assuming random distribution
- Limited data sets for water, gas, electrical, resulting in incomplete numbers for these features
- Relied on state wide data not intended for manipulation at the scale it was used
- Data was not field checked, resulting in an analysis wholly dependent on accuracy of data
- Meta data was lacking on some of the used data sets

In this document, simple maps were created to provide a graphical illustration of location. These maps are done at a scale, which allows them to fit on a standard letter sized page. Data manipulation and maps were created as a planning tool, to be used by interested persons. This information should not take the place of accurate field verified mapping from which ordinances need to be based.

Effort to analyze hazards related to potential future development areas was also addressed where applicable. This proved to be a very difficult exercise and at best can only identify areas which need additional research before development should be allowed. No viable source of data exists for this study area to facilitate analysis of future development. Limited zoning data was available, but this data does not necessarily indicate which areas will be developed and which will not.

D. Hazard Description

Each of the natural hazards that could affect the Region has been described. These are general descriptions about each hazard to give an idea of what, why, when, and how the hazards occur.

1. Earthquake

The Utah Geologic Survey defines an earthquake as the result of "…sudden breakage of rocks that can no longer withstand the stresses that build up deep beneath the earth's surface" (UDCEM 1991). The energy that is released is abrupt shaking, trembling or sudden motion in the earth and rocks that break along faults or zone of weakness along which the rocks slip. Seismic waves are then transmitted outward and also produce ground shaking or vibrations in the earth. The Richter scale measures the magnitude of earthquakes on a seismograph. A Richter magnitude 6 earthquake is 30 times more powerful than a Richter magnitude 5. A Richter magnitude 7 is 1000 times more powerful than a Richter magnitude 5.

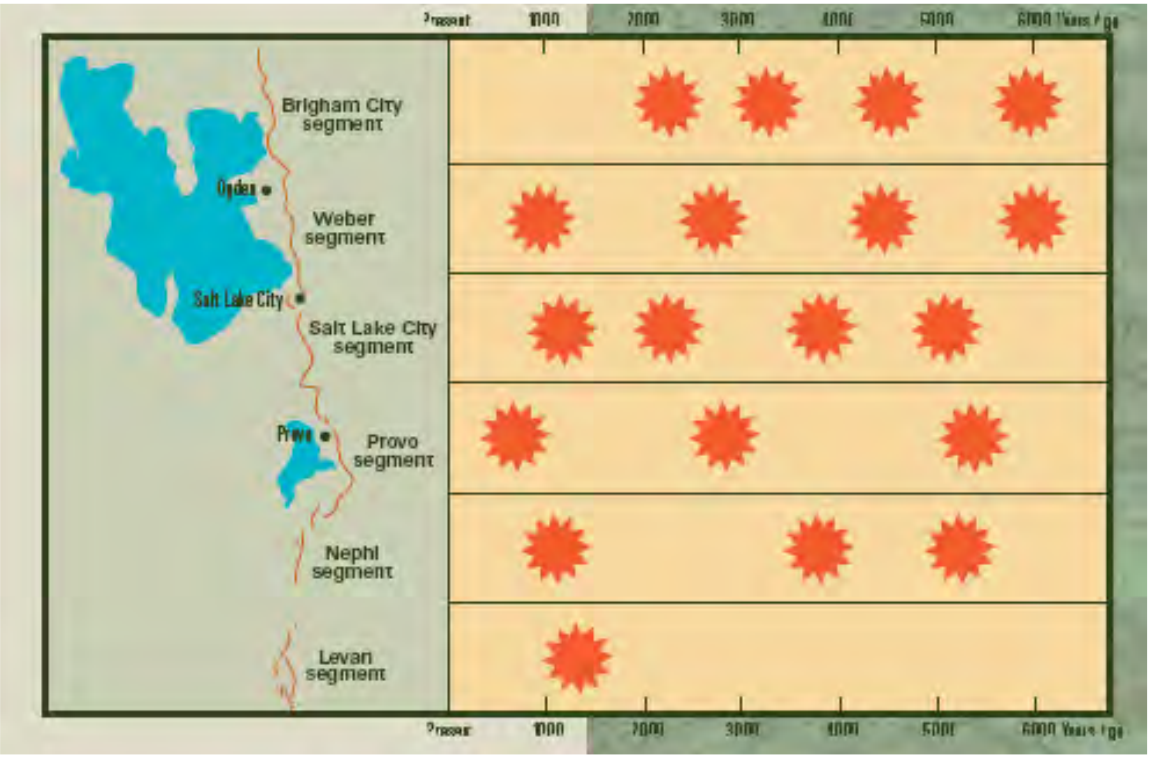


Figure 7-1. Wasatch Fault Segments and Timeline of Major Ruptures
(Source: "The Wasatch Fault," Utah Geological Survey)

Utah experiences approximately 700 earthquakes each year, and approximately six of those have a magnitude 3.0 or greater (Table 7-5, this page). On average, a magnitude 5.5 or greater earthquake occurs in Utah every 10 years.

Generally, in order for humans to feel an earthquake it needs to be at least a magnitude 2.0. In order for significant damage to occur, an earthquake needs to be at least a magnitude of 5.5 or greater. The amount of damage that occurs from an earthquake depends on soil type, rock type, ground-water depth and topography. Other factors include the type of construction in an area and the population density.

Locations and Activity: Faulting can be evident on the earth's surface or not evident at all, therefore earthquakes are believed to be able to occur anywhere in Utah (UDCEM 1991).

The earthquake history of the Wasatch Fault is complicated by the fact that we have not had a large earthquake since the first pioneers first arrived in the valley in 1847. The last major earthquake in the Wasatch Front was approximately 1,350 years before present. Yet, when looking at the region, the potential for a large earthquake exists considering that "since 1850 at least 16 earthquakes (excluding aftershocks) of magnitude 6.0 or greater have occurred within the Intermountain Seismic Belt (ISB)" (UDCEM 1991). The greatest earthquake hazard is considered to be in the areas surrounding the Wasatch, East Cache, East Bear Lake, Bear River, Hansel Valley, Northern Oquirrh, West Valley, and East Great Salt Lake fault zones. Other areas of significant hazard along the southern portion of the ISB include the Hurricane, Paragonah, and Sevier faults. The other significant hazard areas in Central Utah are the Stansbury, Joes Valley, and Gunnison faults (UDCEM 1991). On the Wasatch fault, the segments between Brigham City and Nephi, the "composite recurrence interval for large surface-faulting earthquakes (magnitude 7.0 to 7.5) is 395 $\pm$ 60 years. The most recent surface-faulting earthquake on the Wasatch fault occurred 400 years ago on the Nephi segment" (UDCEM 1991) (Figure 6-1). The two largest measured earthquakes to occur in Utah were the Richfield earthquake of 1901, with a magnitude of 6.5 and the Hansel Valley earthquake of 1934 with a magnitude of 6.6.

"The Hansel Valley earthquake produced MM intensities of VIII in Salt Lake City, with numerous reports of broken windows, toppled chimneys, and structures twisted on their foundations. A clock mechanism weighing more than 2 tons fell from the main tower of the Salt Lake City County Building and crashed through the building. The only death that occurred during the event was caused when the walls of an excavation collapsed on a public-works employee south of downtown Salt Lake City." (Lund 2005) Utah's most damaging earthquake was of a smaller magnitude (5.7), which occurred near Richmond in Cache Valley in 1962. This earthquake damaged over 75 percent of the houses in Richmond, as well as roads and various other structures. The total damage in 1962 dollars was about one million dollars.

	Wasatch Front	**Utah**
Magnitude	***Frequency***	***Frequency***
≥3.0	3 per year	6 per year
≥4.0	1 every 2 years	1 per year
≥5.0	1 every 10 years	1 every 4 years
≥5.5	1 every 20 years	1 every 10 years
≥6.0	1 every 50 years	1 every 20 years
≥6.5	1 every 120 years	1 every 50 years
≥7.0	1 every 330 years	1 every 150 years

Table 7-5. Average Earthquake Frequency *(Source: UUSS unpublished data in UGS PI-38 1996)* *excludes foreshocks, aftershocks and human-triggered seismic events

"Earthquakes in 1909, 1914, and 1943 produced MM intensities in Salt Lake City of up to VI, and earthquakes in 1910, 1949, and 1962 had MM intensities of VII in Salt Lake City. Damage produced by these events included broken windows, cracked walls, fallen plaster, toppled chimneys, and buildings shifted on their foundations. The 1949 earthquake also ruptured a water main causing loss of water to a portion of the city." (Lund 2005)

On average, Utah experiences a moderate, potentially damaging earthquake (magnitude 5.5 to 6.5) every 7 years. The history of seismic activity in Utah and along the Wasatch Front suggests that it is not a matter of "if" but when an earthquake will occur.

Secondary Hazards: Associated earthquake hazards include ground shaking, surface fault rupture and tectonic subsidence, soil liquefaction, flooding, avalanches, dam failure, fire, and slope failure.

Ground Shaking: Ground shaking is caused by the passage of seismic waves generated by an earthquake. Shaking can vary in intensity but is the greatest secondary hazard because it affects large areas and stimulates many of the other hazards associated with earthquakes. The waves move the earth's surface laterally and horizontally and vary in frequency and amplitude.

High frequency, small amplitude waves cause more damage to short, stiff buildings. Low frequency, large amplitude waves have a greater effect on high-rise buildings. The intensity depends on geologic features such as bedrock and rock type, topography, and the location and magnitude of the earthquake.
Other significant factors include ground water depth, basin shape, thickness of sediment, and the degree of sediment consolidation. Moderate to large earthquake events generally produce trembling for about 10 to 30 seconds. Aftershocks can occur erratically for weeks or even months after the main earthquake event. (UDCEM 1991)

Surface Fault Rupture and Tectonic Subsidence**:** Surface fault rupture or down dropping and tilting associated with tectonic subsidence can rupture the ground surface and in Utah the result is the formation of scarps or steep breaks in the slope. The 1934 Hansel Valley earthquake resulted in a surface displacement of approximately 1.6 feet. The highest potential for surface faulting exists in the central segments of the Wasatch fault. Also, earthquakes having a magnitude of 6.5 or greater could result in surface faulting of 16 to 20 feet high and 12 to 44 mile long break segments. Surface displacement generally occurs over a zone of hundreds of feet wide called the zone of deformation. Tectonic subsidence generally depends on the amount of surface fault displacement. The greatest amount of subsidence will be in the fault zone and will gradually diminish out into the valley (UDCEM 1991).

Soil Liquefaction**:** Liquefaction occurs when there is a sudden large decrease in shear strength of sandy soils. It is caused by the collapse of the soils structure in which the soil loses its bearing capacity, and also by a temporary increase in pore-water pressure, or water saturation during earthquake ground shaking. Liquefaction is common in areas of shallow ground water and sandy or silty sediments. 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) and 2) ground shaking must be strong enough to cause susceptible soils to liquefy (Lips 1999). The result is soils that will flow even on the gentlest of slopes.

Lateral spreading is a type of failure that results in surficial soil layers breaking up and moving, up to 3 feet or more, independently over the liquefied layer. On slopes more than 5 percent, flow failures can move several miles at speeds up to 10s of miles per hour. On slopes less than 0.5 percent the bearing capacity will lessen and can cause buildings to settle or tip. No matter the slope percent, ground cracking and differential settlement will occur. Liquefaction can also cause foundation materials to liquefy and fail and/or cause sand boils. Sand boils are deposits of sandy sediment ejected to the surface during an earthquake along fissures. Liquefaction can occur during earthquakes of magnitude 5.0 or greater. (UDCEM 1991)

Slope Failure**:** Ground shaking can cause rock falls and landslides in mountainous or canyon areas. Rock falls are the most common slope failure and can occur up to 50 miles away from a 6.0 magnitude earthquake. Landslides occur along benches in wet unconsolidated materials. During a 6.0 magnitude earthquake, landslides may occur within 25 miles of the source. (UDCEM 1991)

Flooding**:** "Flooding can happen due to tectonic subsidence and tilting, dam failure, seiches (waves generated in standing bodies of water) in lakes and reservoirs, surface-water diversion or disruption, and increased ground-water discharge." (UDCEM 1991)

Avalanches**:** Avalanches could be triggered because of the associated ground movement. The most vulnerable areas include those that have steep terrain, high precipitation, high earthquake potential, and high population density. An example of this area in Utah would be the Wasatch Front (UDCEM 1991).

Sensitive Clays: Sensitive clays are a soil type that loose strength when disturbed and result in liquefaction or collapse. The resulting type of ground failure is similar to liquefaction (UDCEM 1991).

Subsidence: A settling or sinking of the earth's crust in loose granular materials such as gravel that do not contain clay. Western Utah is subject to this type of ground settlement (UDCEM 1991).

Unreinforced Masonry Structures: Unreinforced masonry structures (URM) are a type of building where load bearing walls, non-load bearing walls, or other structures such as chimneys are made of brick, cinderblock, tiles, adobe or other masonry material that is not braced by reinforcing beams. The term is used as a classification of certain structures for earthquake safety purposes, and is subject to some variation from place to place.

URMs are vulnerable to collapse in an earthquake. One problem is that most mortars used to hold bricks together is not strong enough. Additionally, masonry elements may "peel" from the building and fall onto occupants or passersby outside.

URMs were popular when Utah was first settled and continued to be built into the 1970s. The clay material to make bricks was both readily available and familiar to the early settlers. Utah's seismic building codes made substantial improvements in construction in the mid-1970s. Buildings constructed prior to this time may be seismically unsafe. Even some buildings constructed in the 1980s are not as seismically safe as buildings constructed under today's seismic codes. It is not known how many URMs exist in Utah. The Utah Seismic Commissions estimates that there are in excess of 185,000 URMs in the state with Salt Lake County alone estimated to have more than 65,000.

Mitigating the hazards posed by URMs is a difficult and expensive prospect. California enacted a state law in 1986 requiring seismic retrofitting of existing structures. Retrofits are relatively expensive, and may include tying the building to its foundation, tying building elements (such as roof and walls) to each other so that the building moves as a single unit rather than creating internal shear during an earthquake, attaching walls more securely to underlying supports so that they do not buckle and collapse, and bracing or removing parapets and other unsecured decorative elements. Retrofits are generally intended to prevent injury and death to people, not to protect the building itself. The California law left implementation, and standards, up to local jurisdictions. Compliance took many years. Utah has not enacted a URM law similar to California's. In 2008, an eight year seismic retrofit of the Utah State Capitol Building was completed at a cost in excess of $212 million.

2. Flood

It is important to note that flooding is a natural event for rivers and streams. Flood is determined to be the overflow of water onto land that is normally dry. Floods are related to an excess of snowmelt, rainfall, or failure of natural or engineered impoundments onto the banks and adjacent floodplains. Floodplains are lowland areas near river, lakes, reservoirs, oceans, and low terrain urban areas that are subject to recurring floods. Flooding occurs when the peak discharge, or rate of flow in cubic feet per second, is larger than the channel of the river or the storm sewer capacity in a city. The peak discharge for a stream is associated with a probability of occurrence. The probability of occurrence can be stated in terms of recurrence intervals or return periods. For example, a probability of occurrence of 10 percent would be a flood expected to occur once in 10 years or 10 times in a 100 years. Flooding damage includes saturation of land and property, erosion from water, deposition of mud and debris, and the fast flowing waters from

the flood itself. Most injuries and deaths occur from the fast moving floodwaters and most of the property damage results from the inundation by sediment-filled water. Flash flood conditions result from intense rainfall over a short period of time (UDCEM 1991).

Snowmelt floods occur from the rapid snowmelt in the mountains. These floods generally happen in April, May and June. Warm air masses with mostly sunny skies melt the mountain watershed snowpack. The large accumulations of water generally last several days and the magnitude depends on the amount of snowpack and the warm weather. Snowmelt flood risk is reduced when the snowpack is below normal and/or the weather changes from winter to spring and summer gradually without an abrupt warming trend (UDCEM 1991).

Rainfall floods result from large amounts of precipitation. Short duration local storms such as cloudburst or thunderstorms with a high intensity rainfall as well as the general storms that last several days with a less intense rainfall can produce a flooding event (UDCEM 1991).

Areas prone to flooding, according to the Utah Natural Hazards Handbook, include lake and reservoir shorelines which may flood when the flow of water into the lakes or reservoirs is greater than the outflow capacity. The Great Basin has several terminal lakes, such as the Great Salt Lake and Sevier Lake, which mean there is no outlet to the sea. These types of lakes are subject to considerable variations in water levels because the only outflow is by evaporation. Successive wet or dry periods lasting several years can result in a large change in size of terminal lakes. Development near this type of lake during a dry period is risky and certain to get flooded during wet periods (UDCEM 1991).

River and creek floodplain areas range from narrow zones to extensive lowlands extending great distances from a natural drainage area. Construction in floodplains is also dangerous because of the high flood risk. It is important to note that Weber County does not have ANY repetitive loss properties.

Urban areas are also prone to flooding because of the decrease in vegetation of the natural watershed. Houses, driveways, parking lots, buildings, and streets are all replacing the vegetative cover that is so important in lessening the potential for flood. This type of development prevents water infiltration into the soil and greatly increases the runoff. In some areas undersized piping and channels are used which may cause flooding. Manmade drainage channels can also play a role in flooding. Trash and debris can obstruct passageways (UDCEM 1991).

3. Landslide

Utah ranked third in the nation in terms of largest total landslide damage cost and cost per person between 1973 and 1983. Utah's landslide hazard rating is "severe", the highest level of five hazard classes given by the U. S. Geological Survey. The three main contributing factors to slope failure include areas with moderate to steep slopes, conductive geology, and high precipitation. The main elements that cause slope failure include precipitation events, topography and vegetation (UDCEM 1991). Landslide distribution in Utah is associated with topography and physiographic provinces. The two physiographic regions that are conducive to landslides in Utah are the Middle Rocky Mountains province and the High Plateaus subdivision of the Colorado Plateau physiographic province. Landslides are also known as slope failure and are classified according to the type of movement and the material involved. The five types of movement include falls, topples, slides, lateral spreads, and flows. The types of materials include rocks, debris (course-grained soil), and earth (fine-grained soil). Slope failure types are identified as rock falls,

rock topples, rock slides, debris flows, debris topples, debris slides, slumps, and earth flows (UDCEM 1991).

Rock Falls and Rock Topples occur when loosened blocks or boulders from an area of bedrock move down slope. Rock falls and topples generally occur along steep canyons, cliffs, and steep road cuts. Rock fall damage usually affects roads, railroad tracks, and utilities.

Debris Slides and Debris Flows generally occur in mountainous areas and involve the relatively rapid, viscous flow of course-grained soil, rock, and other surficial materials. Debris flows generally occur in mountainous areas and are considered a flow rather than a slide because of the high water content coupled with the debris. Debris flows are typically more dangerous because of the high speeds under which they form and travel. Debris flows generally remain in stream channels but can flow out from canyon mouths for a considerable distance. Debris flows and slides can damage anything in their path including buildings, roads, railroad tracks, life lines/utilities, and reservoirs.

Slumps are common along road embankments and river terraces. They slip or slide along a curved failure plane away from the upper part of a slope leaving a scarp (a relatively steeper slope separating two more gentle slopes). Slumps generally do not move very far from the source area.

Earth Flows are slumps with the addition of water that slump away from the top or upper part of a slope, leaving a scarp. These can range in size from very small to flows involving hundreds of tons of material and result in a bulging toe that can block streams and cause flooding, and damage buildings or other structures.

Causes of landslides are the result of hillside instability. Slope makeup, slope gradient, and slope weight all play a role. Other important factors of slope instability include rock type and structure, topography, water content, vegetative cover, and slope aspect. Debris flows, for example, occur when these elements are modified by natural processes or by human created processes.

Natural processes that can induce slope failure include ground shaking, wind and water weathering and erosion.

Human created processes such as lawn watering and irrigation may place excess water on already unstable ground by adding water weight to the material and raise the pore pressure, leading to a loss of shear strength. Water can also change the consistency of the slope material reducing cohesion leading to an unstable mixture.

Rock types containing clay, mudstone, shale, or weakly cemented units, which, are strongly affected by weathering and erosion, are particularly prone to landsliding because of expansive and lubricating properties. Other processes include the removal or addition of slope materials during construction. Vegetation is very important in the stabilization of slopes because it prevents rainfall from impacting the soil directly and helps protect from erosion by retaining water and decreasing surface runoff. The roots systems serve as slope-stabilizing elements by binding the soil together or binding the soil to the bedrock. Increase in slope gradient such as placing heavy loads at the top of a slope and /or the removal of material at the toe of a slope all affect the equilibrium and result in slope failure because of slope instability.

4. Wildfire

The Wildland-Urban Interface (WUI) area, or I-Zone, is where residential areas meet wildland areas. It is known as the interface zone and presents a serious fire threat to people and property. The urban aspect includes homes, schools, storage areas, recreational facilities, transmission lines and commercial buildings. Wildland refers to unincorporated areas including hills, benches, plateaus, and forests. Homes are built on the benches adjacent to wildland areas. Wildfires remove vegetation which results in slope failure, erosion, water runoff and depletion of wildlife resources. The three conditions that affect fire behavior are topography, vegetation and weather (UDCEM 1991).
Topography includes such factors as slope, aspect, and elevation. Fires spread faster upslope because the fuels are closer to the flames on the upslope. The heat from a fire moves uphill and dries fuels in front of the fire allowing for easier ignition. The aspect of slope dictates moisture content. In other words, the sun dries out fuels on south and west facing slopes more than on north and east facing slopes. Elevation and weather are interrelated because, generally, higher elevations result in cooler temperatures and a higher relative humidity. Elevation also determines the types of vegetation present (UDCEM 1991).

Vegetation plays a major role in the speed of a fire. Light grasses burn rapidly and heavy dense fuels burn slowly but with a greater intensity. The five major fuel types in Utah's vegetation include grass/sagebrush, pinion-juniper, mountain bush, hardwoods, and softwoods. The grass/sagebrush area poses a serious threat because people under estimate the danger of wildfires in this area. These fires burn across thousands of acres rapidly and pose a serious threat to not only property but also life. Pinion-juniper fuel does not normally burn much, except when conditions are hot, dry and windy. When a fire does occur here, it will burn intensely and spread rapidly. Mountain brush is commonly found in Utah's foothills and when moderate to extreme fire conditions are present; this type of fuel will burn hot and fast. Hardwood-forest and softwood (deciduous) fuel types are generally less risky (UDCEM 1991).

Size, continuity and compactness all affect the fuel's rate of spread. Large fuels do not burn as readily as smaller fuels and need more heat to ignite. Small fuels on the other hand ignite easier, and a fire will spread more rapidly through them. Continuity is described by how fuel is arranged horizontally. Fuels that are broken up burn unevenly and slower than fuels that are uniform. Compactness is how fuel is arranged vertically.

Tall, deep fuels have more oxygen available so they burn more rapidly. Less oxygen is available to compact fuels such as leaf litter and stacked logs; therefore they burn slower (UDCEM 1991).

Weather factors include temperature, humidity, precipitation, and wind. Weather affects the ease with which a fuel ignites, the intensity at which it burns, and how easy or difficult fire control may be.

High temperatures increase fire danger because it heats fuels and reduces water content, which increases flammability. Humidity influences fuel ignition and how intensely fuel burns. A decrease in relative humidity causes fuels to dry, promoting easier ignition and more intense burning. Wind speed can increase burning intensity and the direction that the fire moves. Wind carries heat from a fire into unburned fuels drying them out and causing them to ignite easier. The wind may also blow burning embers into unburned areas well ahead of the main fires starting spot fires (UDCEM 1991).

Fire protection in these areas is difficult because the tactics used for wildland fire suppression cannot be used for structure protection and suppression. The energy that is emitted from a wildland fire is very dangerous to firefighters and homeowners and makes protection of homes almost impossible. One third of

all firefighter deaths occur fighting wildfires. Many believe that WUI areas increase the risks to firefighters significantly. Legally, federal wildland protection agencies seldom have the responsibility to protect structures. The legal responsibility for protecting structures on non-federal wildlands varies widely among state forestry agencies (UDCEM 1991).

5. Dam Failure

Dams and associated water delivery systems serve various functions and are built by different agencies and entities including; the Bureau of Reclamation, Army Corps of Engineers, Soil Conservation Service, cities, counties, and private irrigation companies. Dams are built for hydroelectric power generation, flood control, recreation, water storage for irrigation, as well as municipal and industrial uses. Utah's dry climate makes it critical for the storage of the winter snowmelt runoff for uses all year round. 84% of Utah's stored water is behind federal dams, while 650 non-federal dams hold more than 1.2 million acre-feet of water. Dam placement is important and needs to be in an area where it can collect and distribute the greatest amount of water. Dam sites with strong impermeable bedrock are the best in terms of strength. Many materials can be used to construct a dam such as earthen fill, concrete, roller compacted concrete, and rocks and mine tailings. Other dams are created by the enlargement or addition of existing lakes (UDCEM 1991).

Rainy Day failures occur when floodwaters overstress the dam, spillway, and outlet capacities. The floodwater flows over the top of the dam and eventually erodes the structure from the top down. At this point the floodwater meets with the floodwaters from the rainstorm and a very destructive, powerful flood is created" (UDCEM 1991).

Sunny Day failures are the most dangerous because they happen without any warning. Downstream residents or inhabitants have no time to prepare or even evacuate the area; the results are generally catastrophic. Sunny day failures occur from seepage or erosion inside the dam. This erosion removes fine materials creating a large void that can cause the dam to collapse, or overtop and wash away. Earthquake ground shaking or liquefaction can also create structure problems. Ground shaking will cause the dam to start piping, slumping, settling, or experience a slope failure similar to a landslide. The dam then fails internally or overtops and washes away.

Other sunny day failures occur when vegetation or rodents get into a dam and leave holes or tunnels that can lead to failure. Not all dam failures are catastrophic; sometimes a dam can fail and be drained and repaired without a damaging flow of floodwaters (UDCEM 1991).

Hazard ratings are determined by downstream uses, size, height, volume and incremental risk/damage assessments. The hazard ratings are: Low- insignificant property loss; Moderate- significant property loss; and High- possible loss of life" (UDCEM 1991). Over two hundred Utah dams are rated as high-hazard dams.

6. Drought

According to the National Drought Mitigation Center, drought originates from a shortage of precipitation over an extended period of time, usually a season or more. This deficiency results in a water shortage for some activity, group, or environmental sector. "Drought could be considered relative to some long-term

average condition of balance between precipitation and evapotranspiration in a particular area" (NDMC 2006). Drought is also related to the timing and effectiveness of precipitation. Drought is a normal, recurrent feature of weather and climate but is a particular concern to all affected because of its devastating outcome. It occurs in almost all climatic zones with varying characteristics. "Drought is a temporary aberration and differs from aridity since aridity is restricted to low rainfall regions and is a permanent feature of climate". Drought is a dry progression through the winter, spring, and summer months that could end in a year or last for many years. The number of dry years correlates with that impacted. Usually, a one to two year drought affects only agriculture, while a three-year drought may significantly impact culinary water in the local areas and communities.

Conceptual definitions of drought help people understand the idea of a drought.

Operational definitions define the process of drought. This is usually done by comparing the current situation to the historical average, often based on a 30-year period of record. It is hard to develop a singular operational definition of drought because of the striking differences throughout the world (NDMC 2006).

Meteorological drought is defined by the degree of dryness in comparison to an average amount and the duration of the dry period. Meteorological drought must be considered as region specific since the atmospheric conditions that result in deficiencies of precipitation are highly variable from region to region (NDMC 2006).

Hydrological drought refers to the precipitation decline in the surface and subsurface water supply. The frequency and severity of hydrological drought is often defined on a watershed or river basin scale (NDMC 2006).

Agricultural drought occurs when there is not enough water available for a crop to grow. This drought links various characteristics of meteorological or hydrological drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, and reduced ground water or reservoir levels (NDMC 2006)

Socioeconomic drought occurs when the physical water shortage begins to affect people (NDMC 2006). When drought begins, the agricultural sector is usually the first to be affected because of its heavy dependence on stored soil water. If precipitation deficiencies continue, then people dependent on other sources of water will begin to feel the effects of the shortage. Those who rely on surface and subsurface water are usually the last to be affected. Ground water users are often the last to be affected by drought during its onset but may be the last to experience a return to normal water levels. The length of the recovery period is a function of the intensity of the drought, its duration, and the quantity of precipitation received as the episode terminates (NDMC 2006).

Measuring Drought:

Palmer Drought Severity Index (PDSI): Developed in 1965, the PDSI is a soil moisture algorithm calibrated for relatively homogeneous regions used by government agencies and states to trigger drought relief programs. The PDSI provides a measurement of moisture conditions that were "standardized" so that comparisons using the index could be made between locations and between months. This is the oldest index for measuring drought and is less well suited for mountainous land or areas of frequent climatic extremes and does not include man-made changes. The PDSI is calculated based on precipitation and temperature data as well as local available water content of the soil. This scale is given as monthly values and is the

most effective in determining long-term drought. The index ranges from –4 to 4 with negative values denoting dry spells and positive values indicating wet spells. The values 0 to -.5 equal normal, -0.5 to –1.0 equal incipient drought, -1.0 to –2.0 equal mild drought, -2.0 to –3.0 equal moderate drought, -3.0 to –4.0 equal severe drought, greater than –4.0 equals extreme drought. The wet spells use the same adjectives in the positive values (NDMC 2006).

Surface Water Supply Index (SWSI): Developed in 1982, the SWSI index uses the same basic classifications as the Palmer Drought Index and is designed to complement the Palmer Index in the western states. The SWSI is more of an indicator of surface water conditions and is described as "mountain water dependent", in which mountain snowpack is a major component; calculated by river basin, based on snowpack, stream flow, precipitation, and reservoir storage. The objective of the SWSI was to incorporate both hydrological and climatological features into a single standardized index value. The pros and cons of the SWSI is that the index is unique to each basin. The SWSI is centered on 0 and has a range between –4.2 (extremely dry) and 4.2 (abundant supply). The index is calculated by combining pre-runoff reservoir storage with forecasts of spring and summer stream flow that is based on hydrologic variables (NDMC 2006).

Standardized Precipitation Index (SPI): T.B. McKee, N.J. Doesken, and J. Kleist of the Colorado State University, Colorado Climate Center, formulated the SPI in 1993. The Standardized Precipitation Index was designed to quantify the precipitation deficit for multiple time scales; basically, the SPI is an index based on the probability of precipitation for any time scale. It assigns a single numeric value to the precipitation that can be compared across regions with different climates. The SPI is calculated by taking the difference of the precipitation from the mean for a particular time scale and dividing by the standard deviation. The SPI is normalized and so the wetter and drier climates can be represented in the same way.

The SPI can provide early warning of drought and help assess drought severity, yet the values based on preliminary data may change. The SPI values indicate an extremely wet period value at 2.0+, very wet equals 1.5 to 1.99, moderately wet is 1.0 to 1.49, -.99 to .99 is near normal, -1.0 to –1.49 moderately dry, -1.5 to –1.99 is severely dry, -2 and less is extremely dry. The time scales were originally calculated for 3-, 6-, 12-, 24-, and 48- months (NDMC 2006).

A drought analysis review of 33 gauging stations data in Utah indicated that a localized drought has occurred on at least one stream every year since 1924. The duration of drought lasts longer in basins where runoff is mainly from snowmelt. The frequency of occurrence is greater for areas in the Wasatch Range than in the Wasatch Plateau, the mountains of southwestern Utah, or the Uintah Mountain range. Because Utah relies on surface water supplies, about 81% of the population relies on off-stream water use and 35% of the population relies on surface water supplies, drought severely affects the people and industry of the whole state.

7. Infestation

Infestation has plagued this region since the early 1800-s and continues to be a problem. Infestation is known as a parasite that over-populates in numbers or quantities large enough to be destructive, threatening, or obnoxious. The Utah Department of Agriculture and Food maintains a database of insect infestation throughout the State. Their data shows that although Weber County has not had historic infestations, several pests that pose serious threat to Weber County agriculture. Wood Boring Bark Beetles, the Cherry Fruit Fly, Apple Maggot and worms tend to be the most damaging and affect the rural areas the most. During times of drought in the area pest populations tend to decrease. The drought also affects the food supplies and so the insects begin to search over a wider area when in search of food.

8. Severe Weather

Winter Storm: Winter storms gain energy from the collisions of two air masses. In North America, a winter storm is usually generated when a cold air mass from dry Canadian air moves south and interacts with a northward moving warm moist air mass from the Gulf of Mexico. The position where a warm and a cold air mass meet is called a front. If cold air is advancing and pushing away the warm air, the front is known as a cold front. If warm air is advancing, it will ride up over the cold air mass and the front is known as a warm front. A winter storm will typically begin under what is known as a stationary front. A stationary front is when neither air mass is advancing. The atmosphere will try to even out the pressure difference by generating an area of lower pressure; this creates wind that blows from high pressure towards a low-pressure area.

As the air travels toward the center of the low-pressure area, it is pushed up into the colder regions of the upper atmosphere because it has nowhere else to go. This causes the water vapor to condense as snow in the northern areas because of the colder temperatures. In the south, if the temperatures are warm enough the water vapor will fall as heavy rain in thunderstorms. Because of the easterlies in Northern America, the winter storm moves quickly over the area and generally does not last longer than a day in one area. However, in Utah, because of the Great Salt Lake "lake-effect", snowstorms can last for many days. This is because of the amount of moisture from an unfrozen body of water. When a strong cold wind blows over a larger area of water, the air can attain a substantial amount of moisture; this moisture turns into heavy snow when it reaches land causing a lake effect snowstorm.

Ice Accumulations can bring down electrical wires, telephone poles and lines, trees, and communication towers. Ice can also cause extreme hazards to motorists and pedestrians. Bridges and overpasses are likely to freeze first. (NWS 2001)

Heavy Snow will sometimes "immobilize a region by stranding commuters, stopping the flow of supplies, disrupting emergency and medical services, close infrastructure and services" (NWS 2001). When heavy snow occurs with high winds, blowing snow or blizzard conditions may exist. (NWS 2001).

Avalanche: Avalanches are a rapid down-slope movement of snow, ice, and debris. Snow avalanches are a significant mountain hazard in Utah, and nationally account for more deaths each year than earthquakes. Avalanches are the result of snow accumulation on a steep slope and can be triggered by ground shaking, sound, or a person. Avalanches consist of a starting zone, a track, and a run-out zone. The starting zone is where the ice or snow breaks loose and starts to slide. The track is the grade or channel down which an avalanche travels. The run-out zone is where an avalanche stops and deposits the snow.
The two main factors affecting avalanche activity include weather and terrain; large, frequent storms combined with steep slopes result in avalanche danger. Additional factors that contribute to slope stability are the amount of snow, rate of accumulation, moisture content, snow crystal types, and the wind speed and direction. In Utah, the months of January through April have the highest avalanche risk.
Topography plays a vital role in avalanche dynamics. Slope angles between 30 to 45 degrees are optimal for avalanches, with 38 degrees being the most idyllic. The risk of avalanches decreases on slope angles below 30 degrees. (State of Utah HMP, 2014).

Dry-slab avalanche is when a cohesive slab of snow that fractures as a unit slides on top of weaker snow and breaks apart as it slides. Dry-slab avalanches occur usually because too much additional weight has been added too quickly, which overloads the buried weak layer. Even the weight of a person can add a

tremendous stress to a buried weak layer. Dry-slab avalanches usually travel between 60-80 miles per hour within 5 seconds of the fracture and are the deadliest form of avalanche (UAC 2008).

Wet-slab avalanches occur for the opposite reason of dry avalanches; percolating water dissolves the bonds between the snow grains on the pre-existing snow, which decrease the strength of the buried weak layer. Strong sun or warm temperatures can melt the snow and create wet avalanches. Wet avalanches usually travel about 20 miles per hour (UAC 2008).

Avalanches can result in loss of life as well as economic losses. At risk are some communities, individual structures, roads, ski areas, snowmobilers, backcountry skiers, snowshoers, snowboarders, and climbers. One of the major consequences of avalanches is the burial of structures, roads, vehicles, and people in the runout zone where tens of feet of debris and snow can be deposited (UAC 2008).

Severe Thunderstorms usually last around 30 minutes and are typically only 15 miles in diameter (NWS 1999), but all produce lightning, the "number one weather-related killer" in Utah (NWS 2008). Thunderstorms can also lead to flash flooding from heavy rainfall, strong winds, hail and tornadoes or waterspouts (NWS 1999).

Tornado: Expressed as "a violently rotating column of air extending from a thunderstorm to the ground" (NWS 1999), a tornado is often on the edge of the updraft or next to the air coming down from the thunderstorm. A tornado's vortex is a low-pressure area and as air rushes into the vortex, its pressure lowers and cools the air. This cooler air condenses into water vapor in the funnel cloud, known as the vortex, and doesn't touch the ground. The swirling winds of the tornado pick up dust, dirt, and debris from the ground, which turns the funnel cloud darker. Some tornadoes can have wind speeds greater than 250 miles per hour with a damage zone of 50 miles long and greater than 1 mile wide (NWS 1999). Most tornadoes in Utah typically have winds less than 110 miles per hour, are no wider than 60 feet and are on the ground longer than "a few minutes" (Brough, et al. 2007).

A change in wind direction and an increase in wind speed along with increasing height create a horizontal spinning effect in the lower atmosphere form a tornado while the rising air within the thunderstorm updraft tilts the rotating air vertically resulting in what we call a tornado. The area of rotation is generally 2-6 miles wide and extends through much of the storm (NWS 1999).

Scale: Tornadoes are classified by the National Weather Service using the Fujita Scale, which relates wind speed to damage to determine tornado intensity. The scale uses numbers from 0 through 5 with the ratings based on the amount and type of wind damage (SPC 2007). This scale has recently been modified and is now referred to as the Enhanced Fujita Scale. The Enhanced Fujita Scale classifications are listed below:

Enhanced Fujita Scale

EF-0: 65-85 mph, Light damage, downed tree branches, chimney damage
EF-1: Winds 86-110 mph, Moderate damage, mobile home damage
EF-2: Winds 111-135 mph, Considerable damage, mobile home demolished, trees uprooted
EF-3: Winds 136-165 mph, severe damage, roofs and walls torn down, trains overturned, cars thrown
EF-4: Winds 166-200 mph, Devastating damage, well-constructed walls leveled
EF-5: Winds over 200 mph, incredible damage, homes lifted off foundation and carried, autos thrown as far as 100 feet. (SPC 2007a)

Waterspouts are weak tornadoes that form over warm water, and in Utah generally occur with cold, late fall or late winter storms (Brough, et al. 2007).

Extreme Heat kills more people in the United States each year than any other weather-related hazard (NOAA 2008). Extreme heat is defined as "summertime weather that is substantially hotter and/or more humid than average for a location at that time of year" (EPA 2006). Extreme heat poses multiple threats to persons and infrastructure. Not only may personal health be affected through heat cramps, heat exhaustion or heat stroke (EPA 2006), but power grids are substantially burdened through the increased use of air conditioning, potentially resulting in brownouts or blackouts.

Certain populations are especially vulnerable during these events. These include the very young and elderly, the poor and homeless, reclusive persons, persons with physical or mental impairment, persons using specific medications, illicit drugs or alcohol, or persons strenuously working or playing outdoors (EPA 2006).

Extreme Cold: Prolonged exposure to the cold can cause frostbite or hypothermia and can become life threatening (NWS 2001). Increasing winds can increase the risk to this hazard.

THIS PAGE INTENTIONALLY LEFT BLANK

PART VIII. REGIONAL HAZARDS

Certain natural hazards are widespread with no unique risk affecting a single jurisdiction. To adequately examine the scope of these hazards, they must be analyzed on a regional level. Regional hazards examined in this section include severe weather (high winds, fog, severe storms which can produce thunderstorms, lightning, hail, tornado, and heavy precipitation, extreme temperatures and avalanche), drought, insect infestation and radon.

Most jurisdictions in this plan have not developed mitigation strategies for these regional hazards. There are several reasons. There may be a relatively minor jurisdictional impact, or the simple inability to mitigate the risk of a specific, or the high cost of mitigating the risk would result in a very minor return on public fund investment.

Climate Change

As climate change may change the characteristics of hazards in the region, Weber County has chosen to include a discussion of how climate change may affect each of these hazards and the County as a whole. This will help the County and the local jurisdictions to be proactive in addressing climate change impacts.

The White House Fact Sheet, *What Climate Change Means for Utah and the Southwest,* warns: "increased, warming, drought and insect outbreaks, all caused by or linked to climate change, have increased wildfires and impacts to people and ecosystems in the Southwest." The report also indicates that Utah's watersheds will be seriously impacted with snowpack and streamflow amounts projected to decline while extreme rainfall events increase.

1. Severe Weather

Severe weather has caused considerable losses for the region. Although drought is also a weather-related hazard, it is treated separately here and continues to be an issue in the region. Insect infestations regularly irritate farmers, gardeners and arborists alike.

The NWS Summary of Hazardous Weather Fatalities, Injuries and Damage Costs provides the following estimates for Utah for the last 20 years:

Year	Fatalities	Injuries	Property Damage (Million $)	Crop Damage (Million $)	Total Damage (Million $)
2014	5	5	7.09	0	7.09
2013	9	2	5.61	0	5.61
2012	6	22	27.23	0	27.23
2011	6	10	84.29	0	84.29
2010	5	12	35.86	0	35.86
2009	0	1	.84	.10	.94
2008	6	3	.79	.01	.80
2007	17	7	3.71	0	3.71
2006	4	3	18.0	0	18.0
2005	8	35	300.4	0	300.4
2004	4	14	2.2	0	2.2
2003	12	25	5.6	.01	5.7

Year	Fatalities	Injuries	Property Damage (Million $)	Crop Damage (Million $)	Total Damage (Million $)
2002	2	13	8.7	.03	9.0
2001	7	24	1.9	.01	2.0
2000	7	24	3.8	.02	4.0
1999	5	143	182.5	.7	183.2
1998	13	160	8.5	1.5	10.0
1997	13	280	60.6	0.2	60.8
1996	4	126	10.0	0	10.0
1995	2	15	-	-	17.1
20 year totals	**135**	**924**	**$762.62 million**	**$2.58 million**	**$787.93 million**

Table 8-1. Severe Weather 20-year Summary
Source: National Weather Service 2015

Hazard Profile

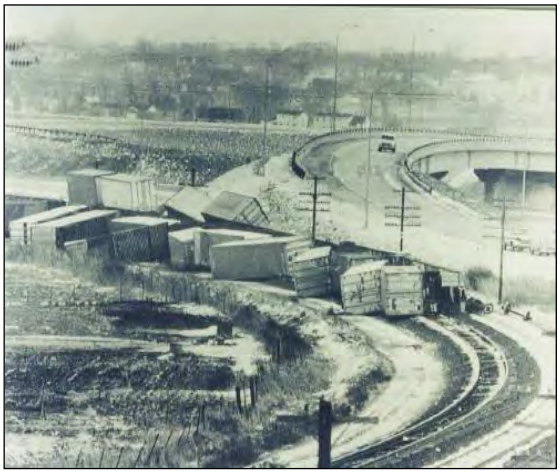
Potential Magnitude		***Catastrophic (>50%)***	***Probability***	X	***Highly Likely***
		Critical (25-50%)			***Likely***
	X	***Limited (10-25%)***			***Possible***
		Negligible (< 10%)			***Unlikely***
Location	Occur in localized areas throughout the region. Although many severe weather phenomena generally have recognizable patterns of recurrence, it is difficult to identify exactly when and where the next event will take place.				
Seasonal Pattern	Year round.				
Conditions	Vary based on latitude, elevation, aspect and land forms.				
Duration	Severe weather hazards generally last hours and can persist for days.				
Secondary Hazards	Wildfire, flooding.				
Analysis Used	National Climate Data Center, National Weather Service, Utah Avalanche Center, Utah DEM, local input, and review of historic events and scientific records.				

Description of Location and Extent

High Winds

High winds can occur with or without the presence of a storm and are unpredictable in regards to time and place. Each of the five counties that make up the Wasatch Front has experienced high winds in the past (see Map 8-1 page 76), and can expect regional high wind future events.

Canyon winds can bring wind gusts greater than 100 mph through the canyon mouths into the populated areas of the Wasatch Front. Winds are usually strongest near the mouths of canyons and have resulted in the loss of power and the inability to heat homes



Wasatch Front, April 4-6, 1983 – 70 mph "East Winds" derailed this train in the Lagoon area. Peak gusts were recorded at 104 mph. *(Source: Utah's Weather and Climate, Photo: Ogden Standard Examiner)*

and businesses. Winds have also damaged roofs, destroyed and knocked down large trees and fences, overturned tractor trailers and railroad cars, and downed small airplanes.

The following table contains vulnerabilities for wind hazards with regard to critical facilities. Results are not weighted relative to each hazard, but rather, based solely on the hazard itself. Hazard determinations are taken from the maps in the preceding regional hazard sections. It is not possible to accurately determine specific vulnerabilities from hail, lightning, tornado or radon hazards.

Critical Facilities	Number of Buildings Vulnerable to Wind
Amateur Radio Repeaters	4
Public Safety Repeaters	10
Electric Generation Facilities	6
Emergency Operations Centers	22
Fire Stations	21
Hospitals	2
Police Stations	10
Schools	68
Water Treatment Facilities	2

Table 8-2. Critical Facilities Number of Buildings Vulnerable to Wind

Fog

Temperature inversions often occur during the winter months as a result of high pressure trapping cold air in the valley. These inversions keep cold, moist air trapped on the Wasatch Front valley floor forming super-cooled fog. This fog can cause visibility restrictions and icy surfaces. Wind is needed to clear the inversion and fog. The Great Salt Lake has been shown to affect the prevalence of fog, especially when lake levels are high (Hill 1987).

Severe Storms

Severe storms can include thunderstorms, lightning, hailstorms, heavy snow or rain, extreme cold and avalanche. These storms are generally related to high precipitation events during the summer and winter months and can happen anywhere in the region. Damage can be extensive especially for agriculture, farming, and transportation systems; they can also disrupt business due to power outages.

Thunderstorms

Strong, rising air currents bring warm, moist air from the surface into the upper atmosphere where it condenses forming heavy rains, hail, strong winds and lightning. Based on historical evidence thunderstorms can strike anywhere in the region, mainly during the spring and summer months

Hailstorms

Hailstorms occur when freezing water (in thunderstorm clouds) accumulates in layers around an icy core generally during the warmer months of May through September. Hail causes damage by battering crops, structures and automobiles. When hailstorms are large, damage can be extensive (especially when combined with high winds). See Map 8-2 (page 77) for spatial distributions of hail events.

Lightning

Lightning is the electric discharge between clouds or from a cloud to the earth. Lightning casualties occur most frequently during the summer monsoonal flow in July and August. See Table 8-2 for the number of fatalities caused by lightning in Utah since 1995. Lightning is also the primary cause of wildland fires in Utah (NWS 2014), which could cause casualties, damage property, and be disruptive to the economy. Map 8-3 (page 78) shows the annual distribution of lightning strikes in Weber County.

Location	Fatalities
Camping	3
In Water	1
Outside/Open Areas	11
Under Tree	5
Total	20

Table 8-3. Lightning Fatalities in Utah, 1995-2014
Source: National Weather Service, 2015

Lewis Peak, North Ogden, Utah– Lightning *(Source: Utah's Weather and Climate, Photo by Gene Poncelet)*

Tornado

Historically, atmospheric conditions have not been favorable for tornado development in Utah due to a dry climate and mountainous terrain. Utah is one of the lowest ranked in the nation for incidences of tornadoes with only one F2 or stronger tornado every seven years. Utah averages about two tornados per year which typically occur between May and August.

Great Salt Lake, September 12th, 1998 – Waterspout *(Photo: KTVX News 4)*

Despite this fact, interactions of the relatively cool air of the Great Salt Lake and relatively warm air of urban areas could create situations more favorable for tornado development. This phenomenon possibly contributed to the formation of the August 1999 Salt Lake City tornado (Dunn and Vasiloff 2001) which was the costliest disaster in Salt Lake County history causing over $170 million in damages.

Tornado distribution for the region (Map 8-4 page 79) suggests many tornadoes are funnel clouds aloft coming into contact with the increasing elevation of the region's foothills and mountains.

Salt Lake City Tornado, August 11, 1999 – Orange fireball is a power sub-station exploding *(Photo: KTVX News 4)*

Heavy Precipitation

Heavy amounts of precipitation from rain or snow can result in flash flood events. The Wasatch Front has been susceptible to these types of storms because of close proximity to the mountain ranges. Major winter storms can produce five to ten times the amount of snow in the mountains than in the valley locations. Heavy snow can cause a secondary hazard in avalanches.

Much of the valley's development has occurred on old alluvial fans from the canyon mouths. During heavy rain events, water and debris collect on these same alluvial fans, damaging residential, commercial property and infrastructure. See Map 8-5 (page 80) for the regional flash flood hazard.

Extreme Temperatures

Temperatures in Utah can reach the extreme ends of the thermometer. Winter months often experience temperatures below zero degrees Fahrenheit. Summer temperatures regularly reach into the nineties with many days above 100 degrees Fahrenheit. Drastic temperature changes also occur, even in matter of hours. Temperature swings in such a short period of time can cause severe emotional stress in people, sometimes resulting in suicide.

Sub-zero temperatures occur during most winters; however, prolonged periods of extremely cold weather are infrequent. January is generally the coldest month of the year. Historically, extreme cold in the region has disrupted agriculture, farming and crops. Especially vulnerable to extreme cold are the young, elderly, homeless and animals. Wind chill can further the effects of extreme cold. See Map 8-6 (page 81) for the average annual occurrences of freezing temperatures for the region.

Extreme heat not only causes discomfort, but can lead to heat exhaustion or heat stroke. Extreme heat also places severe strain on electrical systems due to the widespread use of evaporative coolers and air conditioners. This strain can lead to brownouts or blackouts leaving many without electrical power. See Map 8-7 (page 82) for the average days above 90° Fahrenheit annually.

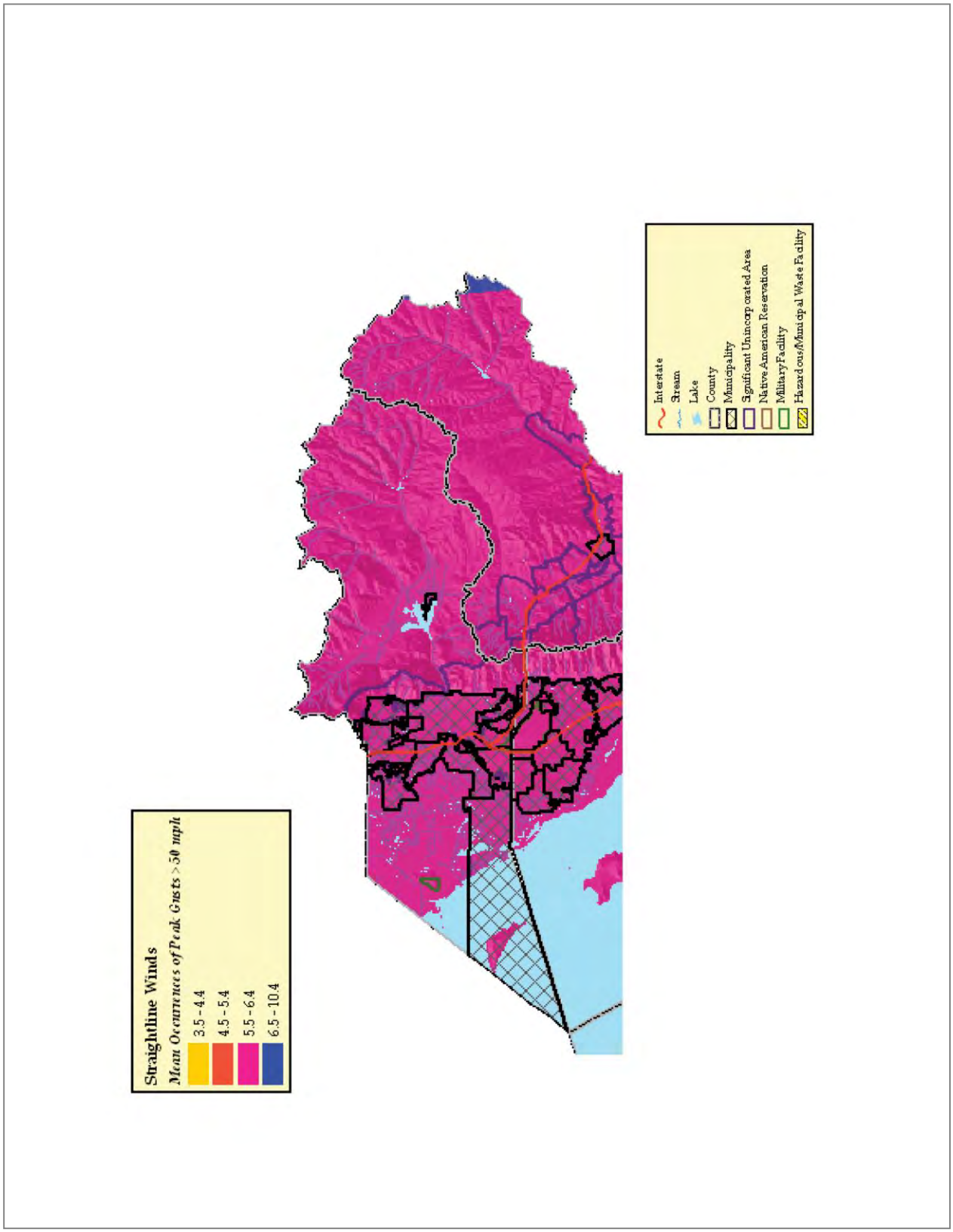
Avalanche

Heavy snows, high winds, extreme temperatures and steep mountain slopes combine to form avalanche hazards in the foothills and mountainous areas of the region. Even though most avalanches occur in wildland areas, recreational endeavors – hiking, hunting, mountain climbing, skiing, snowboarding, snowmobiling and other wintertime activities – bring the population into contact with avalanche-prone areas. Due to the immense popularity of these activities, avalanches are actively mitigated within well-traveled areas. Persons venturing into the backcountry are more at risk. Homes and businesses along the foothills and in mountain areas have been damaged from avalanches.

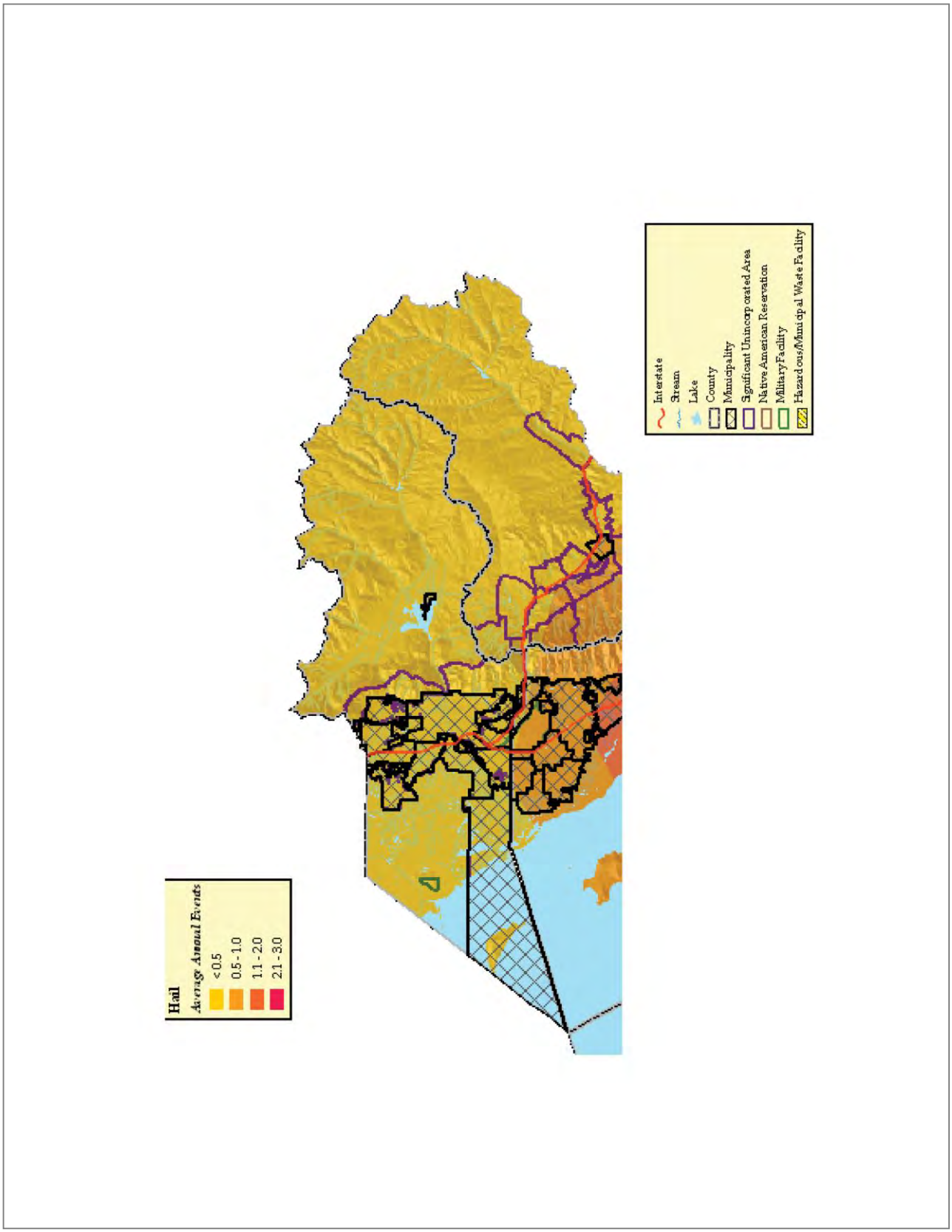
The majority of avalanches occur on slopes between 30 and 50 degrees and with terrain barren of vegetation. Types of avalanches include wet and dry slab. Wet-slab avalanches occur most often in warming conditions on southerly-facing slopes. Dry-slab avalanches occur mostly on northerly facing slopes in mid-winter. Wind can accelerate snow deposition leading to larger and/or more frequent avalanches (State HMP 2014).

Hells Canyon Avalanche, March 4, 2015. This avalanche outside of Snowbasin Resort killed a snowboarder carrying him 1,800 feet. *(Source: Utah Avalanche Center)*

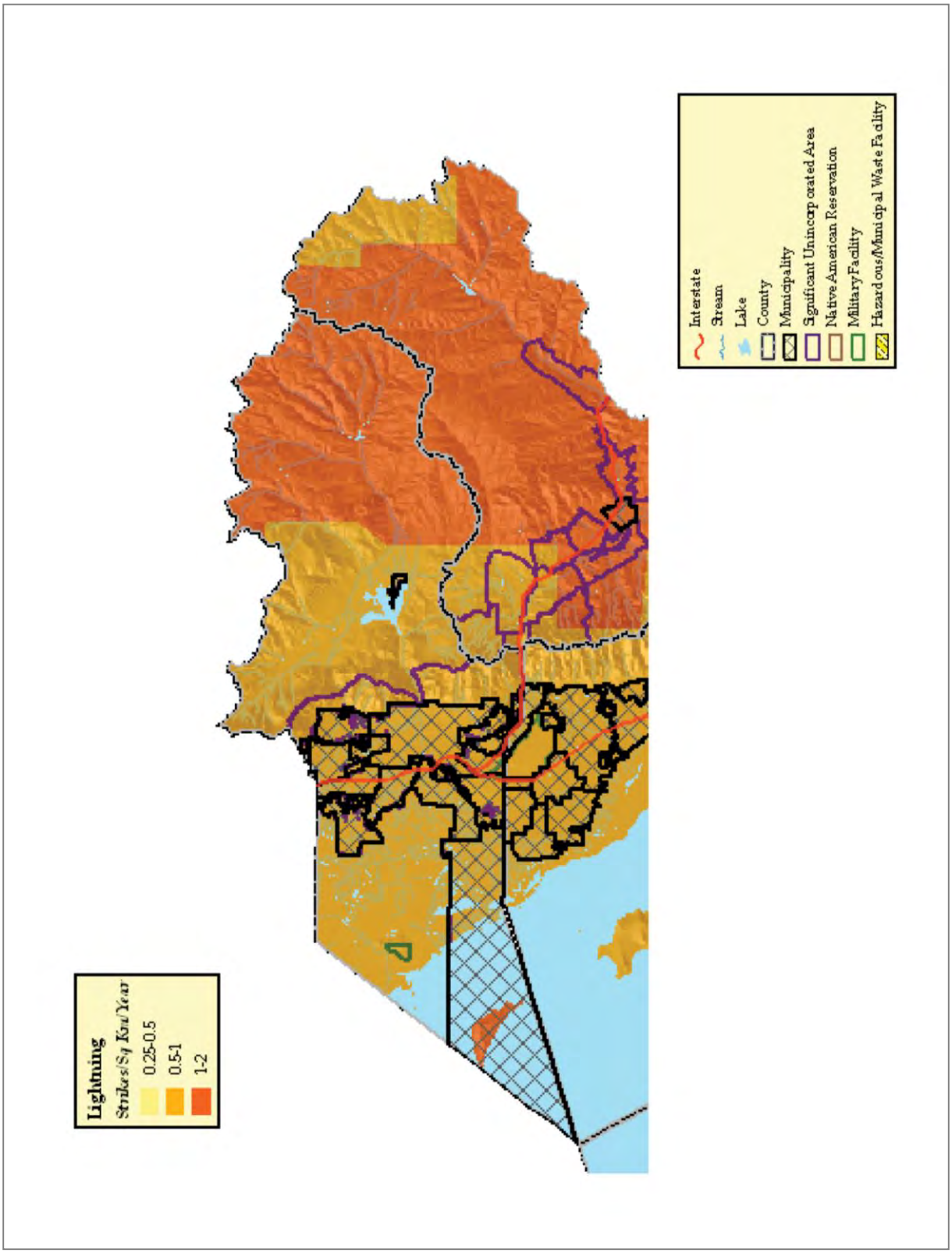
Map 8-1. Weber County High Wind Events
(Source: National Climatic Data Center)



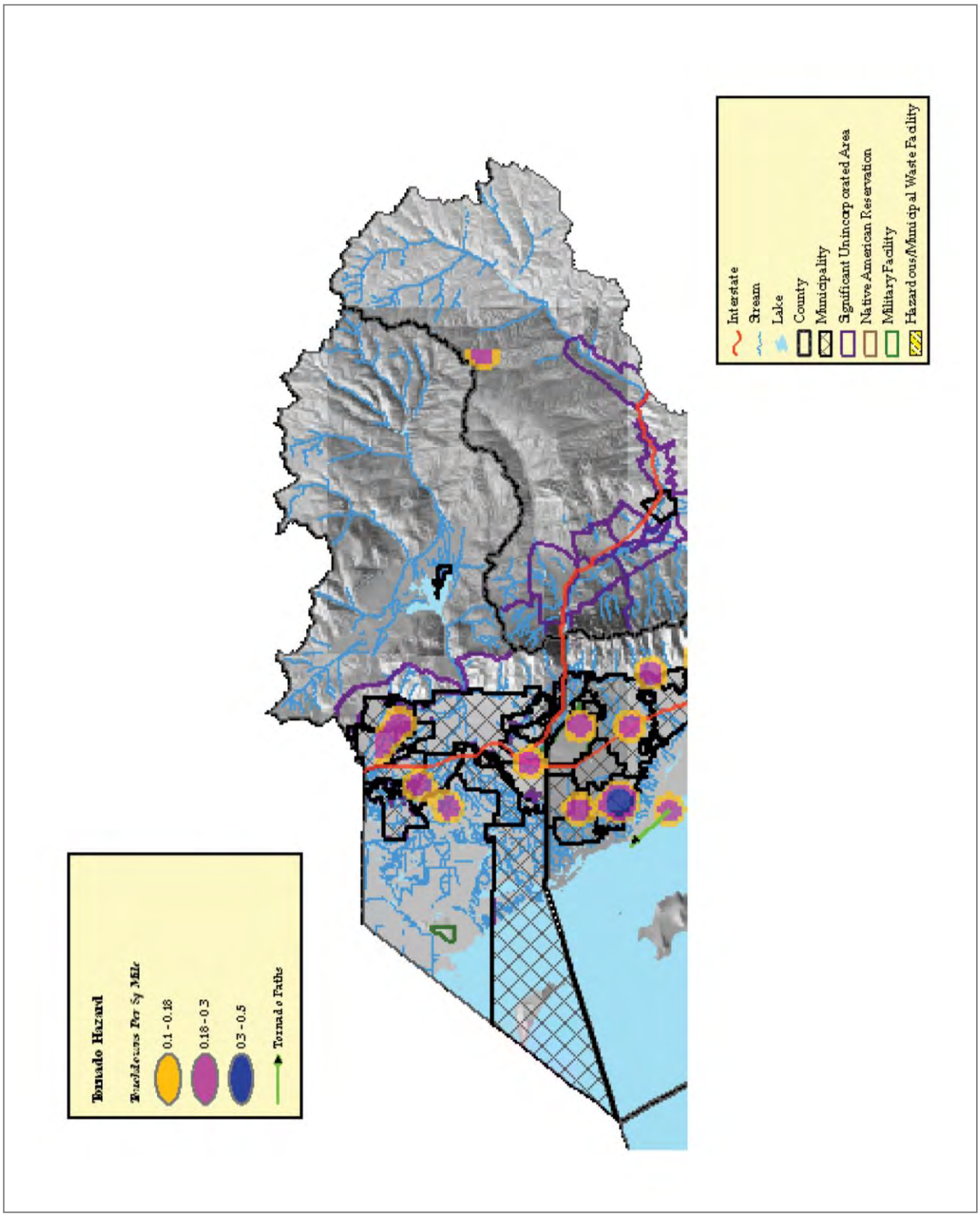
Map 8-2. Weber County Hail Hazard
(Source: National Climatic Data Center)



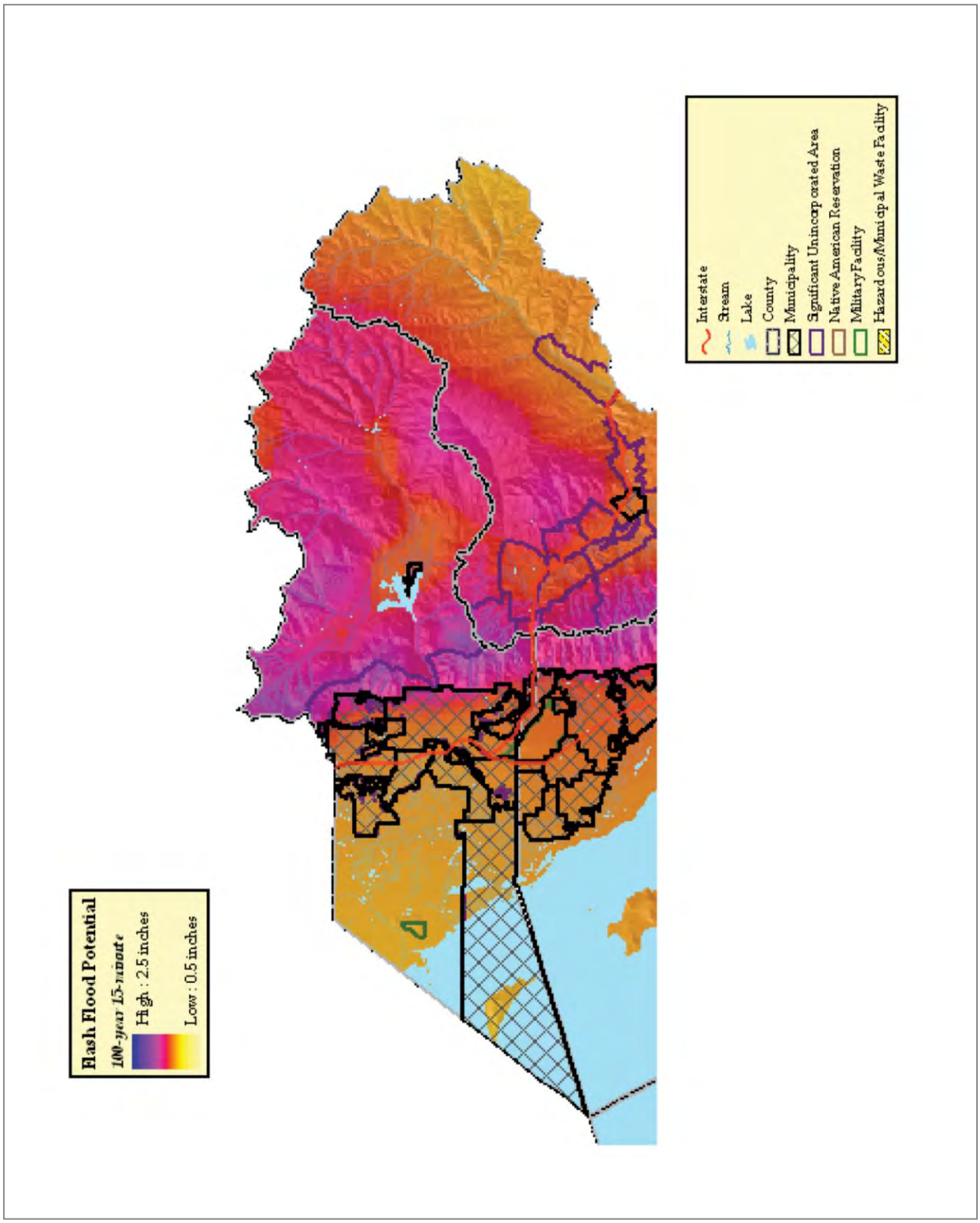
Map 8-3 Weber County Lightning Hazard
(Source: National Climatic Data Center)



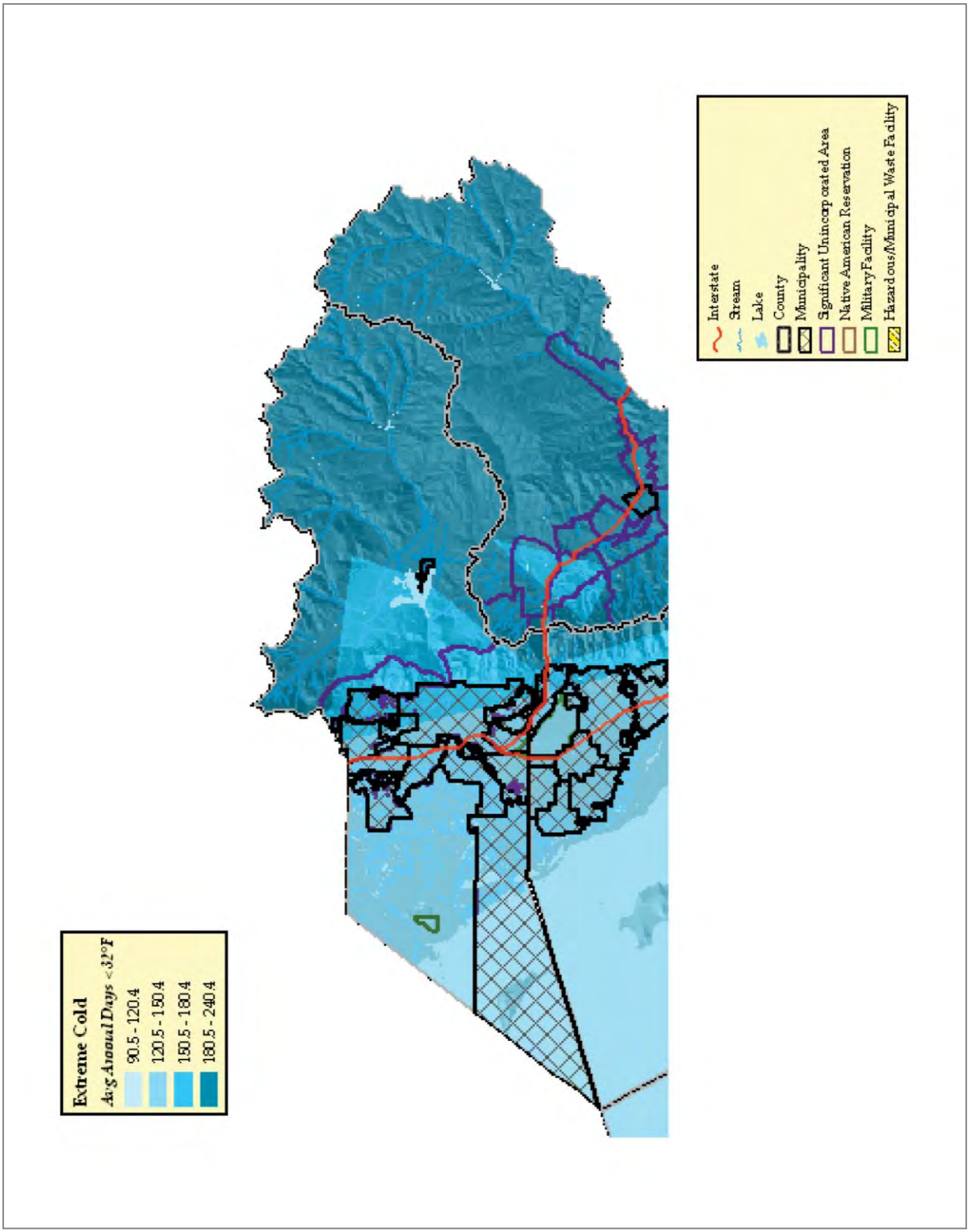
Map 8-4. Weber County Tornado Hazard
(Source: NWS Storm Prediction Center)



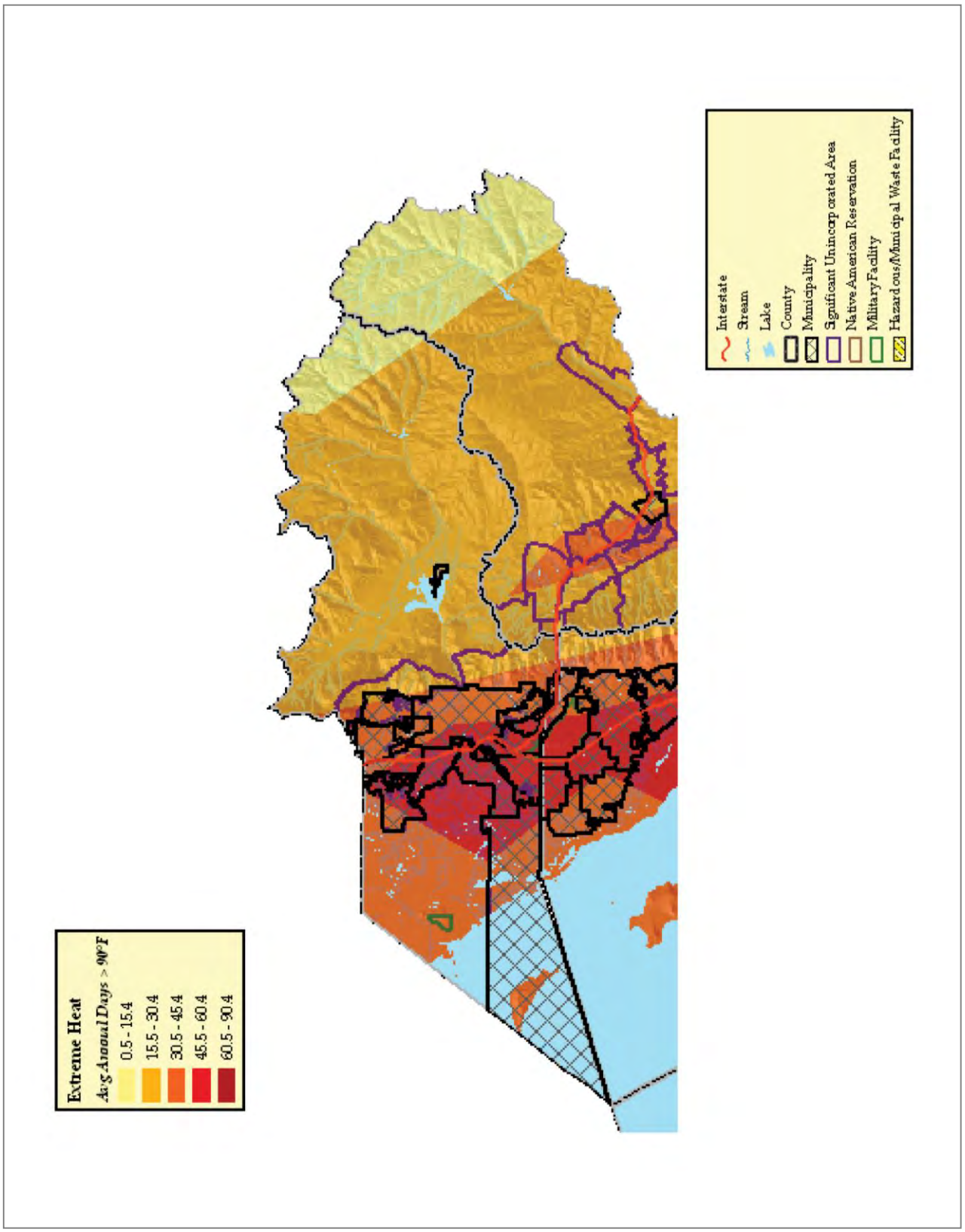
Map 8-5. Weber County Flash Flood Hazard
(Source: NWS Hydrometeorological Design Studies Center)



Map 8-6. Regional Extreme Cold Hazard
(Source: National Climatic Data Center)



Map 8-7. Regional Extreme Heat Hazard
(Source: National Climatic Data Center)



2. Drought

Hazard Profile

Potential Magnitude		***Catastrophic (>50%)***	***Probability***	X	***Highly Likely***
	X	***Critical (25-50%)***			***Likely***
		Limited (10-25%)			***Possible***
		Negligible (< 10%)			***Unlikely***
Location	Regionwide.				
Seasonal Pattern	Summer.				
Conditions	*Meteorological Drought:* Lack of precipitation *Agricultural Drought:* Lack of water for crop production *Hydrologic Drought:* Lack of water in the entire water supply *Socioeconomic Drought:* Lack of water sufficient to support population				
Duration	Months, Years				
Secondary Hazards	Wildfire, dust storms, air quality.				
Analysis Used	National Weather Service, Utah Climate Center, Utah Division of Water Resources, Newspapers, Local input.				

Description of Location and Extent

Drought refers to an extended period of deficient rainfall relative to the statistical mean for a region. The entire region is experiencing drought conditions with a Palmer Drought Severity Index (PDSI) of -2.78 for the past year. The past 5 years has had a PDSI of -1.40. The 20th century Average is 0.37 indicating drier than normal since the turn of the century (ncdc.noaa.gov). Drought dramatically affects this area because of the lack of water for agriculture and industry, which limits economic activity, irrigation and culinary uses. The severity of the drought results in depletion of agriculture lands and deterioration of soils. In the Wasatch Front region the risk of drought is high.

4.0 or more	Extremely wet
3.0 to 3.99	Very wet
2.0 to 2.99	Moderately wet
1.0 to 1.99	Slightly wet
0.5 to 0.99	Incipient wet spell
0.49 to -0.49	Near normal
-0.5 to -0.99	Incipient dry spell
-1.0 to -1.99	Mild drought
-2.0 to -2.99	Moderate drought
-3.0 to -3.99	Severe drought
-4.0 or less	Extreme drought

Table 8-4. Palmer Drought Severity Index
(NDMC 2015)

The Palmer Drought Severity Index (PDSI) developed by Wayne Palmer in the 1965, measures drought severity using temperature, precipitation and soil moisture. The PDSI has become the "semi-official" drought index as it is standardized across various climates. The index uses zero as normal and assigns a number

between +6 and -6, with dry periods having negative numbers and wet periods expressed using positive numbers (Table 8-2) (NDMC 2015)

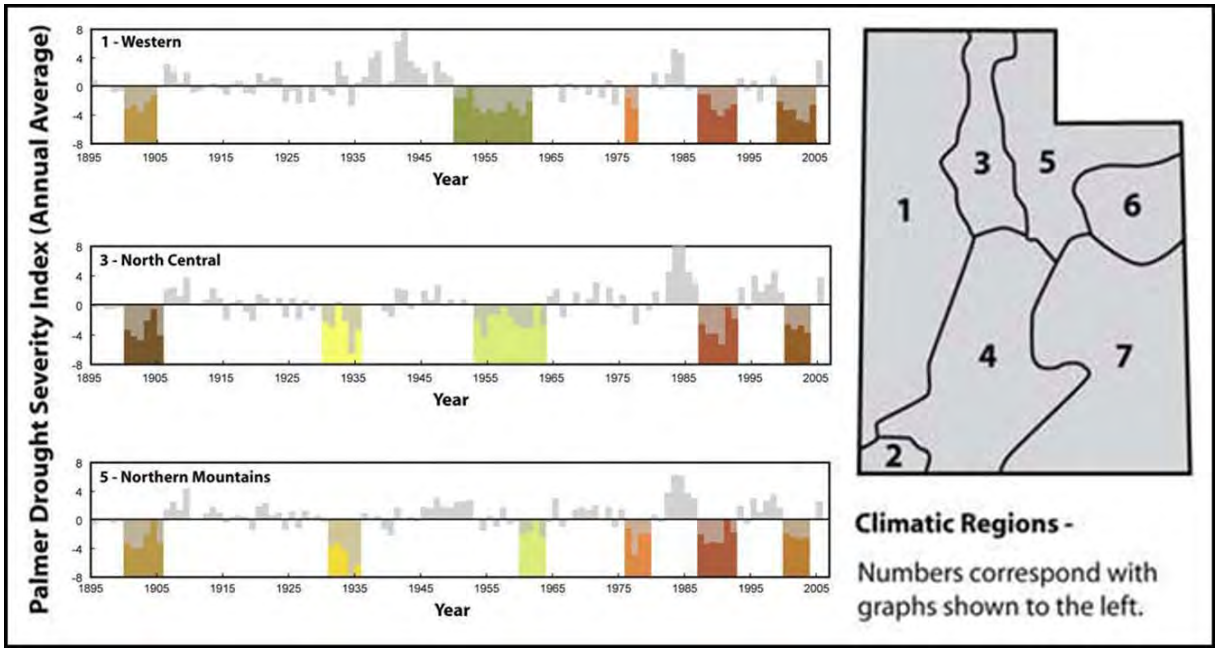


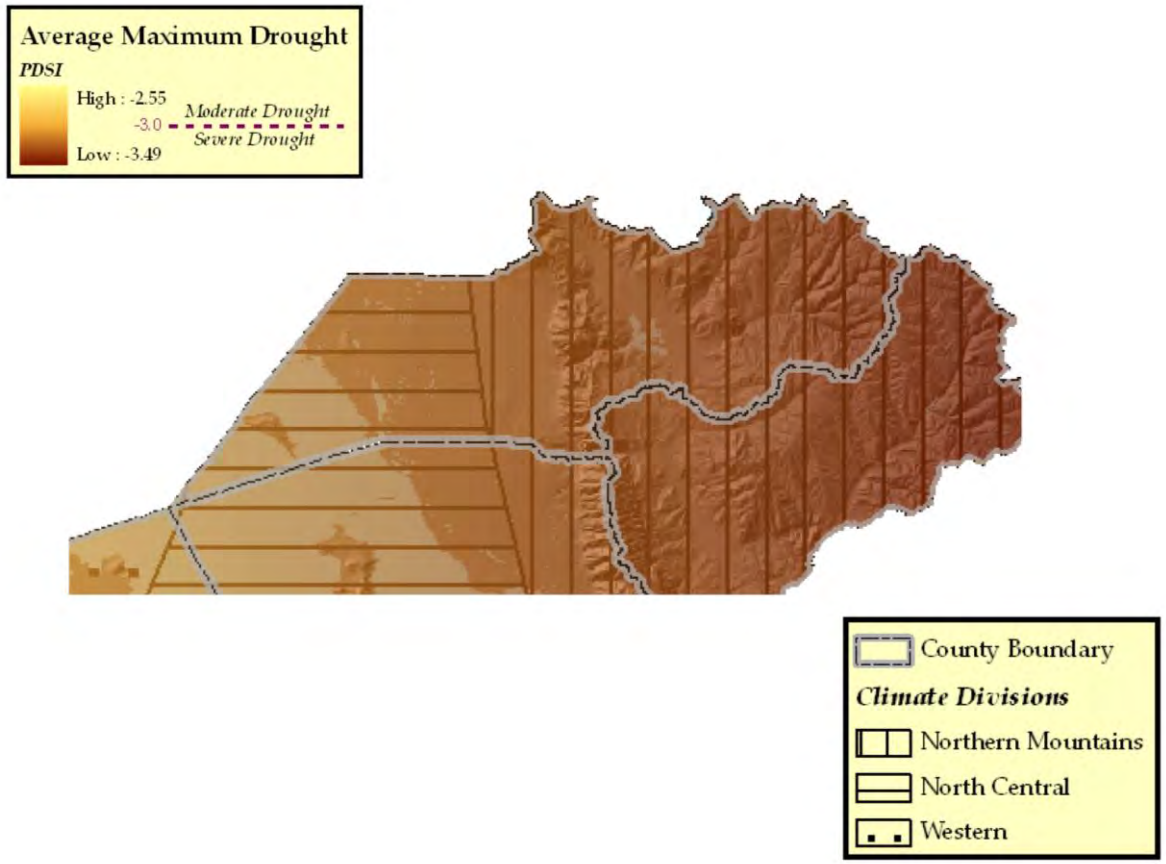
Figure 8-1 Annual Average PDSI *(Modified from* Utah Division of Water Resources 2007a*)*

The planning area falls within three climatic regions: the Western region (1), the North Central region (3), and the Northern Mountains region (5) (See Figure 8-1). Each of these regions has differing characteristics, but often experience similar drought periods. The three regions experience mild drought (PDSI ≥ -1) every 2.6-3.3 years, moderate drought (PDSI ≥ -2) every 3.7-5.2 years, and severe drought (PDSI ≥ -3) every 6.9-8.5 years. The Western region typically experiences droughts more frequently and the Northern Mountains region typically experiences droughts less frequently (Utah Division of Water Resources 2007a). Weber County lies mainly in Region 3.

Conversely, the Northern Mountains region averages more severe drought conditions at its peak than the Western region (Map 8-8 page 107). It may be Northern Mountains region simply has more water to lose as the Wasatch and Uinta Mountains receive much more precipitation on average. The North Central region falls between both regions in all drought conditions, but is most similar to the Northern Mountains region.

The most severe drought period in recorded history for the North Central and Northern Mountains regions occurred in 1934 at the height of the Great Depression (Figure 8-1 above) and during the same drought period (1930 to 1936) that caused the "Dust Bowl" on the Great Plains. The Western regions driest year on record occurred more recently, in 2004. The longest drought period varies from 12 years in the Western region (1950-1961), 11 years for the North Central region (1953-1963), and 6 years for the Northern Mountains (twice; 1900-1905 and 1987-1992) (Utah Division of Water Resources 2007a).

Times of extended drought can turn into socioeconomic drought, or drought that begins to affect the general population. When this occurs, reservoirs, wells and aquifers are low and conservation measures are required. Some forms of water conservation are water-use restrictions, implementation of secondary water or water recycling and xeriscaping. Other conservation options include emergency water agreements with neighboring water districts or transporting water from elsewhere.



Map 8-8. Average Maximum Drought Year

3. Infestation

Hazard Profile

Potential Magnitude			***Probability***		
		Catastrophic (>50%)			***Highly Likely***
		Critical (25-50%)			***Likely***
	X	***Limited (10-25%)***		***X***	***Possible***
		Negligible (< 10%)			***Unlikely***
Location	Dependent on vegetation and climate preference of individual insect species.				
Seasonal Pattern	Typically spring and summer months.				
Conditions	Varies with insect species.				
Duration	Months, years.				
Secondary Hazards	Wildfire, dust storms, landslides due to dead vegetation.				
Analysis Used	Utah Department of Agriculture and Food (UDAF), United States Forest Service (USFS), Utah Division of Forest, Fire, and State Lands (UDFFSL).				

Description of Location and Extent

Insect infestation has been largely kept at bay in Weber County due to the ongoing efforts of the Utah Department of Agriculture and Food (UDAF). UDAF 's objective is early detection & rapid response (EDRR) to detect the population prior to them becoming a problem. They monitor the following species in Weber County annually.

SPECIES	DETECTION
Mormon Crickets	Native
Grasshoppers	Native
Gypsy Moth	Found but since eradicated
Japanese Beetle	Found in Salt Lake Co. but not established.
Rosy Gypsy Moth	Not Found
Asian Gypsy Moth	Not Found
Nun Moth	Not Found
Siberian Silk Moth	Not Found
European Corn Borer	Not established in Utah
Brown Marmorated Stink Bug	Found in Salt Lake Co. and Utah Co.
European Grapevine Moth	Not Found
Wood Boring Bark Beetles	This is general survey for various Bark Beetles with new detections established throughout Utah
Cherry Fruit Fly	Established throughout Utah
Apple Maggot	Established throughout Utah
Emerald Ash Borer	Not Found
Plum Curculio	Established in Box Elder Co

Table 8-5. Insects Currently Monitored in Weber County by Utah Department of Agriculture and Food
(Source: UDAF 2015)

Mormon crickets and grasshoppers are regularly found in the Wasatch Front area. In small numbers, these insects do not cause much of a problem, but when their populations explode, great hordes can devastate

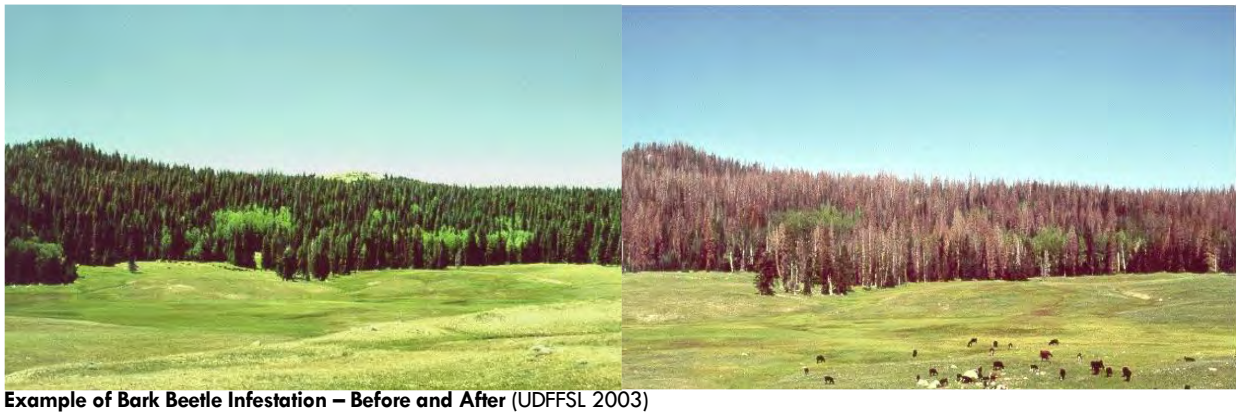
crops. The following excerpt from the 2014 Annual Insect Report by UDAF outlines how these populations can explode:

"Often the damage done to agricultural commodities is increased by the effects of warmer weather and drought. Mild winters and hot, dry weather speed up the maturation process of these insects and allow more of them and their eggs to survive the cold. Drought also cuts into the population of birds and rodents that prey on them, and the fungal diseases that decrease insect numbers."

UDAF has used aerial treatment and ground baiting to manage populations of Mormon crickets and grasshoppers with success. Due to this success, no treatment is planned for 2008 (UDAF 2007a). See Map 8-10 (page 110) for the Mormon cricket and grasshopper hazard potential.

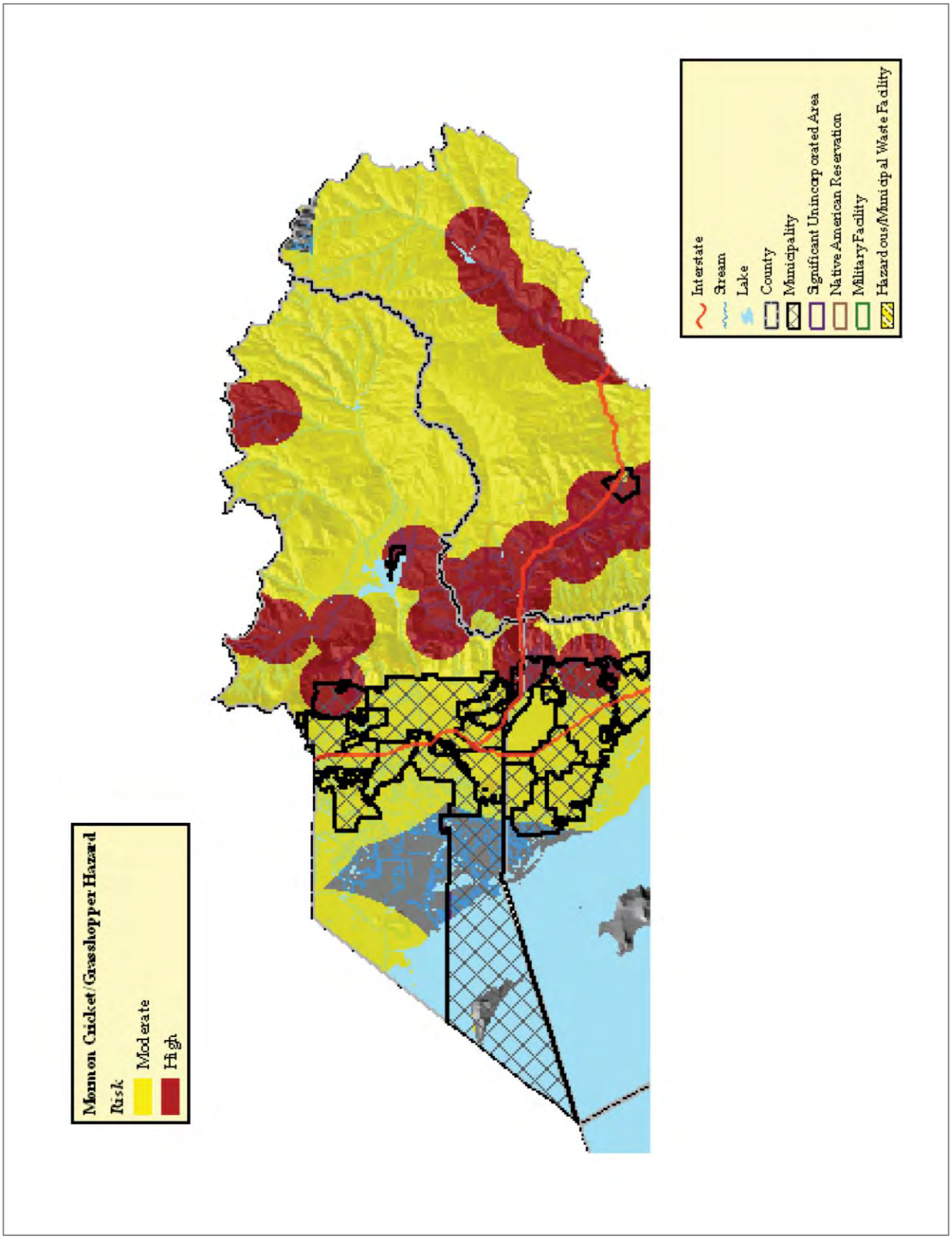
Another insect of concern in the region is the North American Gypsy moth. Utah is an ideal breeding ground for the gypsy moth with an "arid climate, mountainous terrain, and lack of effective natural predators" (Watson 2007). The moths can be very destructive through the defoliation of tree leaves (UDAF 2007a). The Gypsy moth was first found in the state in 1988 with the population rapidly growing the following year.

Treatment programs administered by UDAF using natural bacteria have proven very effective in controlling populations. Less than 3 moths per year have been caught in UDAF traps since 2000 in the entire state. The two moths in 2007 were found in separate locations in Salt Lake County (Watson 2007). See Map 8-11 for Gypsy moth hazard potential.

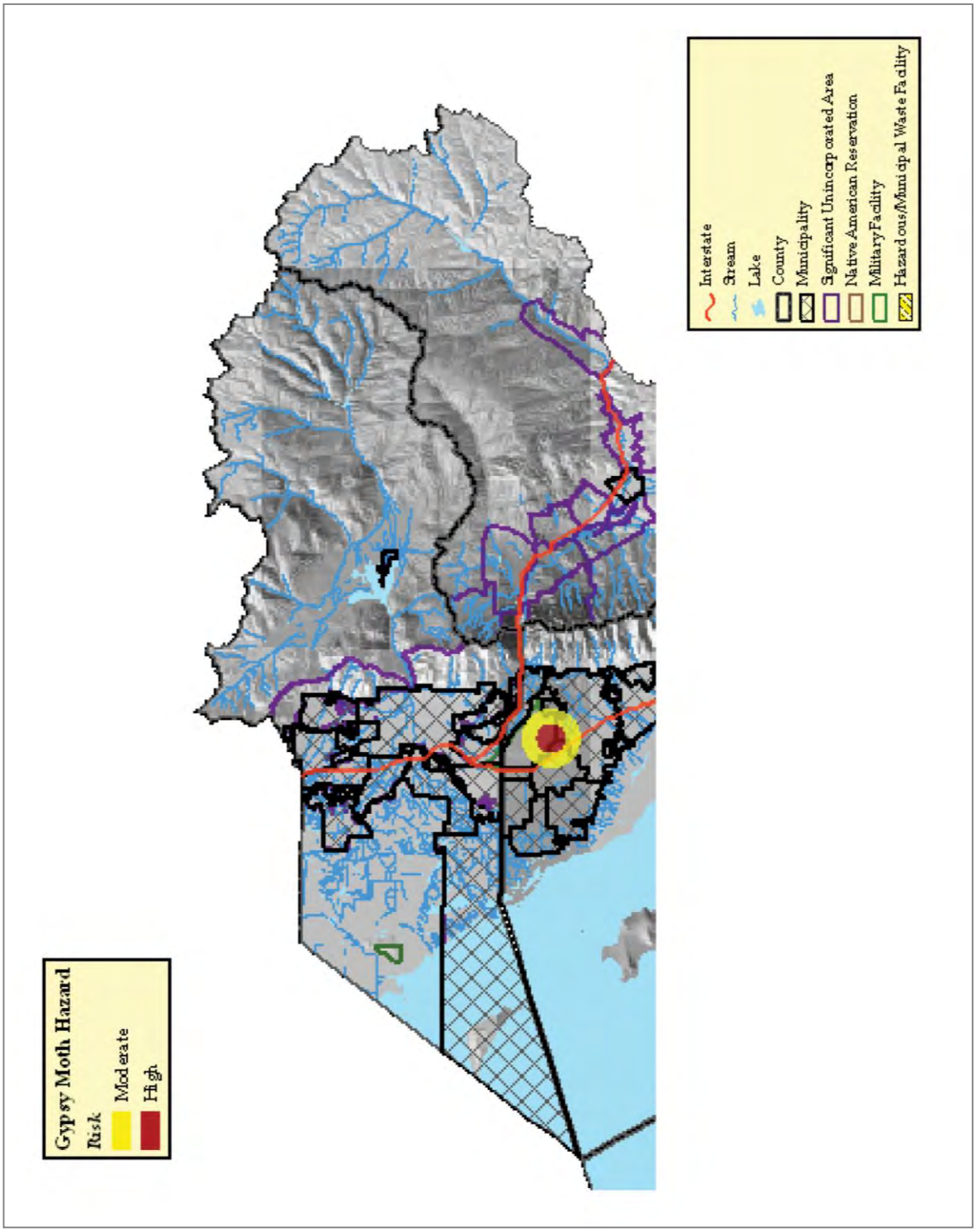


Example of Bark Beetle Infestation – Before and After (UDFFSL 2003)

Wood borers and Bark beetles are a distinct problem for all trees in the Wasatch Front area. Like many other insect hazards in the area, drought has helped Wood borer and Bark beetle populations to grow and expand due to stressed trees (Matthews, et al. 2005). Likewise, overall warming trends in the western United States have allowed these insects to survive the winters promoting multiple reproduction cycles. Insecticides and general thinning of trees has proven to be the most effective methods of control (UDFFSL 2003). See Map 8-11 for damages caused by Wood borers, Bark beetles, and other insects.

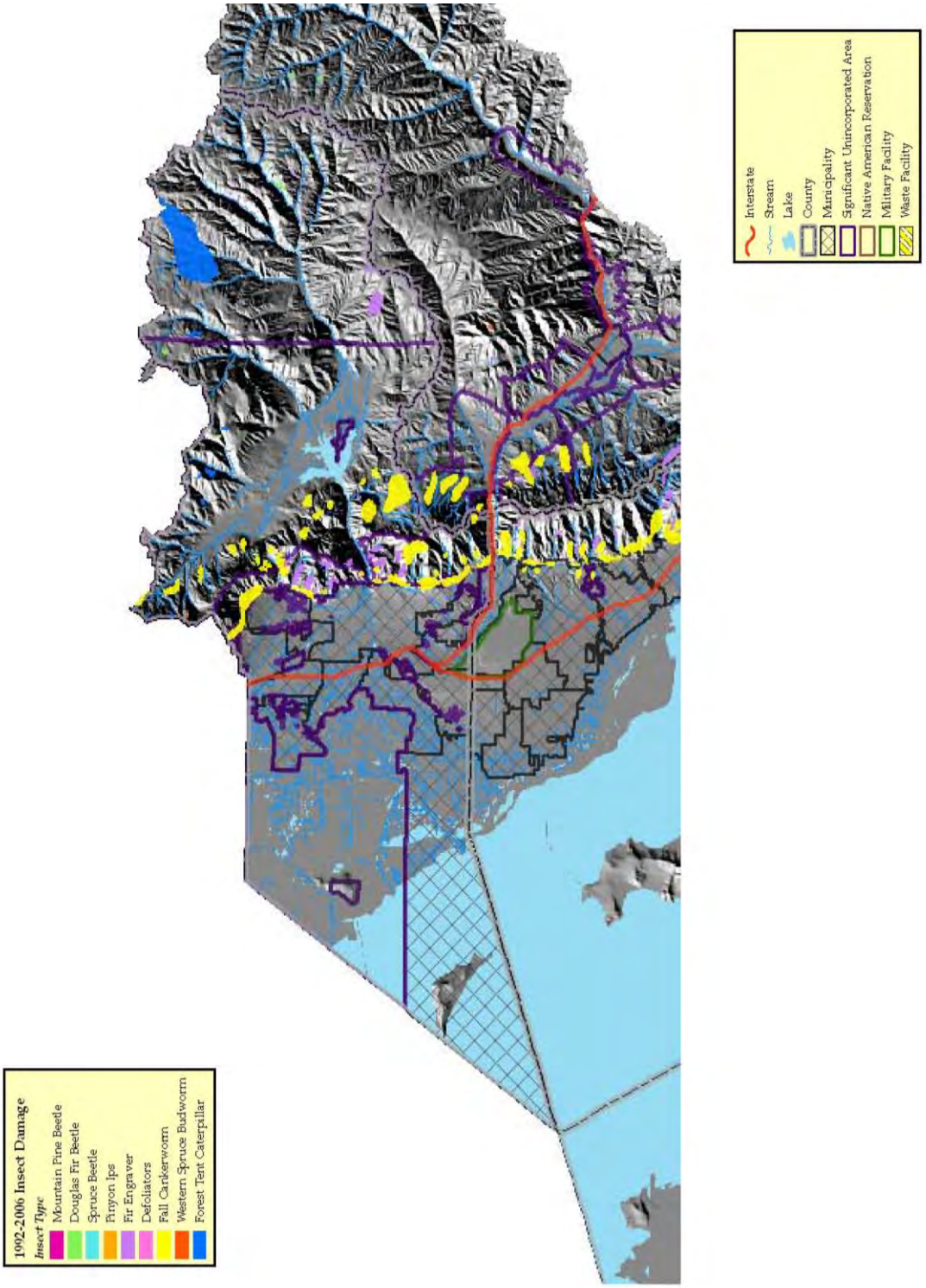


Map 8-9. Mormon Cricket and Grasshopper Hazard Potential
(Source: Utah Department of Agriculture and Food)

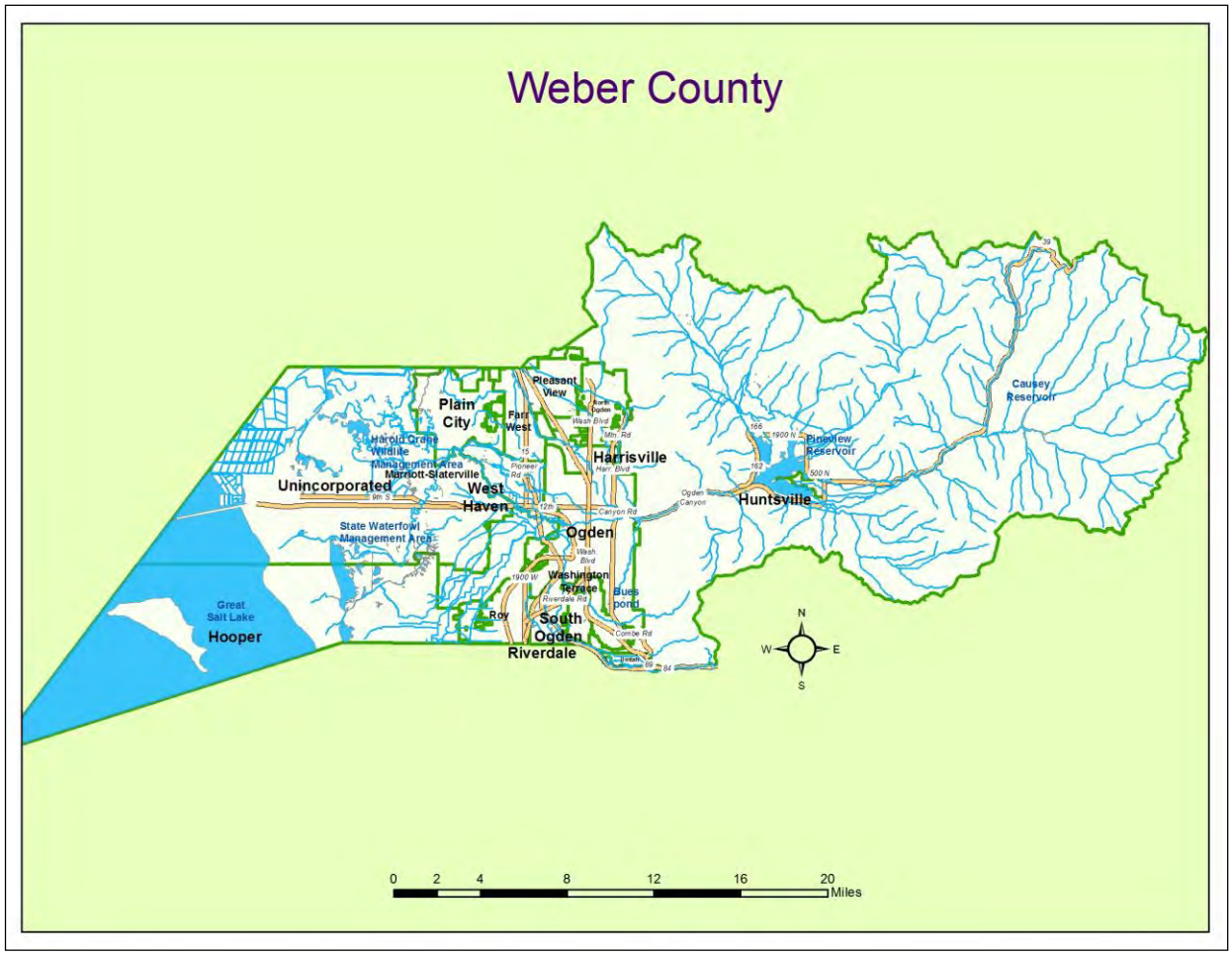


Map 8-10 Gypsy Moth Hazard Potential
(Source: Utah Department of Agriculture and Food)

Map 8-11. Other Insect Hazards
(Source: Utah Department of Agriculture and Food)



PART IX. WEBER COUNTY HAZARDS



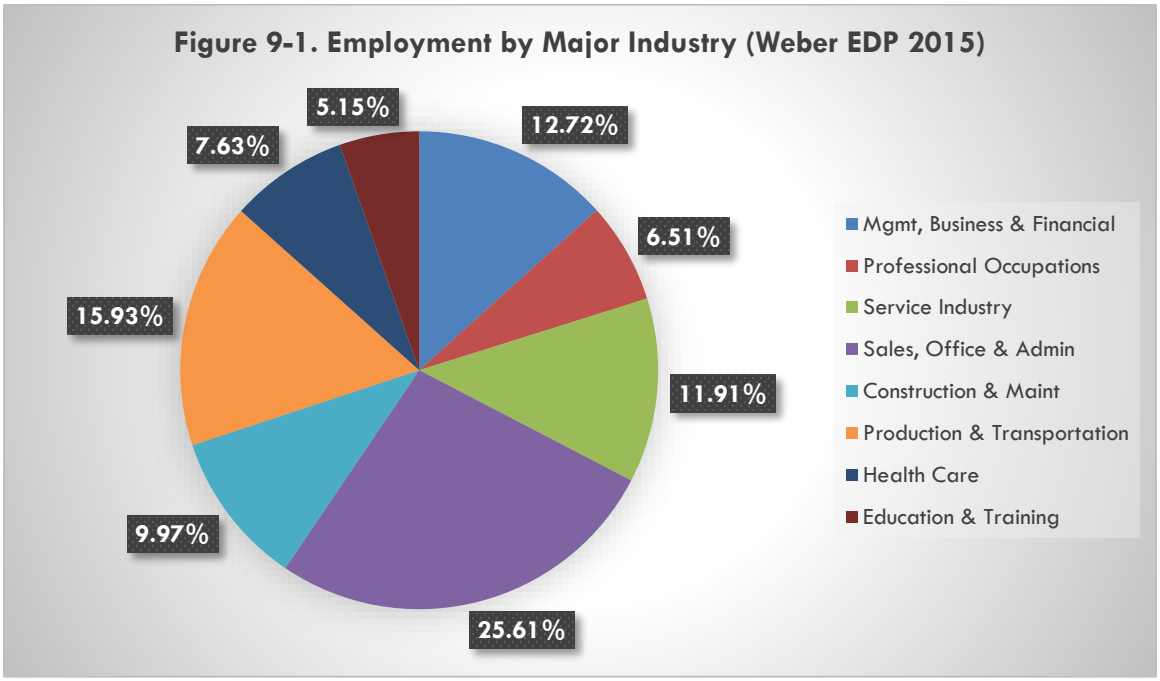
Map 9-1. Weber County

Weber County includes fifteen municipalities: Farr West, Harrisville, Hooper, Huntsville, Marriott-Slaterville, North Ogden, Ogden, Plain City, Pleasant View, Riverdale, Roy, South Ogden, Uintah, Washington Terrace and West Haven. Ogden, Utah's seventh largest city is the county seat for Weber County and a transportation hub for northern Utah. Seven unincorporated communities can also be found in Weber County: Eden, Liberty, Nordic Valley, Taylor, Warren, West Warren and West Weber. Weber County encompasses a total of 644 square miles, composed of the following land ownership categories: Private lands 73.6%, Federal Government 18.2%, State Government 8.3%, Military and Bankhead Jones land 1.0%. Much of Weber County is considered to be a high alpine mountain valley. However, the western portion is a flat fertile plain formed by alluvial deposits from ancient Lake Bonneville.

Weber County experienced a growth of population of approximately 17.7% between 2000 and 2010, 1% below the state average (Utah Population Estimates Committee). Weber County is projected to almost double in population by the year 2050 (UPEC 2014).

The recession of 2008 created a major economic downturn for the entire region and Weber County causing the unemployment rate to peak at 9.7% in January 2010. The County's economy steadily

recovered and in 2015 the unemployment rate was 4.1% for the County. Unemployment has waned despite increasing population growth rates.



Largest Weber County Employers		
Company	**Industry**	**Employment**
Internal Revenue Service	Federal Government	5,000-6,999
Weber School District	Public Education	3,000-3,999
McKay-Dee Hospital Center	Health Care	3,000-3,999
Weber State University	Higher Education	2,000-2,999
Autoliv	Motor Vehicle Equipment	2,000-2,999
State of Utah	State Government	1,000-1,999
Ogden School District	Public Education	1,000-1,999
Fresenius USA Mfg. Inc.	Medical Instrument Manufacturing	1,000-1,999
Wal-Mart	Warehouse Clubs and Supercenters	1,000-1,999
America First Credit Union	Credit Unions	1,000-1,999
Weber County	Local Government	1,000-1,999

Table 9-1. Largest Employers, Weber County
(Source: Weber EDP 2015)

Hazard History

Identifying past hazard events provides a starting point for predicting where future events could potentially occur. The following historical hazard event statistics were consolidated from the Spatial Hazard Events and Losses Database for the United States (SHELDUS) of the Hazards and Vulnerability Research Institute. This database records reported natural hazard events which cause greater than $50,000 in damages. Monetary figures are in 2011 dollars (Figures 9-2 and 9-3).

Figure 9-2. Major Disaster Event Averages 1960 – 2011, Weber County
(Source: HVRI 2011)

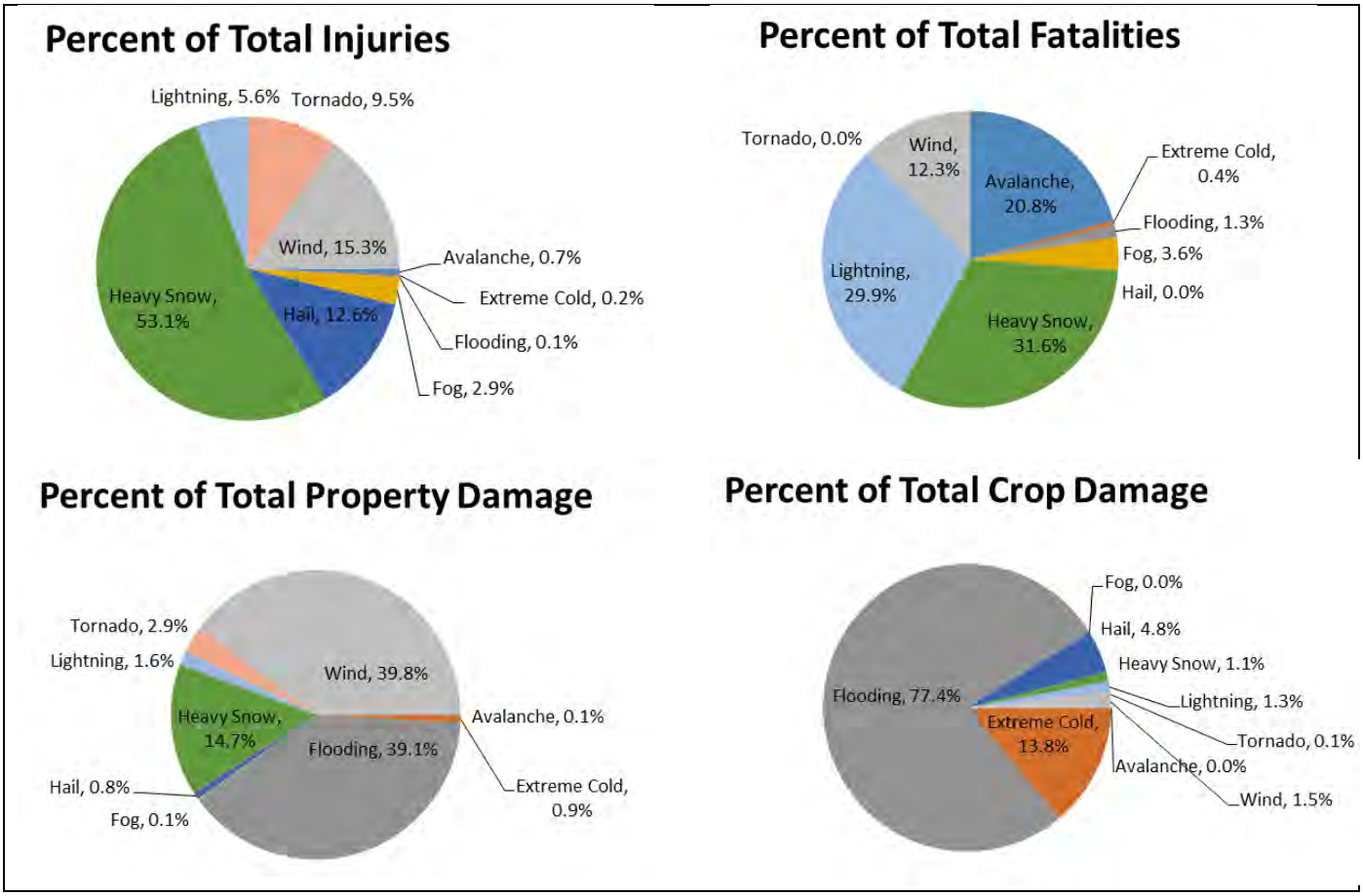
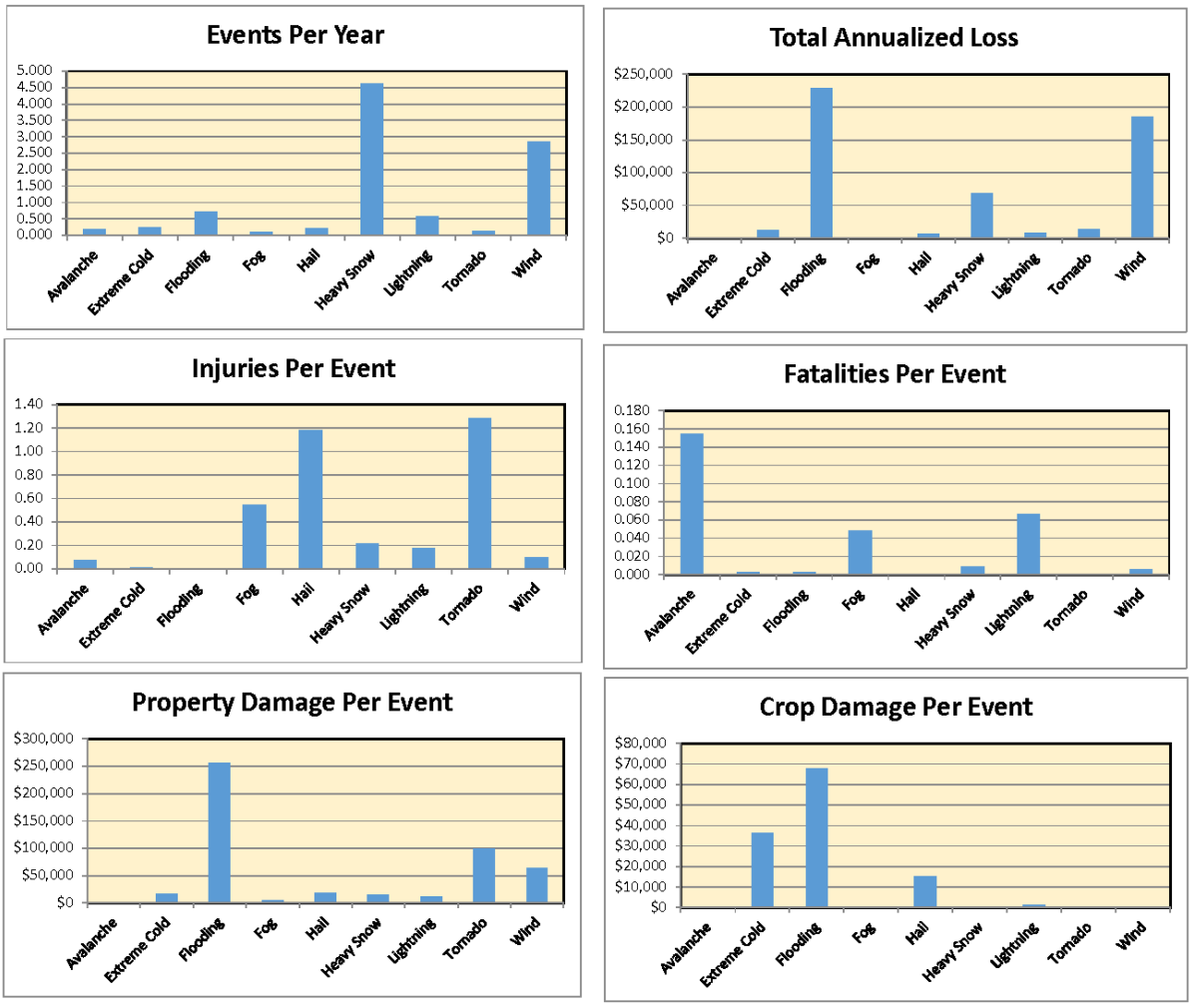


Figure 9-3. Major Disaster Average Annual and Per Event Statistics, 1960 -2011, Weber County
(Source: HVRI 2011)



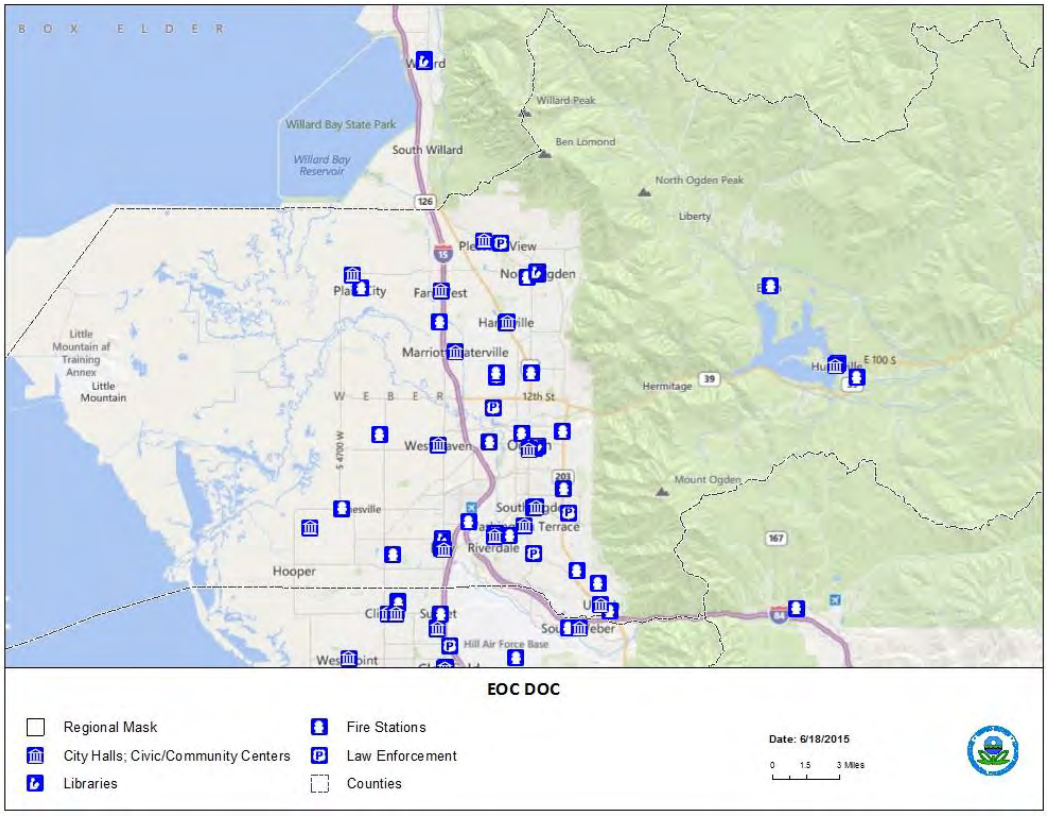
Risk Assessment

The risk assessment process revealed the following for Dam Failure, Earthquake, Flood, Landslide/Slope Failure, Liquefaction, and Wildland Fire. Drought, Infestation, Radon and Severe Weather are considered to be regional hazards and can be found in Weber County. According to this data, there are a total of 141 identified critical facilities within Weber County. For the complete list refer to Appendix D.

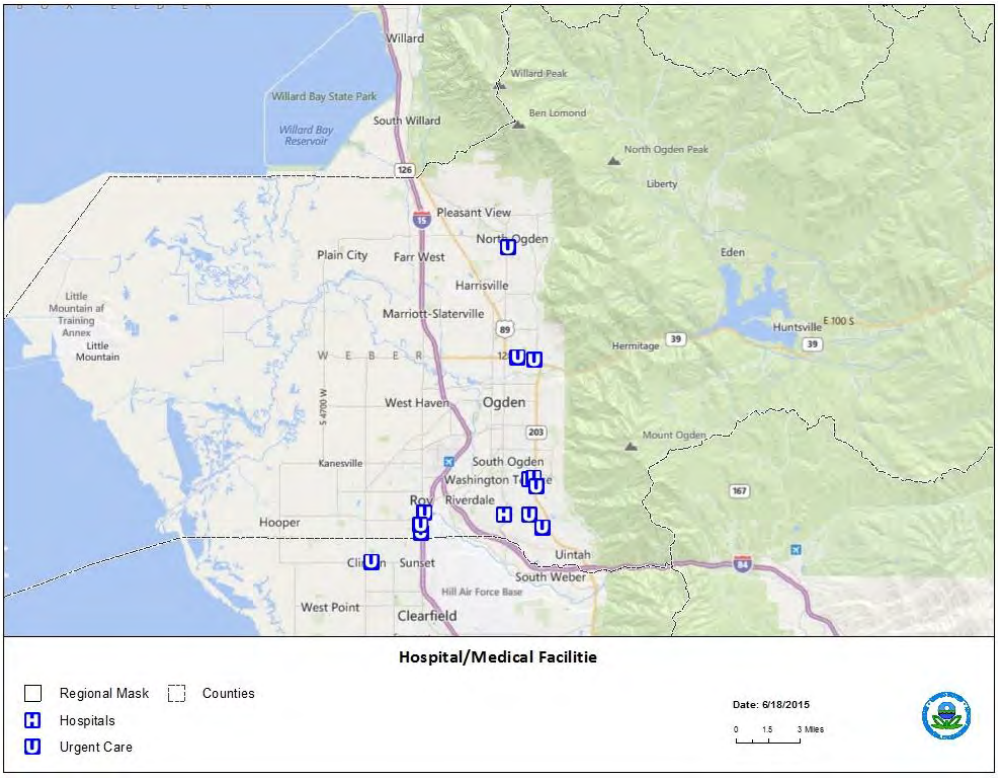
Number of Structures with Moderate or Greater Vulnerability (% of Total)								
Critical Facilities	**Total**	***Dam Failure***	***Flood***	***Earthquake***	***Liquefaction***	***Problem Soils***	***Slope Failure***	***Wildfire***
Amateur Radio Repeaters	**4**	0 (0%)	0 (0%)	4 (100%)	1 (25%)	0 (0%)	4 (100%)	0 (0%)
Public Safety Repeaters	**10**	0 (0%)	0 (0%)	10 (100%)	0 (0%)	0 (0%)	0 (0%)	5 (50%)
Electric Generation Facilities	**3**	6 (100%)	6 (100%)	6 (100%)	1 (33%)	6 (100%)	6 (100%)	6 (100%)
Emergency Operations Centers	**22**	8 (36%)	6 (27%)	22 (100%)	8 (36%)	8 (36%)	1 (1%)	0 (0%)
Fire Stations	**20**	6 (29%)	0 (0%)	21 (100%)	12 (60%)	0 (0%)	0(0%)	0 (0%)
Hospitals	**2**	0 (0%)	0 (0%)	2 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (%)
Police Stations	**10**	3 (50%)	6 (36%)	10 (100%)	6 (36%)	6 (36%)	0 (0%)	0 (0%)
Schools	**68**	13 (19%)	8 (12%)	68 (100%)	40 (59%)	10 (15%)	3 (1%)	2 (1%)
Water Treatment Facilities	**2**	3 (100%)	3 (100%)	3 (100%)	1 (33%)	3 (100%)	0 (0%)	1 (33%)

Table 9-2. Critical Facilities Vulnerability Matrix for Local Hazards, Weber County

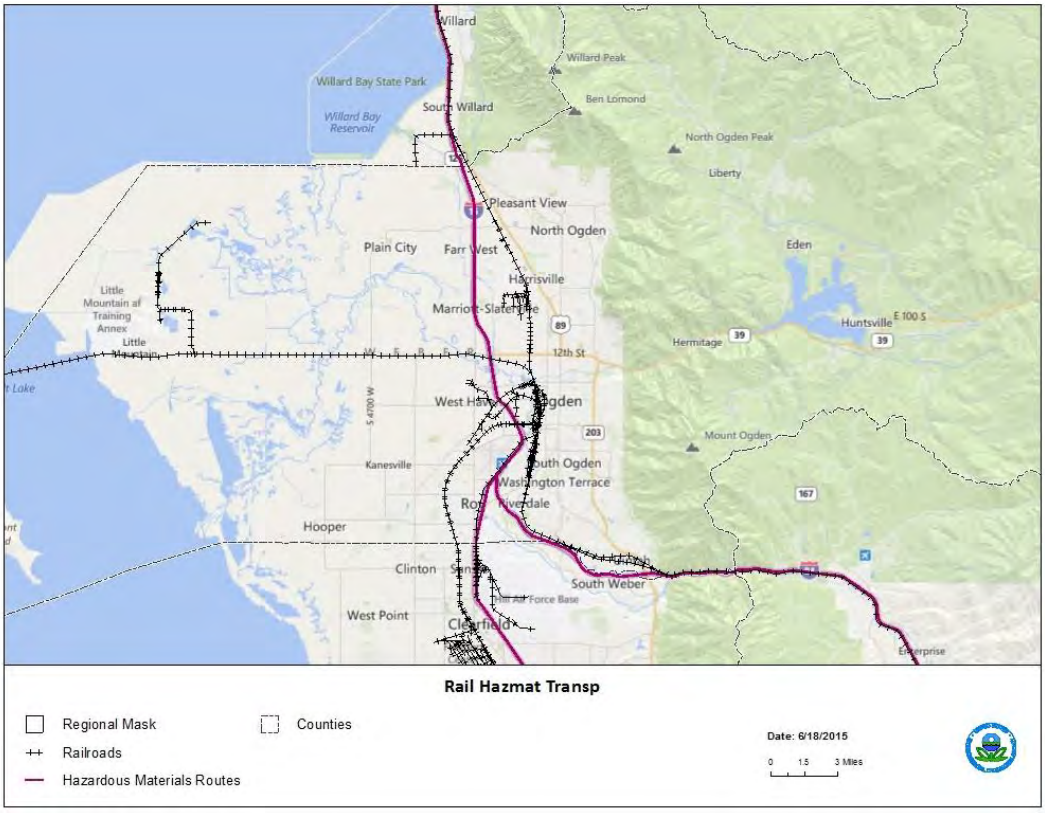
Weber County Critical Facilities and Infrastructure



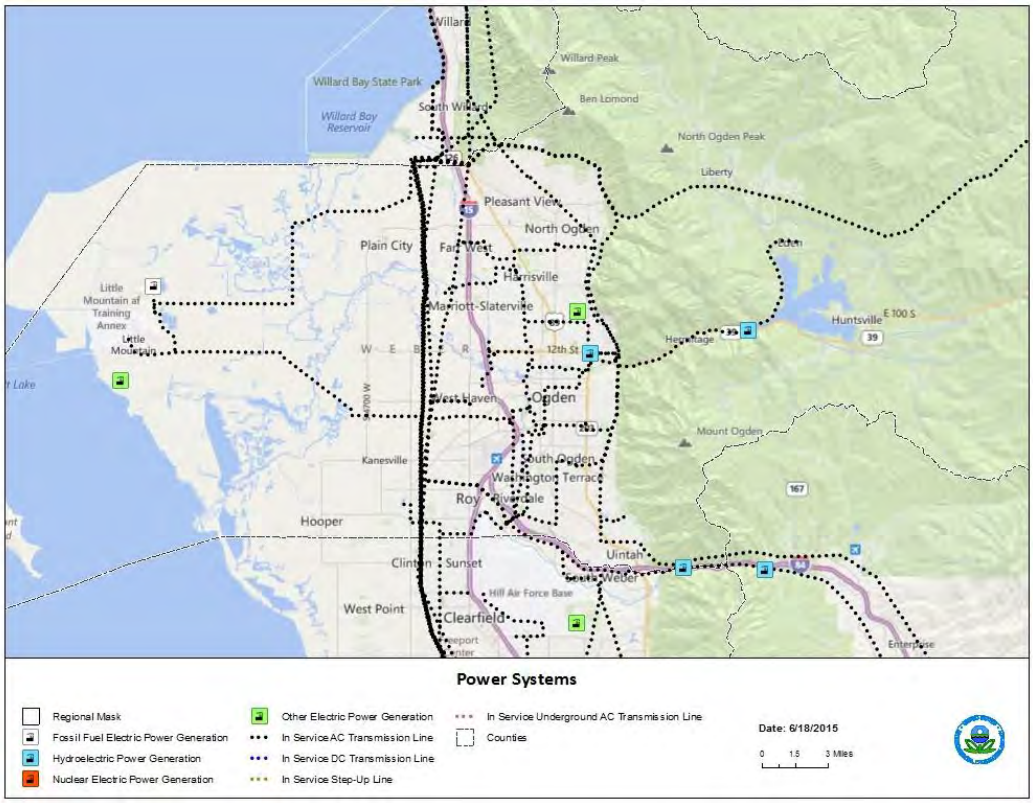
Map 9-2. Emergency Operation Center Locations in Weber County



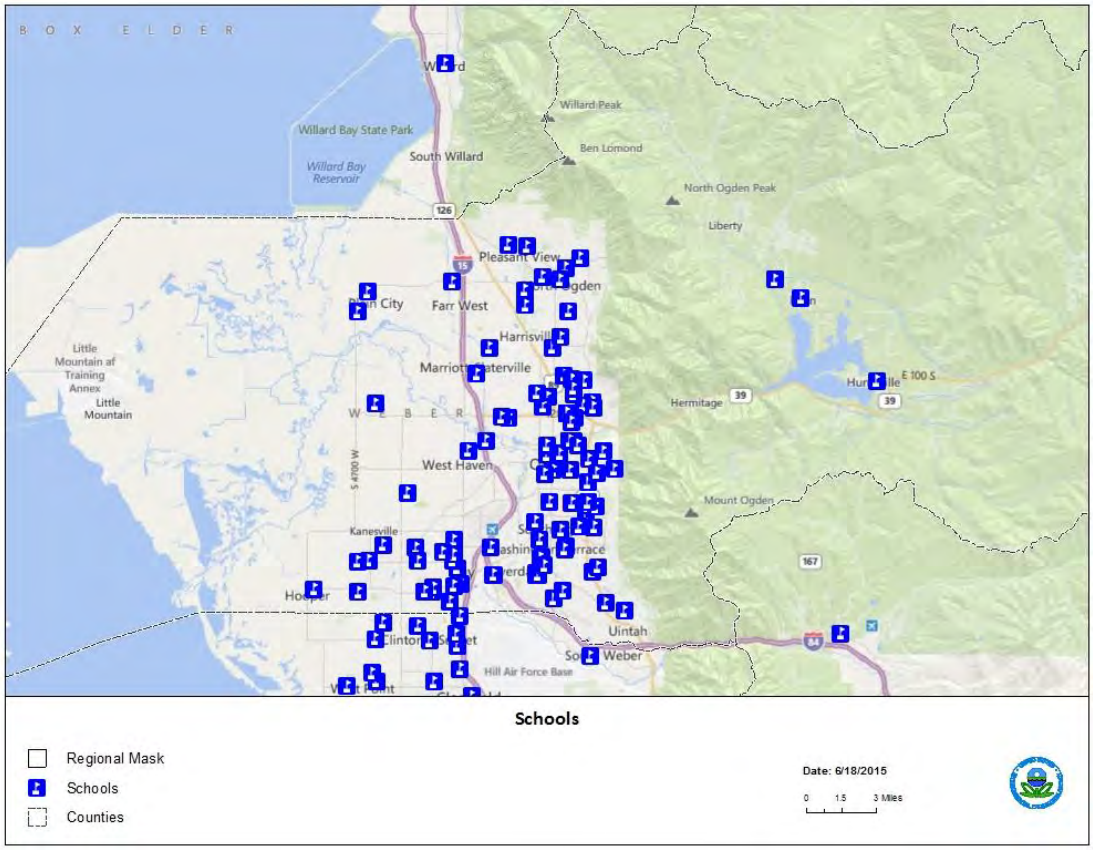
Map 9-3. Hospitals and Medical Facilities in Weber County



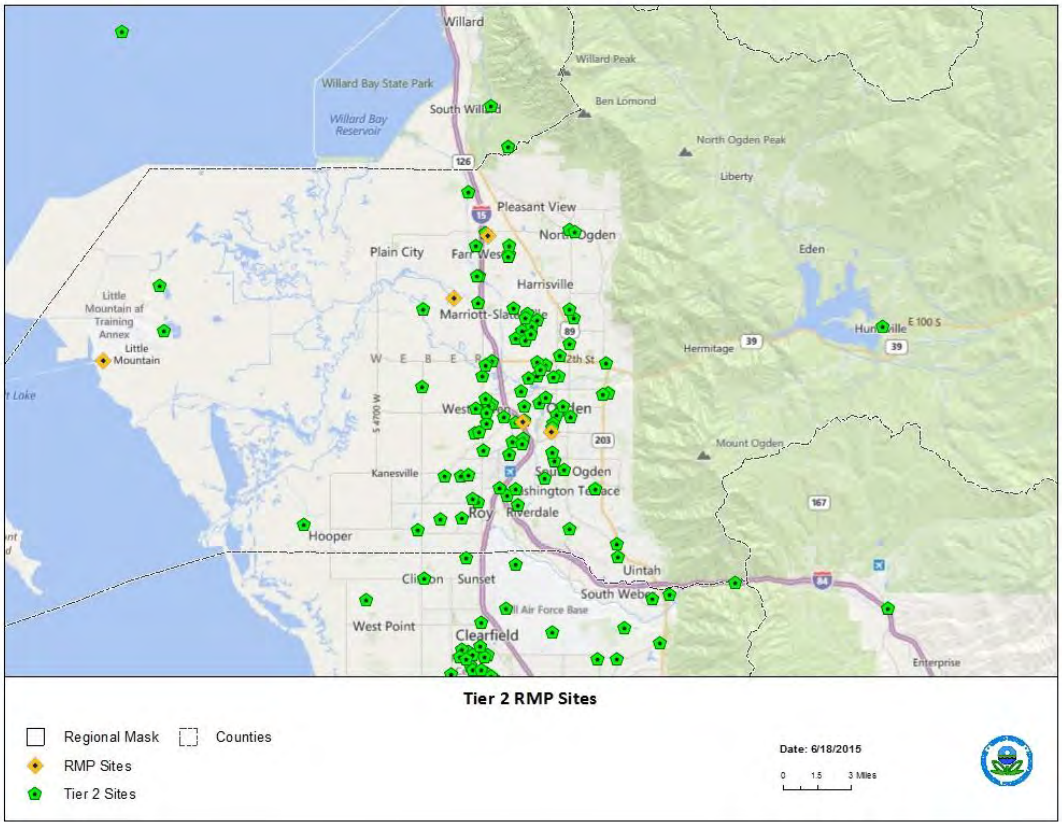
Map 9-4. Rail Hazmat Transportation Routes



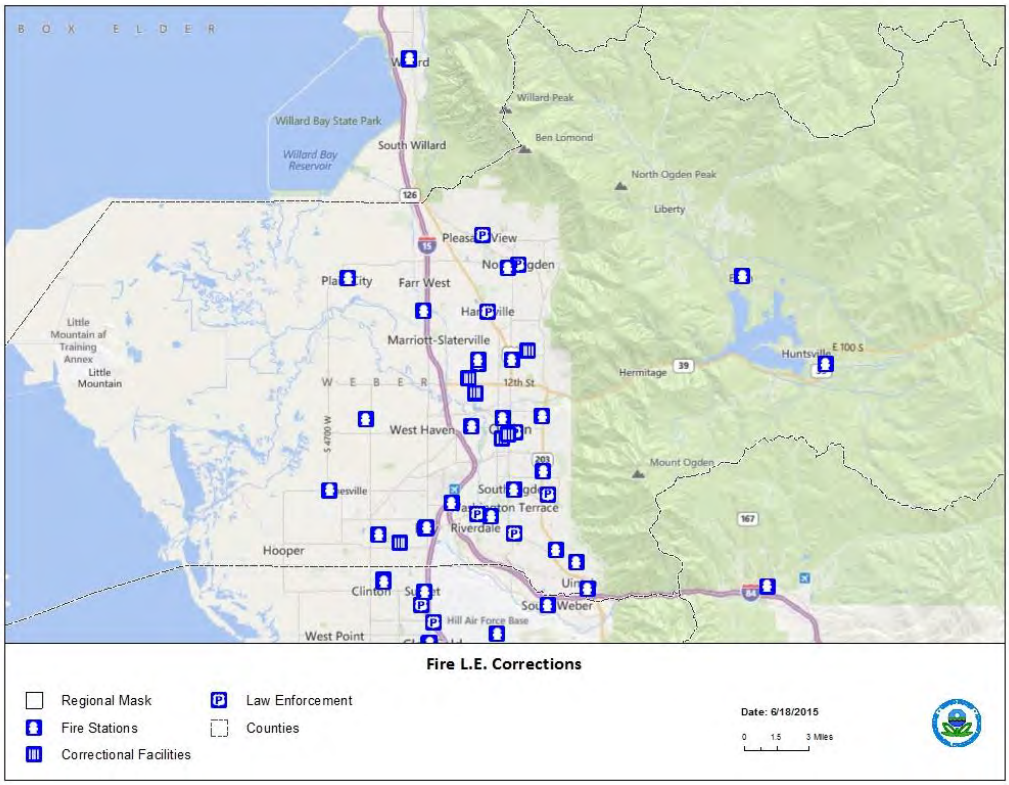
Map 9-5. Power Systems in Weber County



Map 9-6. Schools in Weber County



Map 9-7. Tier 2 RMP Sites in Weber County



Map 9-8. Fire Stations, Law Enforcement and Corrections Facilities in Weber County

1. Earthquake

Hazard Profile

Potential Magnitude	**X**	***Catastrophic (>50%)***	***Probability***		***Highly Likely***
		Critical (25-50%)		**X**	***Likely***
		Limited (10-25%)			***Possible***
		Negligible (< 10%)			***Unlikely***
Location	Ground shaking will be felt throughout the entire county. Surface fault rupture can be felt in areas of known historic fault zones. Liquefaction can be expected in areas of high to moderate liquefaction potential.				
Seasonal Pattern	There is no seasonal pattern for earthquakes. They can occur at any time of the year or day during any or all weather conditions.				
Conditions	Liquefaction potential within high ground water table areas. Soil that is comprised of old lakebed sediments.				
Duration	Actual ground shaking will be under one minute, aftershocks can occur for weeks or even months.				
Secondary Hazards	Fire, landslide, rock falls, avalanche, flooding, hazmat spills, building collapse, loss of utilities.				
Analysis Used	Review of hazard analysis plans and other information provided by the University of Utah Seismograph Station, UGS, USGS, DHLS, AGRC.				

Description of Location and Extent

In northern Utah, the Wasatch Fault Zone is an active fault zone that can produce a large 7.3-7.5 Richter magnitude earthquake on average every 300-400 years. The Weber Segment of the Wasatch Fault Zone includes the area along the eastern edge of the valley between North Salt Lake and Willard Bay. The Weber Segment has produced four large earthquakes over the past 4,000 years making it one of the most active fault segments (UGS 2002). The Weber segment of the Wasatch Fault could potentially create a magnitude 7.0 or above earthquake which would be very damaging to the entire county.

Two major earthquakes have struck the Ogden City area with a Richter magnitude between 5.0 and 5.5 since 1894. Weber County has also felt earthquakes that did not have their epicenters within the county. According to the Weber County Emergency Operations Plan, in 1962, an earthquake along the Cache fault produced a 5.7 Richter magnitude earthquake. Others include a 6.0 earthquake in the Pocatello Valley along the Hansel Valley Fault in 1975, another on the same fault in 1934 with a magnitude of 6.6, and yet another in 1909 with a 6.0 magnitude. For locations of all earthquakes centered within Weber County since 1962, see Map 9-1 (page 103).

One of the better measures of earthquake destruction potential is spectral acceleration. 0.2 spectral acceleration represents the frequency at which the most potential damage can occur in one- and two-story buildings, while 1.0 spectral acceleration represents the frequency at which taller buildings potentially will see greater damage. Maps 9-2 (page 104) and 9-3 (page 105) respectively show 0.2 and 1.0 spectral acceleration for a 2500-year event in Weber County. The potential forces exerted on buildings are shown as a percentage of the force of gravity with 100% equaling one times the force of gravity.

Western Weber County is located atop the ancient Lake Bonneville lake bed, which is made up of very weak soils. The area is also subject to shallow ground water and a relatively high earthquake threat. The secondary threat, liquefaction associated with an earthquake could have a higher impact on this portion of the county than the surrounding areas. For a further explanation of liquefaction, see Map 9-4 (page 106). See also the regional hazard identification section for further explanation of liquefaction.

Name	Fault Type	Length (km)	Time of Most Recent Deformation	Recurrence Interval
Bear River Range faults	Normal	63 km	1320-3420 years ago	1,000-100,000 years
East Great Salt Lake fault, Fremont Island section	Normal	103 km	2939-3385 years ago	4,200 years
Ogden Valley fault, Northeastern Marginal section	Normal	13 km	< 1,600,000 years ago	Unknown
Ogden Valley fault, North Fork section	Normal	26 km	< 750,000 years ago	Unknown
Ogden Valley fault, Southwestern Marginal section	Normal	18 km	< 750,000 years ago	Unknown
Wasatch fault, Brigham City section	Normal	37 km	2100±800 cal yr B.P	1300 years
Wasatch fault, Weber section	Normal	56 km	950±450 cal yr B.P.	1400 years

Table 9-1. Weber County Quaternary Faults
(*Source: UGS 2002, Lund 2005*) cal yr B.P. = calendar years before present

Vulnerability Assessment

Vulnerability to earthquake in Weber County was obtained from the modeling program Hazards United States – Multi-hazards (HAZUS-MH)**. The following numbers were based on a probabilistic 2500-year event with a Richter magnitude of 7.1 as well as an arbitrary 5.9 event located in close proximity to the county's most populated areas. These locations and magnitudes were chosen for their likelihood and proximity respectively. Default HAZUS-MH inventory for all infrastructure was used. (***For a more detailed explanation of the loss estimation methodology of HAZUS-MH MR2, please see Part VI or the HAZUS-MH Technical Manual (Earthquake Model) at www.fema.gov/hazus*).

Building Damage

HAZUS-MH classifies building damage into five levels: none, slight, moderate, extensive and complete. Table 13-4 lists the number of buildings by occupancy estimated to sustain moderate to complete levels of damage. Also listed are the estimated monetary losses to structures, contents/inventory, and income.

Category	Number of Structures with > 50% Damage		Category	Estimated Losses	
	Weber M5.9	2500-yr M7.1		Weber M5.9	2500-yr M7.1
Residential	9,628	36,944	Structural Losses	$121,246,000	$606,962,750
Commercial	402	921	Non-Structural Losses	$427,644,000	$2,131,644,450
Industrial	94	233	Content Losses	$160,762,000	$683,297,620
Government	36	78	Inventory Losses	$5,829,000	$30,625,560
Education	15	35	Income and Relocation Losses	$134,323,000	$537,906,150
Totals	**10,175**	**38,211**	**Totals**	**$849,804,000**	**$3,990,436,530**

Table 9-2. Building Damage Counts and Estimated Losses

Transportation and Utilities Damage

Damages to transportation and utility infrastructure are in Table 13-5. Infrastructure sustaining moderate or worse damage and estimated monetary losses are both shown.

Category	Total	At Least Moderate Damage >50%		Estimated Losses	
		Weber M5.9	2500-yr M7.1	Weber M5.9	2500-yr M7.1
Waste Water Facilities	2	1	2	$18,503,000	$62,682,000
Waste Water Pipelines	1,561 km	248 leaks/breaks	4,095 leaks/breaks	$888,000	$14,740,000
Potable Water Facilities	1	0	1	$1,460,000	$11,423,000
Potable Water Pipelines	2,601 km	312 leaks/breaks	5,177 leaks/breaks	$1,123,000	$18,637,000
Natural Gas Pipelines	1,040 km	264 leaks/breaks	4,377 leaks/breaks	$950,000	$15,757,000
Electrical Power Facilities	1	0	1	$1,401,000	$28,244,000
Communication Facilities	12	4	10	$110,000	$398,000
Highway Bridges	141	17	100	$6,188,000	$52,408,000
Railway Bridges	5	0	3	$7,000	$161,000
Railway Facilities	1	1	1	$597,000	$1,043,000
Bus Facilities	2	1	2	$587,000	$1,055,000
Airport Facilities	1	0	1	$1,262,000	$2,637,000
Total Losses				**$33,076,000**	**$209,185,000**

Table 9-3 Damage to Transportation and Utilities

Debris Removal

Table 9-4 shows how much debris would be generated by the earthquake and how many loads it would take to remove the debris, based on 25 tons per load. One truck can likely haul one load per hour. A second debris removal issue is landfill space. Fifty thousand tons at a weight-to-volume ratio of one ton per cubic yard would cover more than ten acres to a depth of three feet.

Category	Weber M5.9	2500-yr M7.1
Brick, Wood & Others	145,000 tons / 5,800 loads	654,000 tons / 26,160 loads
Concrete & Steel	287,000 tons / 11,480 loads	1,401,000 tons / 56,040 loads

Table 9-4. Debris Generated/Number of Loads

Earthquake Caused Fires

Multiple ignitions and broken water mains following an earthquake can make firefighting nearly impossible. HAZUS-MH uses estimated building damages, loss of transportation infrastructure and predictable winds to calculate the estimated area that would be burned following an earthquake. Table 9-5 estimates ignitions, people at risk and the building stock exposed to fires following an earthquake.

Category	Number of Structures	
	Weber M5.9	2500-yr M7.1
Ignitions	11	14
Persons Exposed	146	239
Value Exposed	$7,290,000	$14,462,000

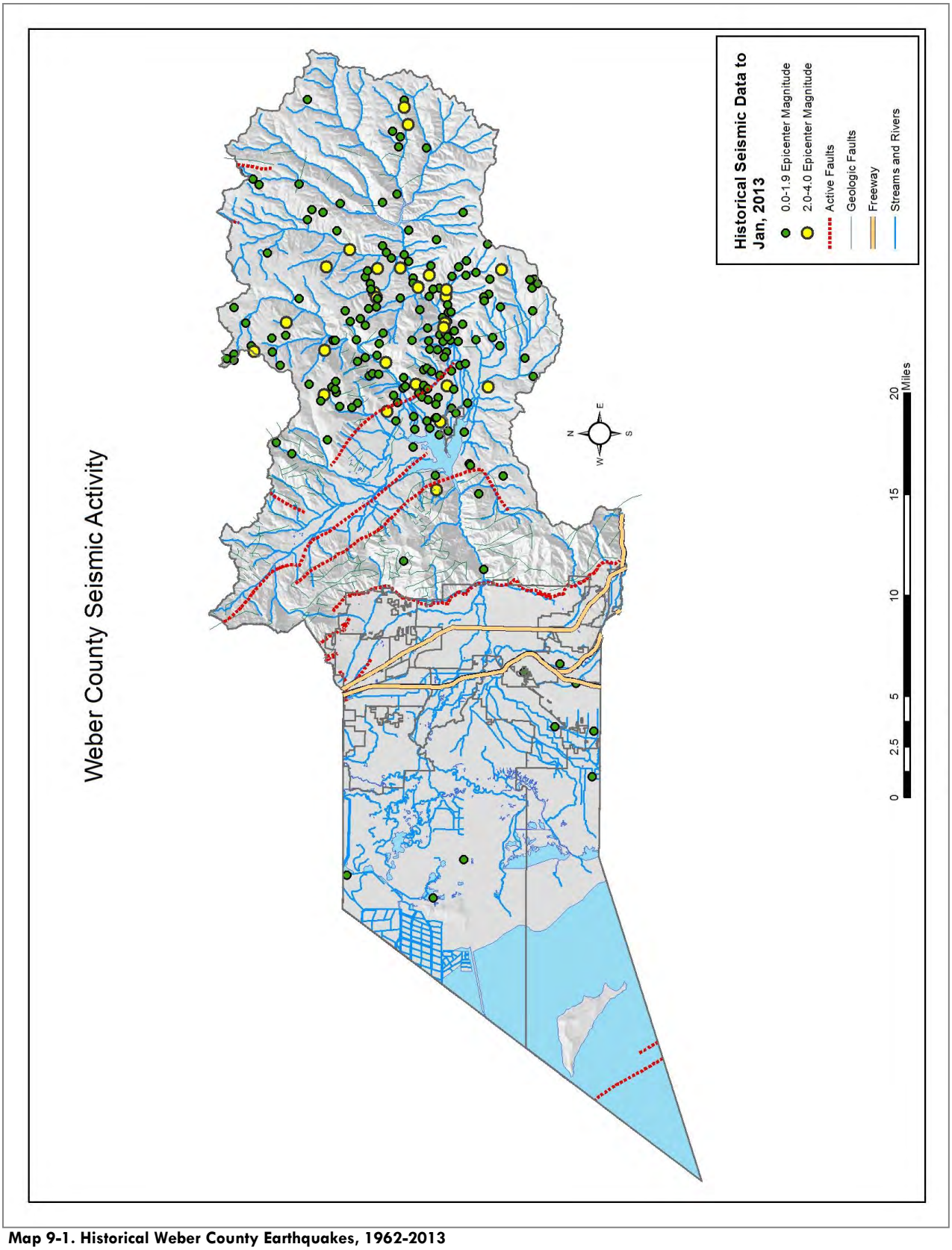
Table 9-5. Fire Following Event, Population Exposed, and Building Stock Exposed

Casualties

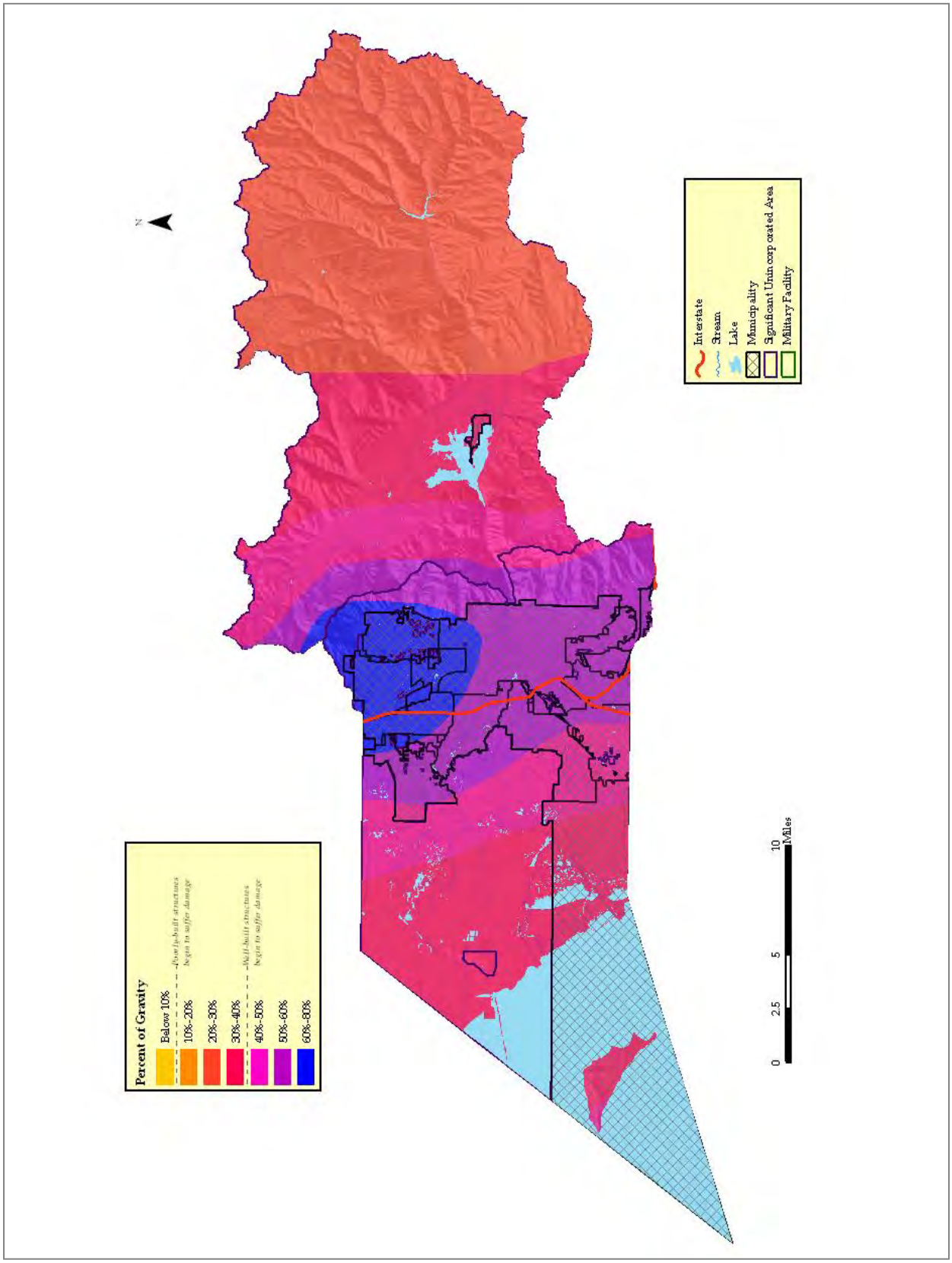
Table 9-6 estimates casualties likely to occur during each earthquake scenario. The nighttime scenario (2 a.m. local time) assumes a primarily residential concentration of persons, the daytime scenario (2 p.m. local time) a commercial concentration, and the commute scenario (5 pm. Local time) a concentration of persons on commuting routes. Categories of casualties include those not requiring hospitalization (minor), those requiring treatment at a medical facility (major), and fatalities.

Night Event	Weber M5.9	2500-yr M7.1	Day Event	Weber M5.9	2500-yr M7.1	Commute Event	Weber M5.9	2500-yr M7.1
Minor	294	2,076	**Minor**	434	2,797	**Minor**	349	2,313
Major	67	636	**Major**	119	996	**Major**	93	793
Fatalities	14	150	**Fatalities**	29	276	**Fatalities**	22	210

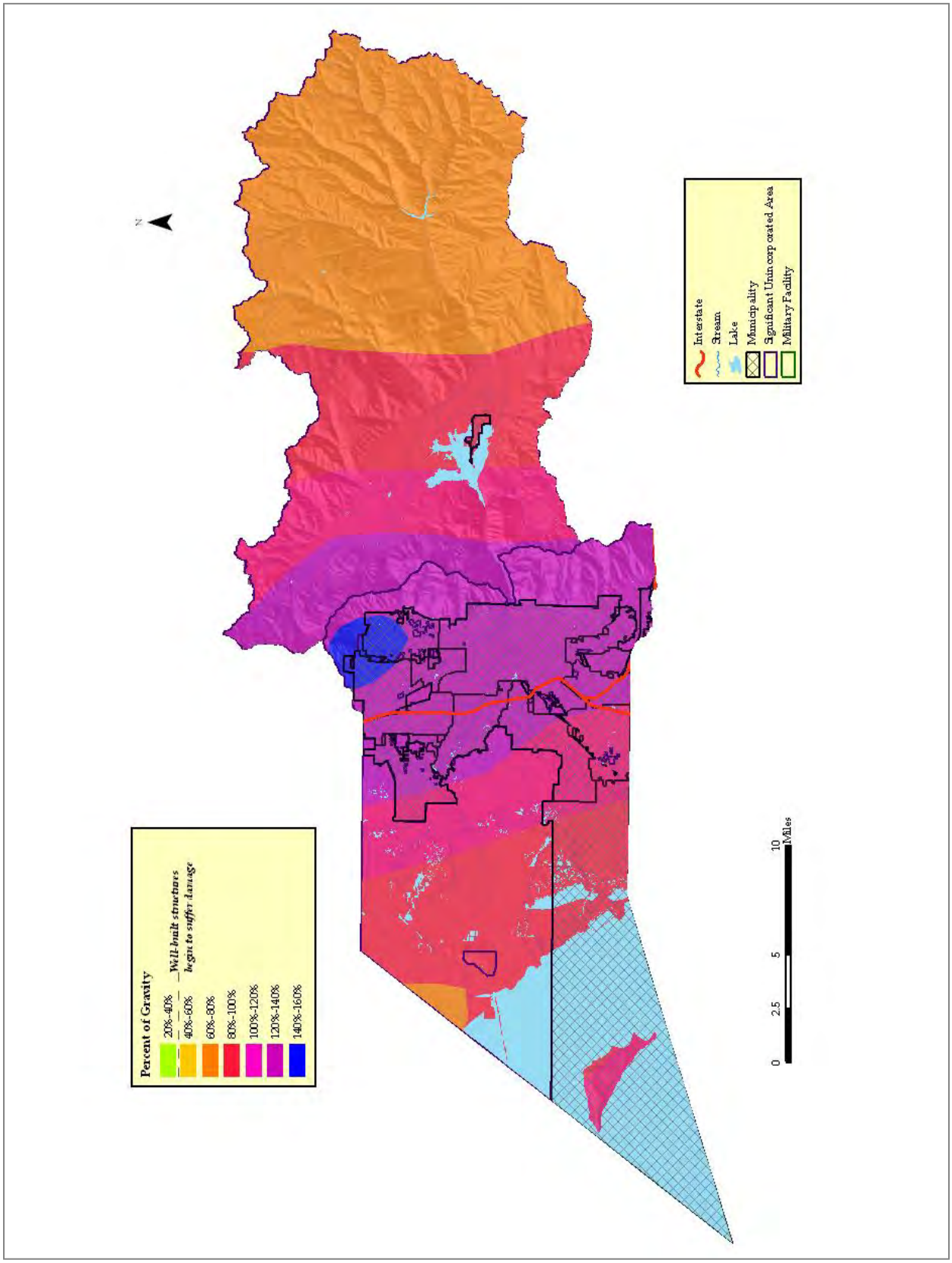
Table 9-6. Casualties



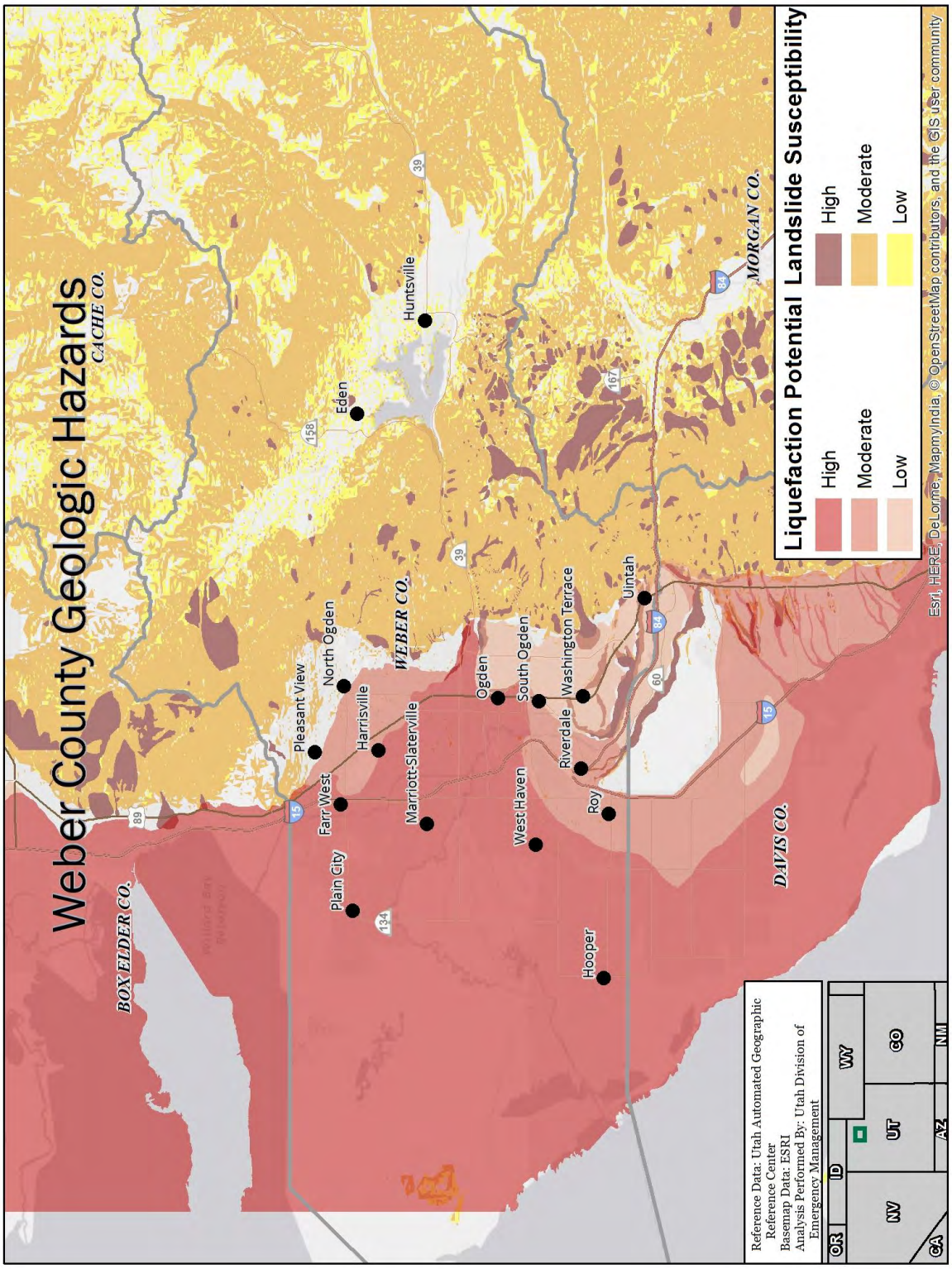
Map 9-1. Historical Weber County Earthquakes, 1962-2013
(Source: Weber County GIS/Engineering, Utah AGRC (Seismology and Volcanology))



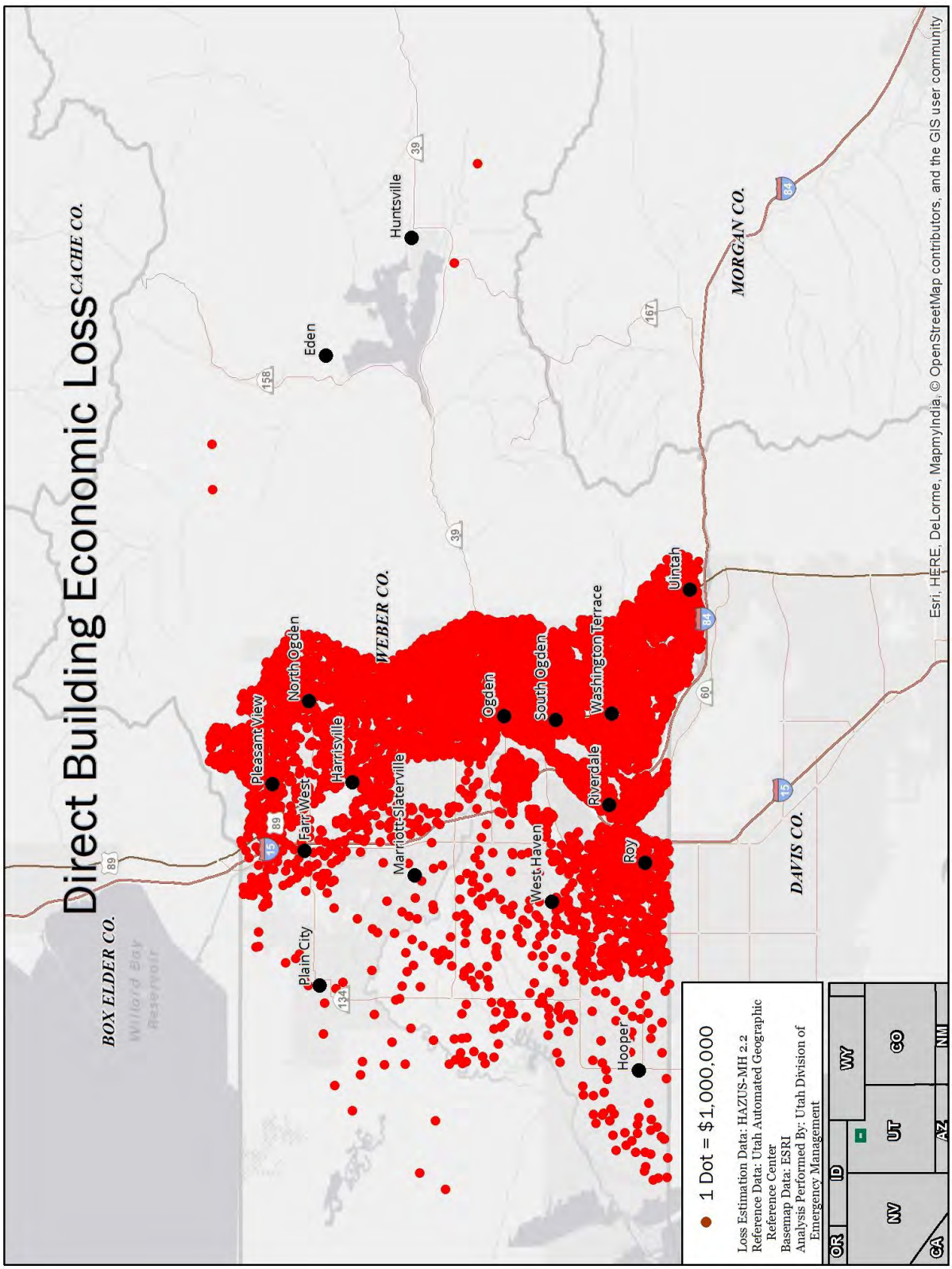
Map 9-2. 0.2 Spectral Acceleration, Weber County
(Source: NSHMP 2002)



Map 9-3. 1.0 Spectral Acceleration, Weber County
(Source: *NSHMP 2002*)

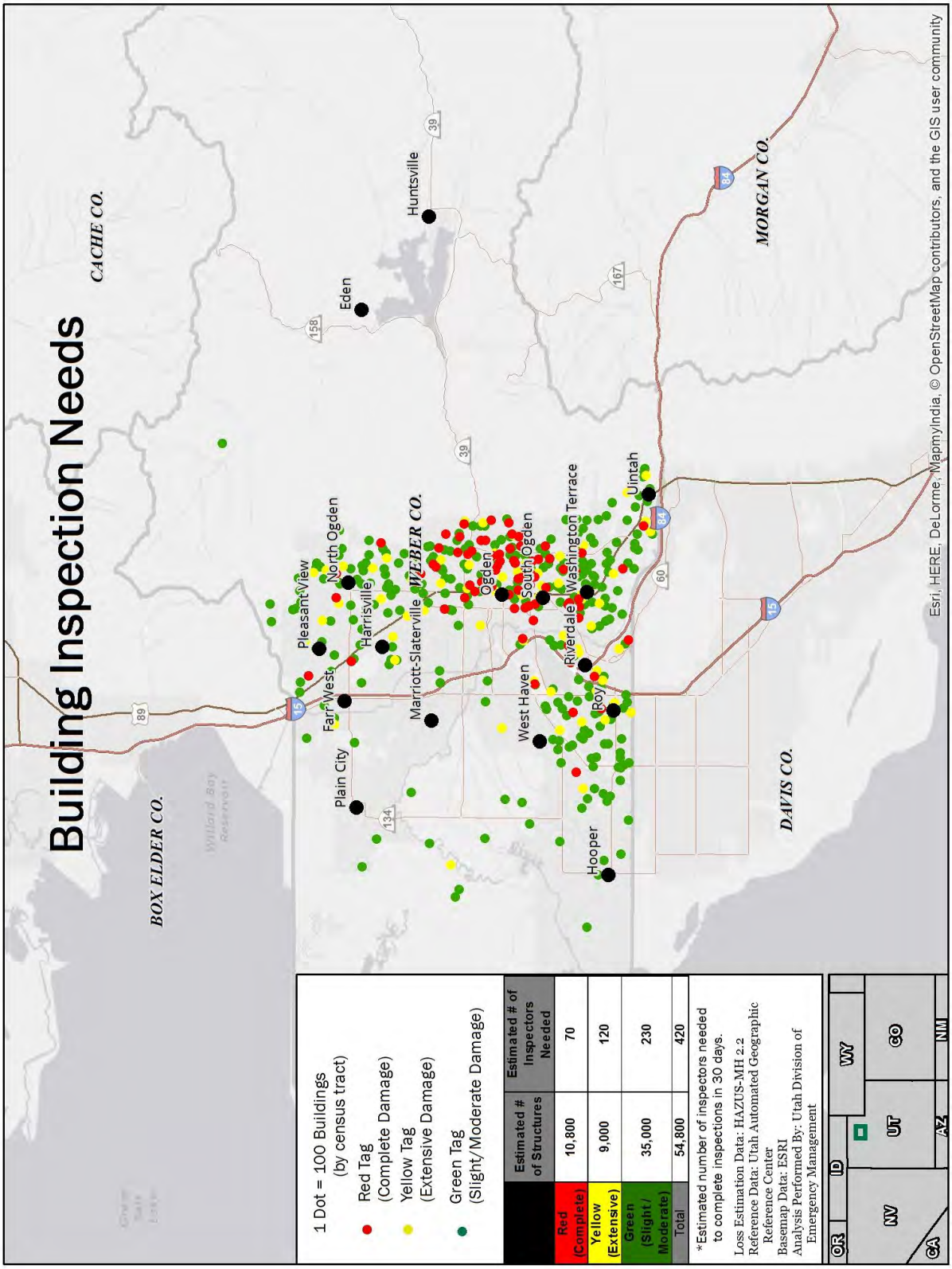


Map 9-4. Liquefaction Probability
(*Source: Utah Automated Geographic Reference Center, Esri basemap, Utah Division of Emergency Mgmt*)



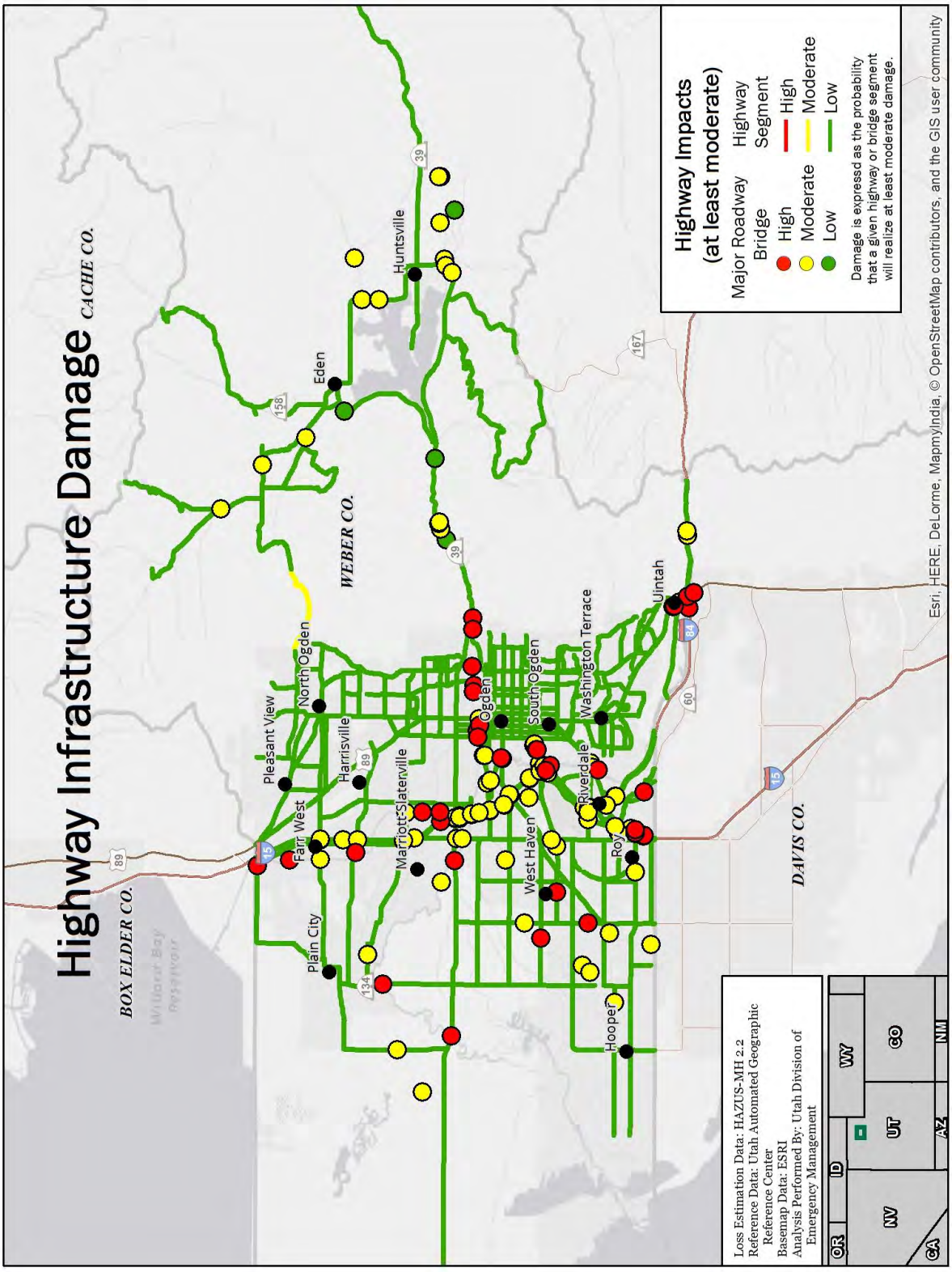
Map 9-5. Direct Building Economic Loss

(*Source: HAZUS-MH 2.2, Utah Automated Geographic Center, Esri basemap, Utah Division of Emergency Mgmt*)



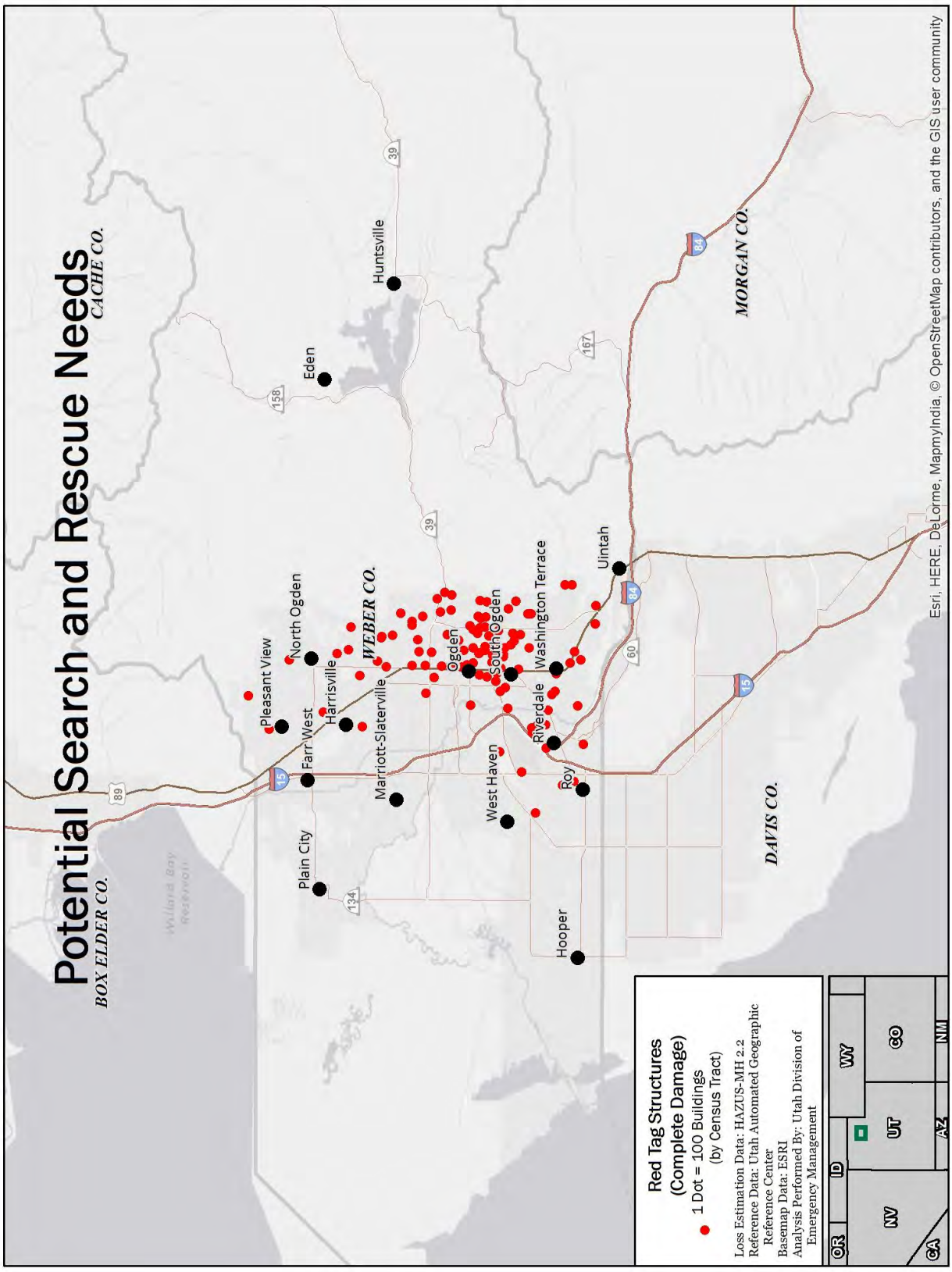
Map 9-6. Building Inspection Needs

(Source: HAZUS-MH 2.2, Utah Automated Geographic Center, Esri basemap, Utah Division of Emergency Mgmt)

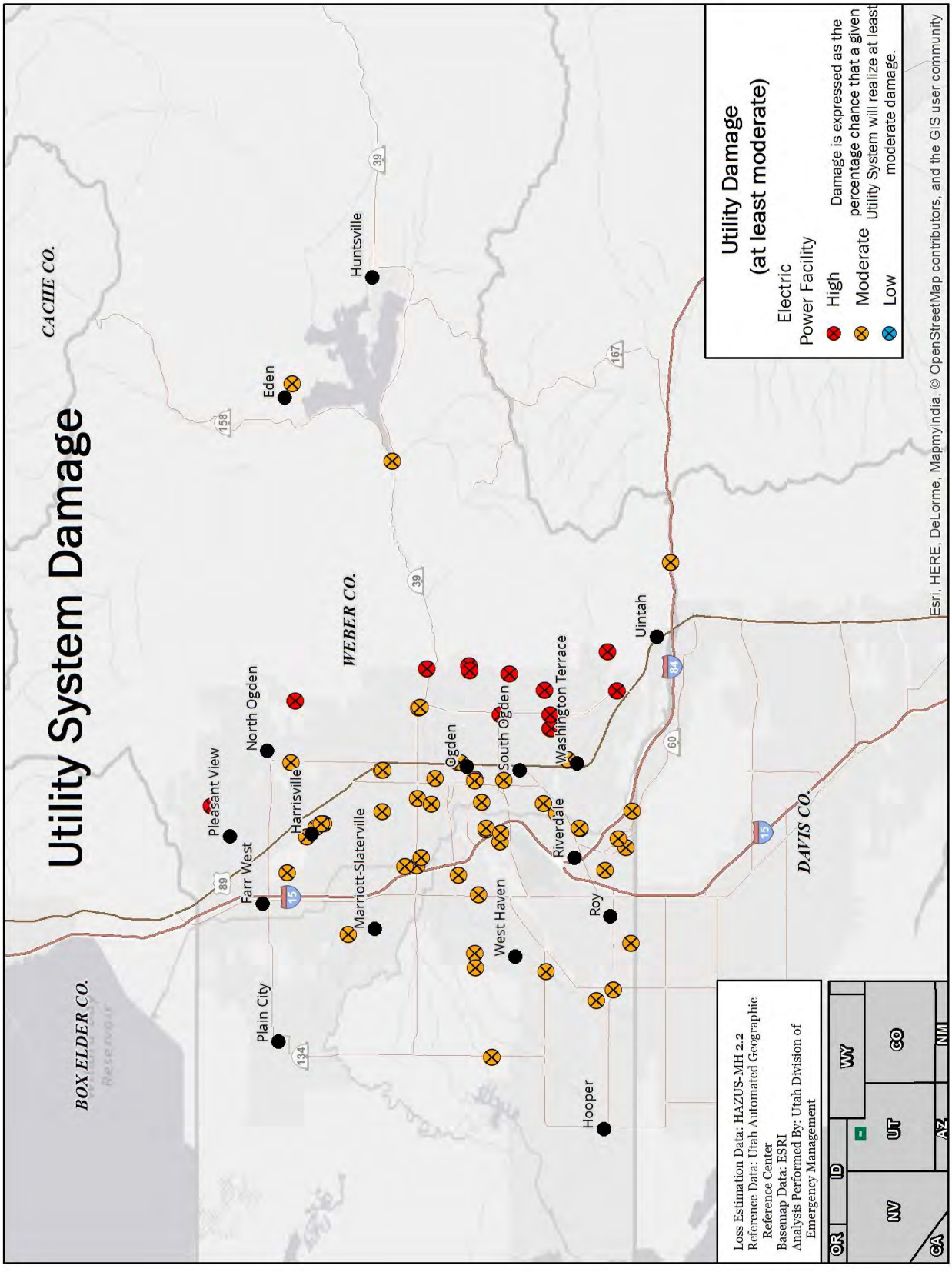


Map 9-7. Highway Infrastructure Damage

(*Source: HAZUS-MH 2.2, Utah Automated Geographic Center, Esri basemap, Utah Division of Emergency Mgmt*)

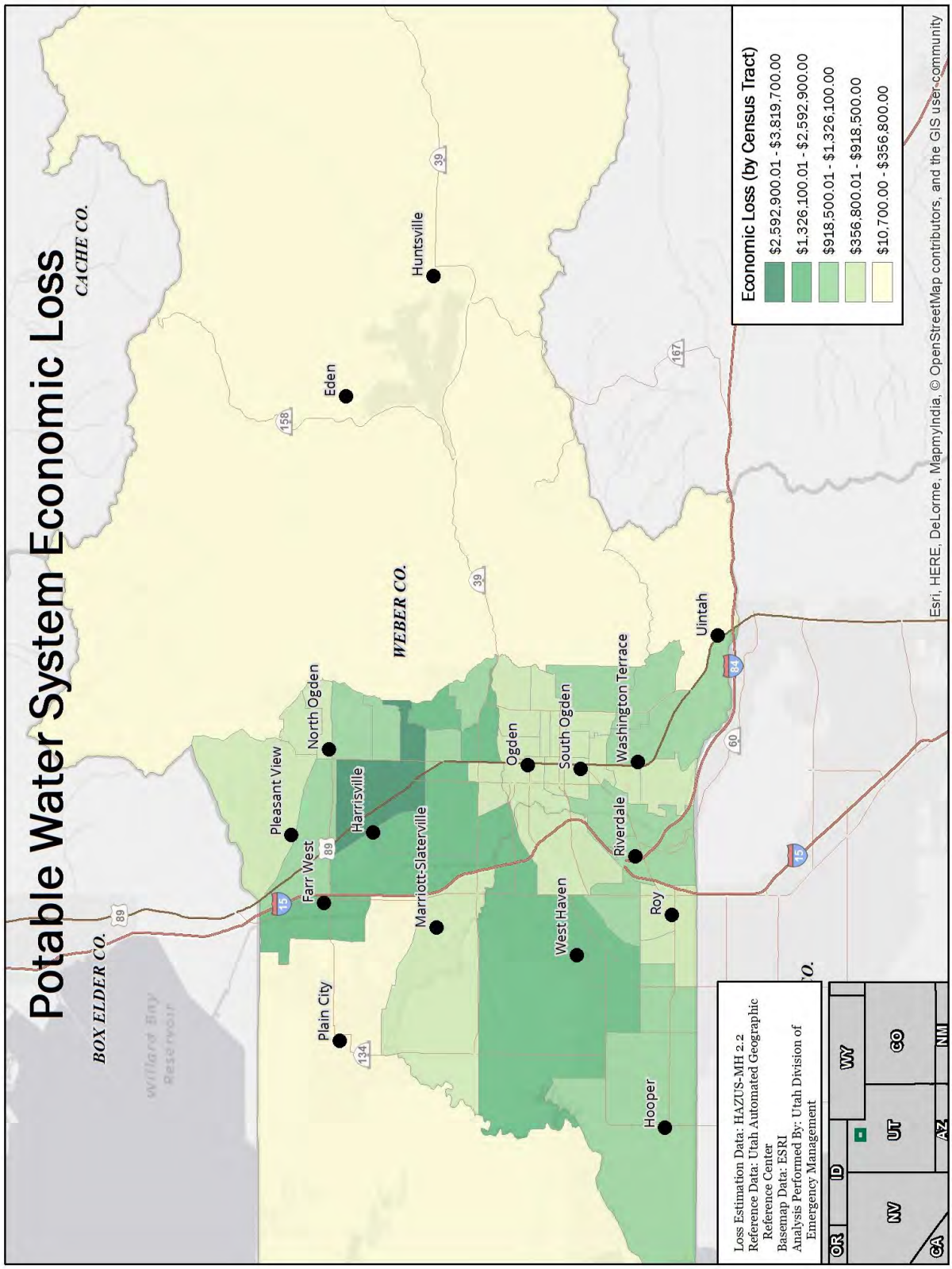


Map 9-8. Potential Search and Rescue Needs
(*Source: HAZUS-MH 2.2, Utah Automated Geographic Center, Esri basemap, Utah Division of Emergency Mgmt*)



Map 9-9. Utility System Damage

(Source: HAZUS-MH 2.2, Utah Automated Geographic Center, Esri basemap, Utah Division of Emergency Mgmt)



Map 9-10. Potable Water System Economic Loss
(Source: HAZUS-MH 2.2, Utah Automated Geographic Center, Esri basemap, Utah Division of Emergency Mgmt)

2. Flood

Hazard Profile

Potential Magnitude			Probability		
		Catastrophic (>50%)			Highly Likely
		Critical (25-50%)		X	Likely
	X	Limited (10-25%)			Possible
		Negligible (< 10%)			Unlikely

Location	Alluvial fans, Great Salt Lake.
Frequency	Spring, Late Summer.
Conditions	Cloudburst Storms, extended wet periods.
Duration	Flooding can last anywhere from hours to days and even months.
Secondary Hazards	Raw sewage/health risk, electrical fires, gas spills.
Analysis Used	Review of FIRM, debris flow maps.

Description of Location and Extent

From April to July of 2011 the Weber and Ogden Rivers experienced flows of more than double the average peak flows. The Weber River's average peak flow is approximately 2800 cfs; during the 2011 runoff it was flowing at 4,580 cfs. (USGS, 2011). The sustained flows lasted for nearly four months causing significant damage to bridges, trails, the river channel, businesses, recreational facilities, homes and agricultural lands. A Major Disaster Declaration was issued in August 2011. Weber County received funding from NRCS to complete emergency water shed projects to repair damage in many areas of the County, but risks still exist along major portions of the Weber River where funding shortages have limited mitigation activities.

The greatest flood risk in Weber County is associated with long duration storms. A significant rain event on top of a heavy snowpack could again cause localized flooding. Cloudburst storms generally result in flash flooding in localized areas. North Ogden has experienced flash flood events in the past fifteen years. Rapid snowmelt is another significant flood threat that results in unusually high runoff. Sheet flooding has occurred several times in the Upper Valley areas around Eden and Liberty.

The areas of greatest flood potential are within western Weber County, Ogden, and the Weber River in Uintah as well as in the flatlands in the western part of the County. The Weber and Ogden Rivers have recently experienced flooding. In 2009 Ogden City completed an urban channel restoration of the Ogden River which restored the banks of the river, the riparian habitat, and removed debris. This made the Ogden River more resilient to the 2011 flooding event and minimal damage occurred at these locations. Major flood risk still remains along much of the Weber River near homes, businesses and transportation corridors.

Other smaller creeks that can create flood problems within the county include North Fork Ogden River, South Fork Ogden River, Taylor Canyon Creek, Wolf Creek, Sheep Creek, Waterfall Canyon Creek, Beus Canyon Creek, Burch Creek, Cold Water Canyon Creek, Four Mile Creek, Six Mile Creek and Hot Springs Creek. The Weber River drainage is approximately 2,460 square miles. The Warren area could experience flooding on agricultural lands and homes from the failure of the West Dike of the Weber River between 4700 West and 1100 South. In the past businesses and roads were damaged from flooding between 1990 West and 1300 South near SR-89 in the West Haven area.

Three irrigation canals in Weber County affect the flood threat: the Ogden-Brigham Canal, the Davis & Weber Counties Canal and the Willard Canal. There are other private canals that are not considered in this report. The Davis & Weber Counties Canal breached in 1999 and flooded over 70 homes in Riverdale. This event was declared as a city, county, and state disaster. The Ogden-Brigham Canal breached in 1979, due to a rockslide. Since 1853, the County experienced over 360 flash floods and more than 170 snow melt floods. The Willard Canal has the potential to cause considerable damage should it breach.

Vulnerability Assessment

Vulnerability to flooding in Weber County was obtained from the modeling program Hazards United States – Multi-hazards (HAZUS-MH)**. Vulnerability was assessed for both 100-year (NFIP Zone A) and 500-year (NFIP Zone B or Zone X (shaded)) flood events. Analysis was completed using Digital Flood Insurance Rate Maps (DFIRM). Only streams which contained detailed flood cross-section data could be used. Flooding from the Great Salt Lake was also not included. Consequently, the results should be considered conservative. Total monetary losses include structures, contents and business interruption. (***For a more detailed explanation of the loss estimation methodology of HAZUS-MH, please see Part VII or the HAZUS-MH Technical Manual (Flood Model) at www.fema.gov/hazus*).

	Acres Flooded	Population Displaced	Number of Structures in Floodplain	
			Residential Units (Total Losses)	Commercial/Industrial Units (Total Losses)
100-year Flood	845	1,789	378 $27,530,000	7 $30,570,000
500-year Flood	1,695	1,966	407 $35,440,000	7 $43,800,000

Table 9-. Weber County Flood Hazard

Agricultural Losses

Agricultural losses are listed in Table 13-10. Losses are computed for the number of days the crops are inundated with water. All numbers are estimated for a flood occurring near April 15th.

	100-year Losses, Day 3	100-year Losses, Day 7	500-year Losses, Day 3	500-year Losses, Day 7
Barley	$2,862	$3,815	$2,906	$3,875
Corn Silage	$30,110	$40,146	$27,769	$37,026

Table 13-10. Agricultural Losses, June 15th Scenario

Vehicle Losses

Table 13-11 contains losses for vehicles in floods during both daytime and nighttime scenarios. The scenarios assume ninety percent (90%) of vehicles being removed from hazard areas due to warning.

Category	100-year	500-year
Daytime Scenario	$1,311,774	$2,552,740
Nighttime Scenario	$1,955,096	$2,592,086

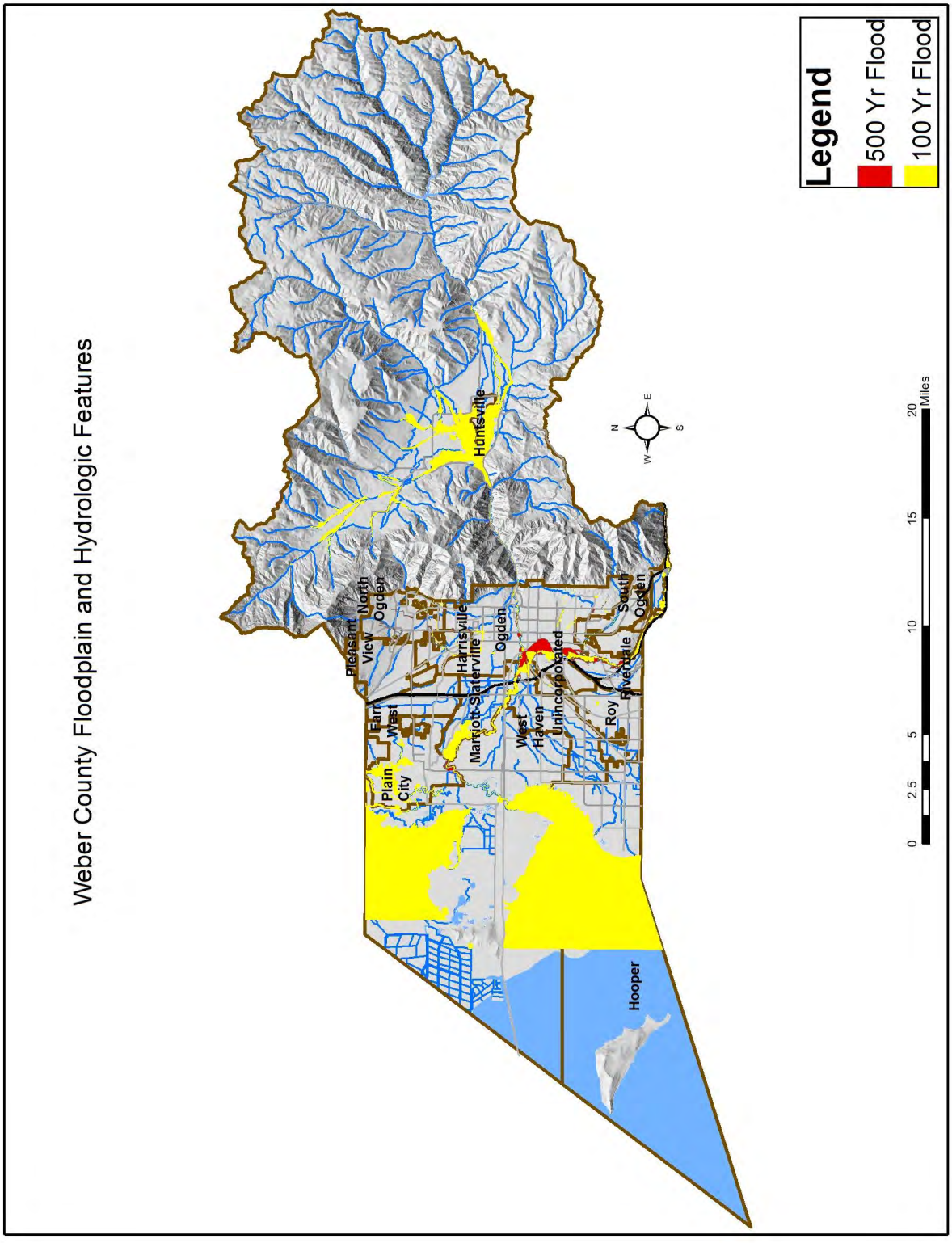
Table 13-11. Vehicle Losses

Debris Removal

Table 13-12 shows how much debris would be generated by flooding and how many loads it would take to remove the debris, based on a capacity of 25 tons per load. One truck can likely haul one load per hour. A second debris removal issue is landfill space. Fifty thousand tons at a weight-to-volume ratio of one ton per cubic yard would cover more than ten acres to a depth of three feet.

Category	100-year	500-year
Finishes	3,280 tons/132 loads	3,982 tons/160 loads
Structures	1,477 tons/60 loads	1,759 tons/ 71 loads
Foundations	1,813 tons/73 loads	2,041 tons/82 loads
Totals	**6,570 tons/265 loads**	**7,782 tons/313 loads**

Table 13-12. Debris Generation and Removal



Map 9-11. Weber County Floodplain and Hydrologic Features
(Source: Weber County GIS/Engineering)

3. Wildland Fire

Hazard Profile

Potential Magnitude		***Catastrophic (>50%)***	***Probability***		***Highly Likely***
	X	***Critical (25-50%)***		X	***Likely***
		Limited (10-25%)			***Possible***
		Negligible (< 10%)			***Unlikely***
Location	Wildland-urban interface (WUI) areas the foothills and in forested areas (See Map 13-7 page 301).				
Seasonal Pattern	Summer months.				
Conditions	Areas affected by drought, heavily overgrown, or with dry brush and debris. Lightning and human triggers.				
Duration	Wildfires typically last days but can last months, depending on climate and fuel load as well as resources (financial, manpower) to extinguish the fire.				
Secondary Hazards	Landslides, debris flows, erosion, traffic accidents, air pollution.				
Analysis Used	Review of plans and data provided by US Forest Service, National Climate Center, FEMA, AGRC, County Hazard Analysis Plans, and DHLS.				

Description of Location and Extent

Potential wildfire hazard within Weber County is growing as population growth is spreading into wildland areas known as the Wildland-Urban Interface (WUI). Over the past 30 years urban sprawl has encroached upon forested foothill areas and wildland areas. A wildfire in these areas would threaten life and property. According to the County Emergency Operations Plan, the upper valley of Weber County will average one lightning caused fire approximately every 80-100 years. However, humans have increased wildfire threat to one every 8-10 years. Fire personnel respond to an average of 50 fires in the wildland areas every year; 20% of which are caused by lightning and 80% by humans. Most fires can be contained in a quarter-acre to one-acre area if they have not traveled into the wildland zones higher on the mountain, which are more difficult to fight due to steep mountain terrain.

Large numbers of homes/structures make the wildfire threat within the county most severe in the Uintah Highlands area, east of Weber State University, the mouth of Ogden Canyon, Coldwater Canyon, upper east area of Harrison Blvd., North Ogden, Pleasant View, Wolf Creek, Powder Mountain, Maple Canyon, South Fork, and Snow Basin.

In July 2014 a fire started in the steep, rock terrain east of Ogden in Weber County. The incident was named the Indian Fire and it was suspected to be human-caused. The fire was a creeping and smoldering fire fueled by grass, oak brush and timber. The fire burned 50 acres of US Forest Service land according to GPS mapping. Homes in the foothills were threatened resulting in approximately 20 homes being evacuated. This fire highlighted the likely hazard of wildland fire in the urban/wildland interface areas of Weber County.

The Utah Division of Forestry, Fire and State Lands maintains an annually updated list of communities considered "at risk" from wildland fire. The "Overall Score" represents the sum of multiple risk factors analyzed for each community. Examples of some risk factors are fire history, local vegetation, and firefighting capabilities. The Overall Score can range from 0 (No risk) to 12 (Extreme risk). This score

allows Utah's fire prevention program officials to assess relative risk and create opportunities for communications with those communities on the list.

Community Name	Fire Occurrence	Fuels Hazards	Values Protected	Fire Protection Capability	Overall Score
Causey Estates	2	3	1	3	**9**
Crimson Ridge	2	3	3	2	**10**
Durfee Creek	2	3	3	3	**11**
Eden	2	1	3	1	**7**
Evergreen Estates	2	3	1	3	**9**
Green Hills	2	3	3	2	**10**
Harrisville	2	1	2	1	**6**
Huntsville	2	2	2	2	**8**
Liberty	2	2	2	2	**8**
Little Mountain	2	1	2	2	**7**
Middle Fork	2	1	2	2	**7**
Moose Mountain	2	3	3	2	**10**
Nordic Valley	2	3	3	2	**10**
North Fork	2	3	2	2	**9**
North Ogden	2	3	3	1	**9**
Ogden	3	3	3	1	**10**
Ogden Canyon	2	3	3	2	**10**
Pine View Estates	2	2	2	3	**9**
Pleasant View	2	2	3	1	**8**
Pole Patch	2	2	3	2	**9**
Powder Mountain	2	3	2	3	**10**
Radford Hills	2	3	3	2	**10**
Snow Basin	2	3	3	2	**10**
Sourdough	2	3	1	3	**9**
South Ogden	3	3	3	1	**10**
Spring Mountain	2	2	2	2	**8**
Strongs Peak	2	3	3	2	**10**
Sunridge Estates	2	3	1	3	**9**
Uintah	3	3	3	1	**10**
Wolf Creek	2	3	3	2	**10**
Wolf Mountain	2	3	3	2	**10**

Table 9-3. Communities at Risk
(Source: Utah Division of Forestry, Fire and State Lands 2013)

Vulnerability Assessment

Table 9-4 (next page) estimates infrastructure vulnerable to wildland fire in Weber County. Provided are the number of units or total length of infrastructure vulnerable and the estimated replacement costs as provided by HAZUS-MH lost estimation software. Table 13-14 estimates the total area, population and buildings vulnerable to wildland fire for individual cities and unincorporated areas.

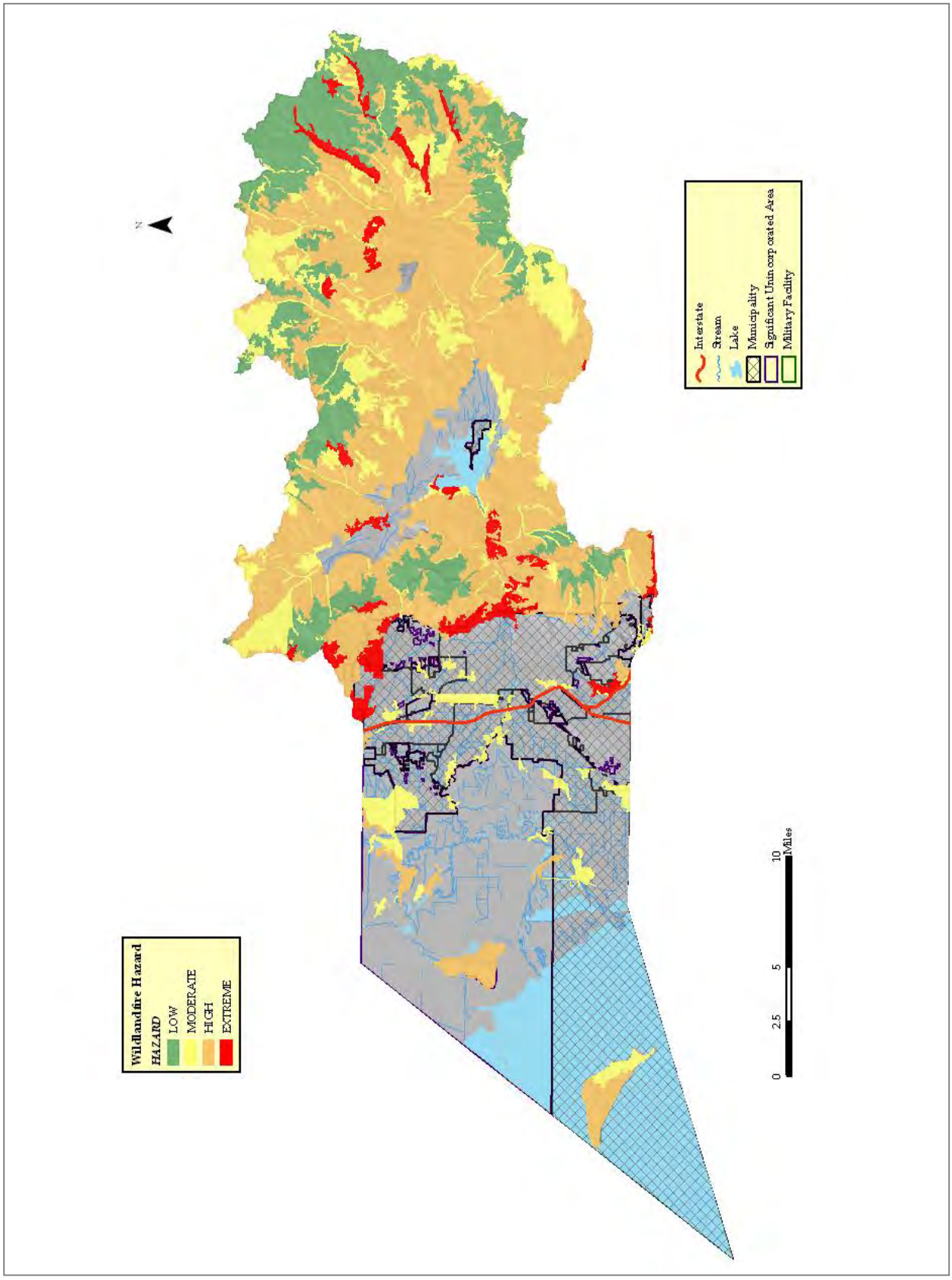
Item	Length (Miles) or Number of Units	Replacement Cost
Highways/Interstates	153.80 miles	$787,196,250
Highway Bridges	141 bridges	$1,845,264,307
Railway Segments	106.27 miles	$122,081,686
Railway Bridges	5 bridges	$884,940
Water Distribution Lines	N/A	N/A
Gas Lines	N/A	N/A
Sewer Lines	N/A	N/A
Total Estimated Infrastructure Replacement Cost		**$2,755,427,183**

Table 9-4. Infrastructure Vulnerable to Wildland Fire, Weber County

Incorporated Areas	Acres Affected	Population Affected	Structures in Areas of Moderate or Greater Hazard	
			Residential (Replacement Value)	Commercial (Annual Sales)
Farr West	129	18	24 $3,547,600	5 $24,691,975
Harrisville	368	187	169 $48,012,600	14 $15,189,309
Hooper	174	129	47 $14,873,800	0 0$
Huntsville	0	0	0	0
Marriot-Slaterville	0	0	0	0
North Ogden	1,326	818	435 $95,782,600	9 $3,262,461
Ogden	1,618	1,150	684 $150,033,600	29 $13,113,043
Plain City	45	0	0	0
Pleasant View	1,445	170	188 $47,938,800	3 $1,252,280
Riverdale	462	43	14 $3,524,800	5 $3,511,241
Roy	0	0	0	0
South Ogden	22	0	0	0
Uintah	80	56	168 $58,693,200	0 $0
Washington Terrace	316	160	50 $15,416,000	3 $1,425,273
West Haven	25	0	0	0

Unincorporated Areas	Acres Affected	Population Affected	Structures in Areas of Moderate or Greater Hazard	
			Residential (Replacement Value)	Commercial (Annual Sales)
Little Mountain Test Annex	781	0	0	0
Ogden Valley	207,682	610	1,250 $436,026,600	34 $21,451,812
Western Weber	9,869	509	159 $47,136,600	5 $2,849,781

Table 9-5. Vulnerability Assessment for Wildland Fire, Weber County



Map 9-12. Wildland Fire Hazard, Weber County
(Source: UDFFSL 2007)

4. Slope Failure

Hazard Profile

Potential Magnitude		***Catastrophic (>50%)***	***Probability***		***Highly Likely***
		Critical (25-50%)		X	***Likely***
	X	***Limited (10-25%)***			***Possible***
		Negligible (< 10%)			***Unlikely***
Location	Generally occur in canyon mouths and foothill areas (See Map 9-7 page 116).				
Seasonal Pattern	Spring and summer; after heavy or long-duration precipitation.				
Conditions	Usually caused by the stress release of over-weighted soils, shallow groundwater in certain soils or loosening of rock and debris.				
Duration	Generally last hours or days, but some can last for longer periods.				
Secondary Hazards	Flooding (natural dams), traffic accidents.				
Analysis Used	Information and maps provided by UGS, DHLS, AGRC.				

Description of Location and Extent

Future landslide areas are usually located near the areas of historical landslides, which are well-defined localized areas. Historically, landslides have been one of the most frequent hazards within Weber County. Homes high along the benches and in the canyons are at the greatest risk of rockfalls, debris flows, landslides and other types of slope failure. Refer to Map 9-7, page 116.

Historic landslides have been identified in Ogden Canyon and Washington Terrace. The Ogden Canyon slide is south of the canyon mouth and forms a 200 foot high bluff above the south bank of the Ogden River, over 90 acres in size. Washington Terrace has a series of landslides four miles long, starting two miles west of the mouth of Weber Canyon and ending on the northwest side of Washington Terrace. Landslides have also occurred in Ogden Canyon between the mouth and Pineview Dam and over North Ogden Pass as well.

East of Plain City and Harrisville there is evidence of lateral spread of more than 2,000 feet. The north-central portion of the county shows evidence of slumps, earth flows and other deep-seated landslides. Extending north to south in the central portion of the county are smaller (less than 2,000 feet) lateral spread landslides. The eastern portion of the county exhibits rockfall, colluvial, talus, glacial and soil-creep landslides larger than 2000 ft.

There are three prominent rockslide areas in the county and many smaller areas. The North Ogden rockslide is 100 acres in size and is one mile northwest of the mouth of North Ogden Canyon. The College rockslide is about 80 acres in size and is located east of the Weber State University campus. The Beus Canyon slide is one half mile square and is located immediately south of the College slide. Ogden Canyon, north of the mouth, is home to smaller rockslides. Potential rockslide hazards exist north of Taylor Canyon.

Debris flows and mudslides are possible near the mouth of Weber Canyon west to Riverdale, which could impact railroads, utilities, storm drainage lines, and residential property. Past landslides have damaged

several homes in this area. Erosion is a threat from Weber Canyon westward including the towns of Uintah and Riverdale. Homes, utilities, and bridges are at risk.

Vulnerability Assessment

Table 9-6 (below) estimates infrastructure vulnerable to landslides in Weber County. Provided are the number of units or total length of infrastructure vulnerable and the estimated replacement costs as provided by HAZUS-MH lost estimation software. Table 13-16 estimates the total area, population, and buildings vulnerable to landslides.

Item	Length (Miles) or Number of Units	Replacement Cost
Highways/Interstates	36.85 miles	$173,291,730
Highway Bridges	13 bridges	$6,752,222
Railway Segments	9.44 miles	$10,846,560
Railway Bridges	0 bridges	$0
Water Distribution Lines	503.25 miles	$16,196,665
Gas Lines	201.32 miles	$6,478,679
Sewer Lines	301.92 miles	$9,718,041
Total Estimated Infrastructure Replacement Cost		**$223,283,897**

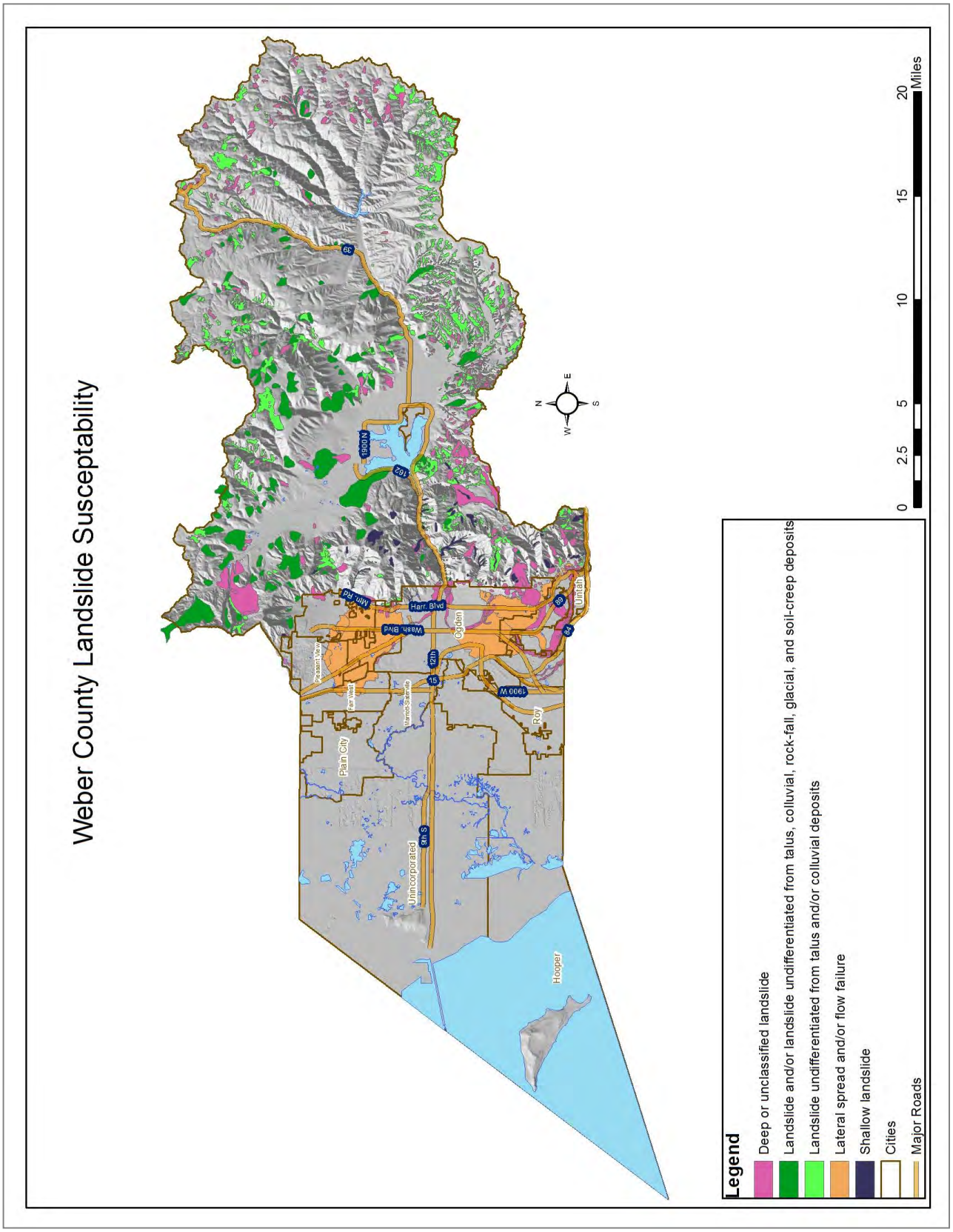
Table 9-6. Infrastructure Vulnerable to Landslide, Weber County

Incorporated Areas	Acres Affected	Population Affected	Structures in Areas of Moderate or Greater Hazard	
			Residential (Replacement Value)	Commercial (Annual Sales)
Farr West	0	0	0	0
Harrisville	0	0	0	0
Hooper	0	0	0	0
Huntsville	14	20	5 $727,000	0 0$
Marriot-Slaterville	0	0	0	0
North Ogden	857	6,147	1,744 $253,577,600	7 $1,400,682
Ogden	2,458	13,630	4,856 $706,062,400	3,568 $1,855,498,277
Plain City	0	0	0	0
Pleasant View	683	2,043	500 $72,700,000	4 $1,418,263
Riverdale	466	2,119	826 $120,100,400	33 $25,727,502
Roy	16	131	51 $7,415,400	1 $12,489
South Ogden	535	4,347	1,702 $247,470,800	31 $10,945,604
Uintah	110	2,085	830 $120,682,000	4 $822,853
Washington Terrace	481	3,606	1,444 $209,957,600	18 $2,666,940
West Haven	0	0	0	0

Unincorporated Areas	Acres Affected	Population Affected	Structures in Areas of Moderate or Greater Hazard	
			Residential (Replacement Value)	Commercial (Annual Sales)
Little Mountain Test Annex	143	0	0 $0	0 $0
Ogden Valley - East	68,579	408	116 $16,866,400	5 $905,219
Ogden Valley - West	70,003	5,995	1,842 $267,826,800	22 $4,209,746
Western Weber - North	0	0	0	0
Western Weber - South	0	0	0	0
Western Weber - West	0	0	0	0

Table 9-7. Vulnerability Assessment for Landslides, Weber County

Map 9-13. Landslide Susceptibility, Weber County
(Source: Weber County GIS/Engineering)



5. Dam Failure

Hazard Profile

Potential Magnitude	X	***Catastrophic (>50%)***	***Probability***		***Highly Likely***
		Critical (25-50%)			***Likely***
		Limited (10-25%)		X	***Possible***
		Negligible (< 10%)			***Unlikely***
Location	See Map 13-9 (page 309)				
Frequency	*Rainy Day Failure:* Spring, Late Summer *Sunny Day Failure:* Anytime				
Conditions	*Rainy-day failure* happens mainly during heavy precipitation events, can have some warning time. *Sunny day failure* happens with no warning at all and can happen at anytime.				
Duration	Hours - Days				
Secondary Hazards	Raw sewage/health risk, electrical fires, gas spills.				
Analysis Used	Review of Bureau of Reclamation inundation maps and plans, Flood Insurance Studies, Utah Division of Water Rights.				

Description of Location and Extent

Seven dams are designated as high hazard within Weber County, meaning if they fail they have a high probability of causing loss of life and extensive economic loss. Twenty-one dams are listed as being moderate (low probability of causing loss of life; appreciable property damage) (Table 13-17).

The dam safety hazard is classified by the State Engineer. This classification is based upon the damage caused if the dam were to fail, not the dam's probability of failure. Therefore, the classification of a high hazard dam does not mean that the dam has a high probability of failure.

Other dams outside the County boundaries that could also affect Weber County include: Echo Dam, located between Morgan and Park City; Wanship Dam/Rockport Reservoir, located upstream from Echo Dam; East Canyon Dam, south of Morgan City; and Lost Creek Dam northeast of Morgan City; as well as AV Watkins Dam - Willard Reservoir/ Willard Bay, located in Box Elder County on the northern border of Weber County. Willard Bay is a diked bay of the Great Salt Lake that has a capacity greater than 215,000 acre-feet of water. A catastrophic breach of the reservoir could flood much of the northwestern portion of Weber County.

Dam/Reservoir	Rating
Fourmile Debris Basin-Harrisville Dam	MODERATE
Kelly Canyon	MODERATE
North Ogden City Orton Park/2100 North	HIGH
Ogden City – 27th Street Debris Basin	LOW
Ogden City – Sullivan Hollow	HIGH

Dam/Reservoir	Rating
Ogden City – Beus Pond	MODERATE
Roy Subconservancy	LOW
Sourdough Wilderness Ranch	MODE RATE
South Ogden City Burch Creek (Glasmann)	HIGH
South Ogden City Burch Creek Debris	HIGH
Ten Acre Lake	HIGH
Utaba Retarding	MODERATE

Table 9-8 Dam Hazard Inventory
(Source: Utah Division of Water Rights, Dam Safety Section 2015)

Vulnerability Assessment

Table 9-10 estimates the total area, population and buildings vulnerable to dam failure for individual cities and Table 13-19 examines the same for unincorporated areas. Table 13-20 estimates infrastructure vulnerable to dam failure in Weber County. Provided are the number of units or total length of infrastructure vulnerable and the estimated replacement costs as provided by HAZUS-MH lost estimation software. Editors Note: These estimates include a catastrophic failure of the Bureau of Reclamation Dams. Specific dam failure data was not available when this plan was developed and will be added in subsequent plan updates.

Incorporated Areas	Acres Affected	Population Affected	Structures in Inundation Areas	
			Residential (Replacement Value)	Commercial (Annual Sales)
Farr West	2,000	4,800	0	0
Harrisville	640	1,500	0	0
Hooper	4,800	2,000	0	0
Huntsville	320	250	0	0
Marriot-Slaterville	4,000	0	0	0
North Ogden	109	583	184 $26,753,600	17 $20,253,156
Ogden	1,285	10,000	654 $95,091,600	229 $136,063,049
Plain City	4,000	8,000	0	0
Pleasant View	0	0	0	0
Riverdale	1,800	4,500	20 $2,908,000	2 $1,111,176
Roy	0	0	0	0
South Ogden	38	251	96 $13,958,400	1 $530,390
Uintah	640	800	0	0
Washington Terrace	0	0	0	0

Incorporated Areas	Acres Affected	Population Affected	Structures in Inundation Areas	
			Residential (Replacement Value)	Commercial (Annual Sales)
West Haven	1,800	1,500	0	0

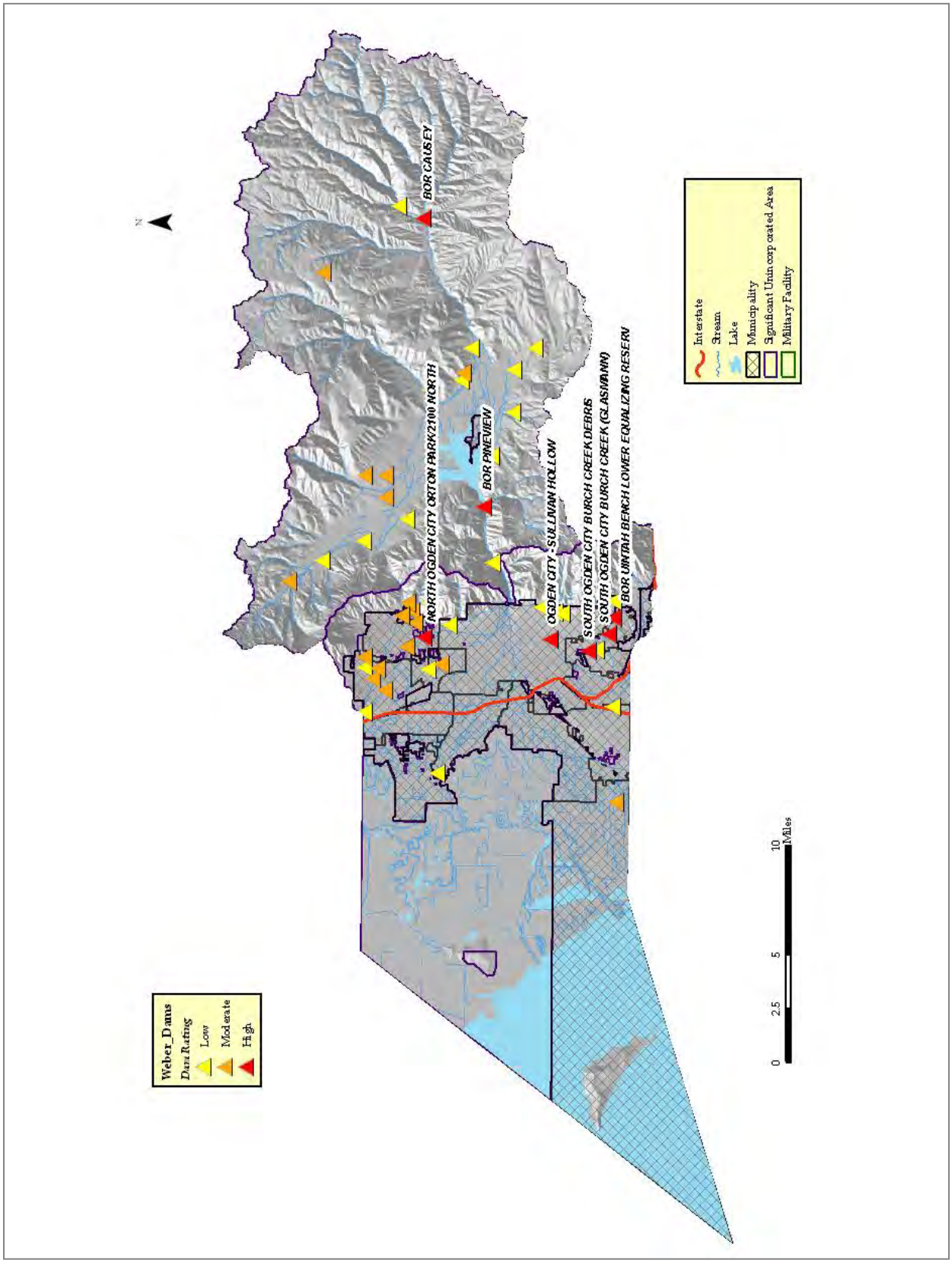
Table 9-10. Vulnerability Assessment for Dam Failure, Incorporated Weber County

Unincorporated Areas	Acres Affected	Population Affected	Structures in Inundation Areas	
			Residential (Replacement Value)	Commercial (Annual Sales)
Little Mountain Test Annex	0	0	0	0
Ogden Valley	5,400	950	0	0
Western Weber - South	1,200	104	37 $5,379,800	0
Western Weber - West	36,000	3,500	0	0

Table 9-11. Vulnerability Assessment for Dam Failure, Unincorporated Weber County

Item	Length (Miles) or Number of Units	Replacement Cost
Highways/Interstates	1.71 miles	$7,367,592
Highway Bridges	0 bridges	$0
Railway Segments	1.93 miles	$2,219,238
Railway Facilities	0 bridges	$0
Water Distribution Lines	N/A	N/A
Gas Lines	N/A	N/A
Sewer Lines	N/A	N/A
Total Estimated Infrastructure Replacement Cost		**$9,586,830**

Table 9-12. Infrastructure Vulnerable to Dam Failure, Weber County



Map 9-14. Dams and Associated Risk Levels, Weber County
(Source: Utah Division of Water Rights 2007)

6. Problem Soils

Hazard Profile

Potential Magnitude			Probability		
		Catastrophic (>50%)			Highly Likely
		Critical (25-50%)			Likely
	X	Limited (10-25%)		X	Possible
		Negligible (< 10%)			Unlikely

Location	See Map 13-10 (page 312)
Frequency	Continuous.
Conditions	Conditions vary by geologic formation.
Duration	Minutes to Years.
Secondary Hazards	Flooding (broken water pipes), fire (broken gas pipes).
Analysis Used	Utah Geological Survey

Description of Location and Extent

Two types of problems soils are present in Weber County – limestone and expansive soils. Both of these hazards are primarily found in the Wasatch Mountains in the eastern part of the County. See Map 13-10 (page 312) for more information on the locations of problem soils in Weber County.

Limestone karst structures are easily eroded by water and therefore often form caverns and crevices. If these caverns become large enough, the overlying ground can give way causing sink holes and other forms of subsidence. Structures directly over the karst structure have a high potential for collapse. Ground water contamination is also possible (Mulvey 1992). Developed areas of Ogden Canyon may present some evidence of karst hazard. Expansive soils can absorb significant quantities of water. When a home or road is placed on top of these soils, normal evaporation cannot take place. The clay begins to absorb more water than is evaporated and begins to expand, causing heaving. During especially dry periods, these soils can contract significantly causing subsidence and ground cracking. Residents already living in these areas should avoid excessive watering, make sure sufficient water drainage is in place around the home and ensure plumbing and irrigation pipes and fixtures are well protected from breakage or leaks (Kaliser 1972). Developments around Pineview Reservoir and northern Ogden Valley may experience some drainage problems, subsidence and/or landslides.

Vulnerability Assessment

Table 13-21 (next page) estimates infrastructure vulnerable to problem soils in Weber County. Provided are the number of units or total length of infrastructure vulnerable and the estimated replacement costs as provided by HAZUS-MH lost estimation software. Table 13-22 estimates the total area, population, and buildings vulnerable to problem soils for individual cities and unincorporated areas.

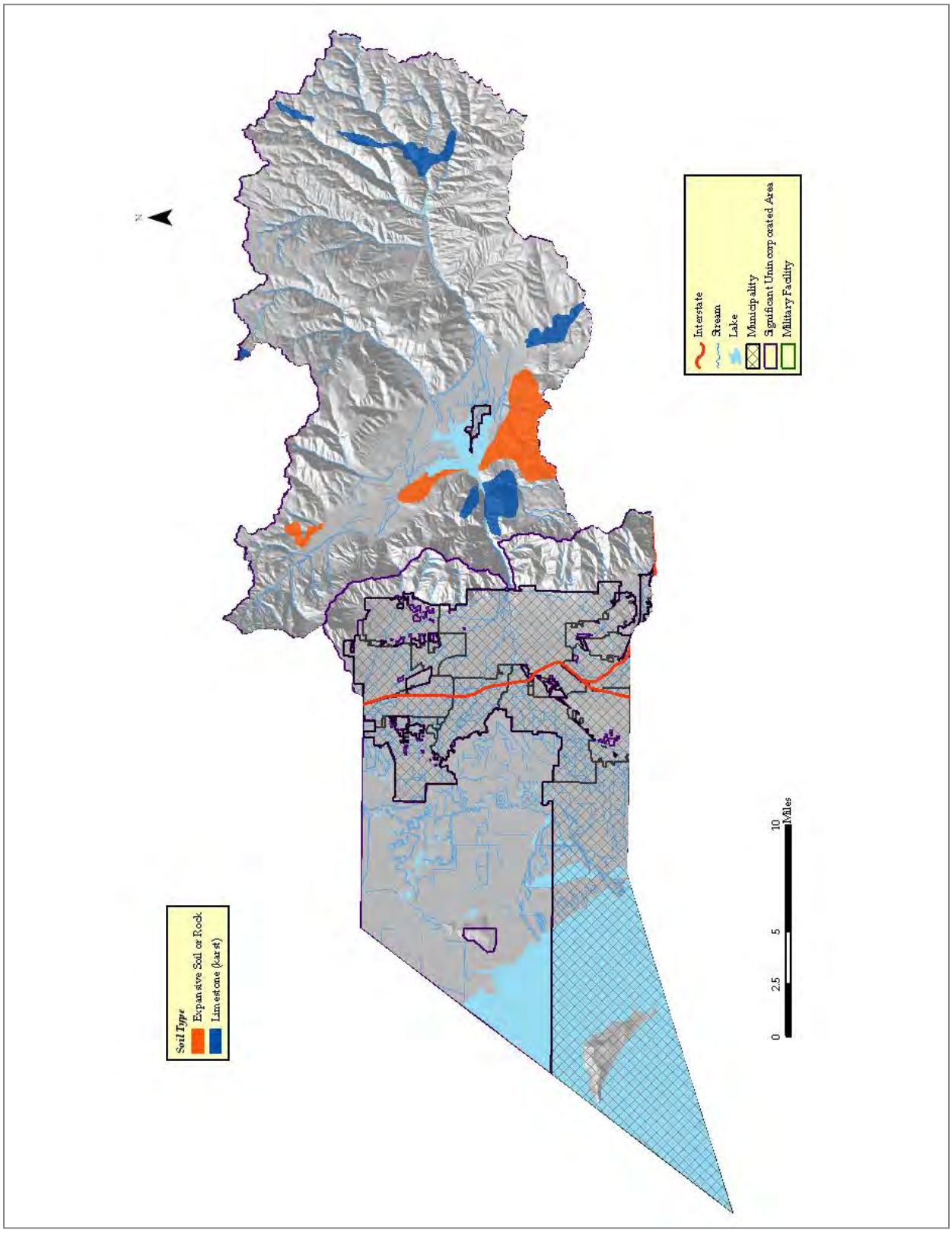
Item	Length (Miles) or Number of Units	Replacement Cost
Highways/Interstates	9.28 miles	$39,945,034
Highway Bridges	1 bridge	$476,756
Railway Segments	0 miles	$0
Railway Facilities	0 bridges	$0
Water Distribution Lines	35.91 miles	$1,155,825
Gas Lines	14.36 miles	$462,331
Sewer Lines	21.55 miles	$693,499
Total Estimated Infrastructure Replacement Cost		$42,733,445

Table 9-13. Infrastructure Vulnerable to Problem Soils, Weber County

Incorporated Areas	Acres Affected	Population Affected	Structures in Areas of Moderate or Greater Hazard	
			Residential (Replacement Value)	*Commercial* (Annual Sales)
Farr West	0	0	0	0
Harrisville	0	0	0	0
Hooper	0	0	0	0
Huntsville	0	0	0	0
Marriot-Slaterville	0	0	0	0
North Ogden	0	0	0	0
Ogden	0	0	0	0
Plain City	0	0	0	0
Pleasant View	0	0	0	0
Riverdale	0	0	0	0
Roy	0	0	0	0
South Ogden	0	0	0	0
Uintah	0	0	0	0
Washington Terrace	0	0	0	0
West Haven	0	0	0	0

Unincorporated Areas	Acres Affected	Population Affected	Structures in Areas of Moderate or Greater Hazard	
			Residential (Replacement Value)	*Commercial* (Annual Sales)
Little Mountain Test Annex	0	0	0	0
Ogden Valley	36,208	0	0	0
Western Weber	0	0	0	0

Table 9-14. Vulnerability Assessment for Problem Soils, Weber County



Map 9-9. Problem Soils Hazard, Weber County (Mulvey 1992)

7. Epidemic/Pandemic

Beginning in 1997 and continuing through 2006, a widespread outbreak of avian influenza (H5N1) affected birds in multiple Asian countries. That strain demonstrated the ability to cause lethal disease among humans and created concern that it might evolve into a strain of virus capable of causing a pandemic. It is not known whether that will occur, but it is certain that another influenza pandemic will afflict humans at some point in the future.

An influenza pandemic of the severity of the 1918 pandemic could cause over one million Utahns to become ill and result in over 500,000 outpatient doctor visits, 15,000 hospitalizations, and 4,000 deaths over the course of a year. Weber and Morgan Counties could experience 100,000 individual influenza cases, 50,000 outpatient doctor visits, 1500 additional hospitalizations and 400 deaths from a pandemic.

A pandemic is a worldwide outbreak of an influenza strain that previously has not circulated among humans, unlike a seasonal flu outbreak. Three flu pandemics have occurred in the last century. The worst was the Spanish flu outbreak of 1918, which killed more than 500,000 people in the United States, according to CDC. The worst-case scenario, should similar outbreak occur today, would affect 25% to 30% of the population in Weber and Morgan Counties.

The health department hopes to enroll key public health partners, including health department staff and hospital emergency response coordinators, infection control practitioners, epidemiologists, nursing directors, and administrators in UNIS, the Utah Notification and Information System
If a major outbreak of avian flu, or bird flu, were to occur in the area, it could dramatically spike work and school absenteeism in Weber and Morgan Counties. The pandemic is likely to last several months or possible longer.

Hazards and Future Development

Area	2010 Population	2020 Population	2030 Population	2040 Population	% Growth 2010-2040
Weber County	**231,236**	**258,423**	**300,477**	**349,009**	**50.9%**
Farr West City	5,928	6,835	7,238	8,163	37.7%
Harrisville City	5,567	6,314	7,741	8,146	46.3%
Hooper City	7,218	8,967	13,989	21,640	199.8%
Huntsville Town	608	666	727	688	13.1%
Marriott-Slaterville City	1,701	2,003	2,741	4,826	183.7%
North Ogden City	17,357	19,927	25,351	36,923	112.7%
Ogden City	82,825	90,971	100,123	102,059	23.2%
Plain City	5,476	6,431	8,727	10,694	95.3%
Pleasant View City	7,979	9,204	11,876	15,626	95.8%
Riverdale City	8,426	9,093	9,365	9,694	15%
Roy City	36,884	39,979	41,890	43,876	19%
South Ogden City	16,532	17,941	18,885	19,387	17.3%
Uintah City	1,322	1,502	1,851	1,749	32.3%

Washington Terrace City	9,067	9,857	10,446	13,456	48.4%
West Haven City	10,272	13,121	21,731	32,674	218.1%
Unincorporated Areas	14,074	15,613	17,796	20,408	45%

Table 9-15 Population Projections (Governor's Office of Planning and Budget, 2013 Population Projections)

The Weber County Assessor's 2014 Assessment Summary Report shows that in 2009 the number of residential building permits was 1,500. In 2013, 1,432 residential building permits were requested reversing a five-year decline from 2007-2010. Given the available land available, the majority of the growth will be in the foothills and in the agricultural lands of western Weber County. The Wasatch Mountain Range and the Great Salt Lake restrain development in the eastern and western reaches of Weber County.

Those portions of the County where the most growth is anticipated are near the Great Salt Lake and are subject to high liquefaction in the event of an earthquake and therefore pose a risk to residents and structures. The County and municipalities can mitigate the earthquake threat and its secondary risks through the continued use of zoning ordinances and building codes. Examples of appropriate forms of land use along fault lines include "farms, golf courses, parks, and undeveloped open space" (UGS 1996).

Flooding is also of considerable concern along the Weber River. Weber County ordinances require setbacks in limiting structures, roads, or parking areas from being developed within 50-100 feet from the high water mark of a river or stream depending on the specific body of water (Sec. 104-28-2). The County also follows the guidelines set by the federal flood insurance administration in that the elevations of the lowest inhabitable floor for any building or structure must be equal or higher than the base flood elevation as determined by the flood hazard boundary map and the county engineer (Sec. 106-2-8).

Wildfire risk is most severe in the foothills of the Wasatch Mountain Range. These areas, known as Wildland-Urban Interface (WUI) zones, are most vulnerable due to the amount and types of vegetation and new structures that act as fuel to a burning fire. This threat may be mitigated by encouraging communities to become "Fire Wise Communities", continued use of building and zoning codes and increasing the public's awareness. Currently no Weber County communities participate in the Firewise program.

Landslide/slope failure is another threat near the foothills of the Wasatch Mountains. Much new development can be found near areas of current landslides. More detailed landslide studies and zoning appropriate for high hazard areas will decrease the likelihood of landslides damaging persons and property.

PART X. MITIGATION STRATEGIES, OBJECTIVES, ACTIONS

Using the findings from the risk assessment and the capabilities assessment as a guide, several mitigation strategies and implementing actions were identified for Weber County. Each action has been formalized and placed into this Plan. These actions were identified in the planning group meetings which included input from the planning team, state and local agencies, county government, and city and county residents.

Goals and objectives were developed by the above-mentioned groups with a period provided for comment and revision.

Each of the jurisdictions identified mitigation actions based on the identified goals and objectives. These actions are included in each city/district section of this Plan. The mitigation actions identify the responsible agency, the funding source, timeline, background, and their priority. Actions were selected using the information obtained from the capabilities assessment, which identified existing programs and shortfalls related to mitigation activities. The actions were prioritized based on the Social, Technical, Administrative, Political, Legal, Economic, Environmental (STAPLEE) method identified in the FEMA How-To Guides. The STAPLEE method of prioritization emphasizes the effectiveness of the actions with respect to their cost, as well as their social, technical, administrative, political, legal, environmental, and economic effects. Each action is judged and ranked against these criteria and assigned the priority of High, Medium, or Low.

The following mitigation strategies were formulated by the Weber County Emergency Management Group at the Weber County Sheriff's Office. The Group sought to refine and expand on efforts already in place from the 2009 version of this Plan.

Dam Failure

Problem Identification: The failure of federal, state and private dams can impact Weber County.

OBJECTIVE #1 (Priority HIGH): Reduce the impact of catastrophic flooding due to dam failure

Action 1: In partnership with the U. S. Bureau of Reclamation (BOR), develop accurate dam failure inundation maps for BOR dams.

Time Frame:	5-10 years
Funding:	Local, state and federal
Estimated Cost:	To be determined
Staff:	County Emergency Management, State, BOR
Jurisdictions:	Countywide

OBJECTIVE #2 (Priority MEDIUM): Reduce the impact of catastrophic flooding due to dam failure

Action 1: In partnership with the U. S. Bureau of Reclamation (BOR), develop accurate dam failure inundation maps for BOR dams in continuing with 2009 actions.

Time Frame:	2-3 years
Funding:	Local, state and federal
Estimated Cost:	Minimal cost to the County
Staff:	County Emergency Management, State, BOR

Jurisdictions: Countywide

Earthquake

Problem Identification: The Weber Center in downtown Ogden houses most Weber County government operations. The parking structure needs seismic retrofitting.

Objective #1 (Priority HIGH): Improve seismic resilience at The Weber Center.

Action 1: Hire a structural engineer to determine options and costs for the retrofit or rebuild of the structure.
Time Frame: In progress
Funding: Local, State Earthquake Program Grant
Estimated Cost: $30,000
Staff: County operations, County engineer, consulting engineer
Jurisdictions: Ogden

Action 2: Implement structural engineering recommendations to meet seismic standards.
Time Frame: Unknown
Funding: Local, FEMA PDM, State Earthquake Program Grant
Estimated Cost: Unknown until solutions determined
Staff: County operations, County engineer, consulting engineer
Jurisdictions: Ogden

Problem Identification: Two county-owned pump stations require electricity to operate, in the case of power loss or damage caused by an earthquake service would be suspended.

Action 1: Add emergency back-up power, and seismic upgrades to sewer lift stations. SCADA need to monitor systems.
Time Frame: Unknown, depending on funding
Funding: Local, FEMA PDM, State Earthquake Program Grant
Estimated Cost: Unknown
Staff: County operations, County engineer, consulting engineer
Jurisdictions: Weber County

Flood

Problem Identification: Lower Weber River Levee has significant damage from flooding and age, needs repair to prevent flooding to homes, schools and farms in the area.

Objective #1 (Priority HIGH): Complete repairs at lower Weber River Levee.

Action 1: Repair the levee and complete rip rap and bank stabilization projects to complete improvements.
Time Frame: Unknown, depending on funding
Funding: Local, FEMA PDM, State Earthquake Program Grant
Estimated Cost: $3,000,000
Staff: County operations, County engineer, consulting engineer

Jurisdictions: Weber County

Action 2: Complete repairs in the Fort Buenaventura area by building sediment ponds and engineered wetlands to clean the water before it enters the fishing lake.
Time Frame: Unknown, depending on funding
Funding: Local, FEMA PDM, CDBG-NDRC
Estimated Cost: $250,000
Staff: County operations, County engineer, consulting engineer
Jurisdictions: Weber County

Action 3: Increase the capacity of the Burch Creek Railroad Crossing to prevent the flooding of local businessess.
Time Frame: Unknown, depending on funding
Funding: Local, FEMA PDM, CDBG-NDRC
Estimated Cost: $630,000
Staff: County operations, County engineer, consulting engineer
Jurisdictions: Weber County

Problem Identification: Stormwater continues to be a critical flood issue in the county.

Objective #1 (Priority HIGH): Enact a county stormwater ordinance to revise discharge rate requirements for new construction.
Time Frame: Adoption anticipated in January 2016
Funding: Local
Estimated Cost: Minimal
Staff: County engineer, County attorney
Jurisdictions: Weber County

Objective #2 (Priority HIGH): Implement and fund identified stormwater projects in the Upper Valley to lessen impact of flooding in the county.

Action 1: Storm Drain Piping 1100 South 6800 East - Valley Lake Estates corner of 1100 S and 8900 E to HWY 39
Time Frame: Unknown
Funding: Local, State, FEMA PDM
Estimated Cost: $103,380
Staff: County engineering
Jurisdictions: Weber County

Action 2: Easements & Ditch from Shaw Drive South to Church (Above Bailey Acres)
Time Frame: Unknown
Funding: Local, State, FEMA PDM
Estimated Cost: $45,870
Staff: County engineering
Jurisdictions: Weber County

Action 3: Install drain pipe and pipe to Chicken Creek (4100 North 3400 East)
Time Frame: Unknown
Funding: Local, State, FEMA PDM
Estimated Cost: $15,600
Staff: County engineering
Jurisdictions: Weber County

Action 4: Remove 36" pipe in Eden Acres Subdivision above structure
Time Frame: Unknown
Funding: Local, State, FEMA PDM
Estimated Cost: $15,265
Staff: County engineering
Jurisdictions: Weber County

Action 5: Increase pipe size through intersection at 4100 North 3300 East
Time Frame: Unknown
Funding: Local, State, FEMA PDM
Estimated Cost: $15,265
Staff: County engineering
Jurisdictions: Weber County

Action 6: Catch Basin on North Ogden Divide to divert water that is eroding bank
Time Frame: Unknown
Funding: Local, State, FEMA PDM
Estimated Cost: $3,385
Staff: County engineering
Jurisdictions: Weber County

Action 7: Ditch to direct storm drain southeast of Country Gardens, 2300 North
Time Frame: Unknown
Funding: Local, State, FEMA PDM
Estimated Cost: $70,800
Staff: County engineering
Jurisdictions: Weber County

Action 8: Replace two rusted out culverts, Hwy 162 near 3300 North
Time Frame: Unknown
Funding: Local, State, FEMA PDM
Estimated Cost: $8,220
Staff: County engineering
Jurisdictions: Weber County

Action 9: Repair Storm Drain Issues in Sheep Creek, west of 4084 East on 4500 North
Time Frame: Unknown
Funding: Local, State, FEMA PDM
Estimated Cost: $10,000
Staff: County engineering

Jurisdictions: Weber County

Action 10: Improve barrow ditch on 3500 East and 3300 North
Time Frame: Unknown
Funding: Local, State, FEMA PDM
Estimated Cost: $61,548
Staff: County engineering
Jurisdictions: Weber County

Action 11: Improve barrow ditch on 3300 East and 4100 North
Time Frame: Unknown
Funding: Local, State, FEMA PDM
Estimated Cost: $8,100
Staff: County engineering
Jurisdictions: Weber County

Action 12: Improve barrow ditch on 3300 East from Bailey Acres
Time Frame: Unknown
Funding: Local, State, FEMA PDM
Estimated Cost: $56,580
Staff: County engineering
Jurisdictions: Weber County

Action 13: Drainage from Nordic Valley Drive to North Fork River down Hwy 162
Time Frame: Unknown
Funding: Local, State, FEMA PDM
Estimated Cost: $57,645
Staff: County engineering
Jurisdictions: Weber County

Objective #2 (Priority HIGH): Implement and fund identified stormwater projects in the Lower Valley to lessen impact of flooding in the county.

Action 1: Install pipe on Melanie Lane
Time Frame: Unknown, dependent upon funding
Funding: Local, State, FEMA PDM
Estimated Cost: Unknown
Staff: County engineering
Jurisdictions: Weber County

Action 2: Storm drain piping 4550 West at 2847 South
Time Frame: Unknown, dependent upon funding
Funding: Local, State, FEMA PDM
Estimated Cost: $21,000
Staff: County engineering
Jurisdictions: Weber County

Action 3: Remove/replace pipe – 1775 South 3500 West

Time Frame: Unknown, dependent upon funding
Funding: Local, State, FEMA PDM
Estimated Cost: $78,972
Staff: County engineering
Jurisdictions: Weber County

Action 4: Uintah Highlands Lincoln Highway Pond Drainage
Time Frame: Unknown, dependent upon funding
Funding: Local, State, FEMA PDM
Estimated Cost: $10,000
Staff: County engineering
Jurisdictions: Weber County

Objective #3 (Priority MEDIUM): Implement and fund identified stormwater projects in the Upper Valley to lessen impact of flooding in the county.

Action 1: Drainage on 3300 East, culvert to take water to Chicken Creek
Time Frame: Unknown, dependent upon funding
Funding: Local, State, FEMA PDM
Estimated Cost: $2,952
Staff: County engineering
Jurisdictions: Weber County

Action 2: Eden Acres Detention Pond or Relief from the canal
Time Frame: Unknown, dependent upon funding
Funding: Local, State, FEMA PDM
Estimated Cost: Unknown
Staff: County engineering
Jurisdictions: Weber County

Action 2: Eden Acres Detention Pond or Relief from the canal
Time Frame: Unknown, dependent upon funding
Funding: Local, State, FEMA PDM
Estimated Cost: Unknown
Staff: County engineering
Jurisdictions: Weber County

Action 3: Outlet structure on existing pond, Elkhorn Subdivision; corner of Buckhorn Drive and Elkridge Trail
Time Frame: Unknown, dependent upon funding
Funding: Local, State, FEMA PDM
Estimated Cost: $8,400
Staff: County engineering
Jurisdictions: Weber County

Action 4: Clean and modify existing storm drain at intersection of Hwy 158 Wolf Creek Drive and 3900 North Elkhorn Trial

Time Frame: Unknown, dependent upon funding
Funding: Local, State, FEMA PDM
Estimated Cost: $12,242
Staff: County engineering
Jurisdictions: Weber County

Action 5: Clean and rip rap drainage channel in Sheep Creek
Time Frame: Unknown, dependent upon funding
Funding: Local, State, FEMA PDM
Estimated Cost: $7,260
Staff: County engineering
Jurisdictions: Weber County

Action 6: Install catch basin 4390 North 3175 East
Time Frame: Unknown, dependent upon funding
Funding: Local, State, FEMA PDM
Estimated Cost: $5,000
Staff: County engineering
Jurisdictions: Weber County

Action 7: Culverts on Avon Divide
Time Frame: Unknown, dependent upon funding
Funding: Local, State, FEMA PDM
Estimated Cost: $11,808
Staff: County engineering
Jurisdictions: Weber County

Action 8: Define Drainage Swale and Place Culvert – Viking Drive and Nordic Valley Way
Time Frame: Unknown, dependent upon funding
Funding: Local, State, FEMA PDM
Estimated Cost: $9,252
Staff: County engineering
Jurisdictions: Weber County

Action 9: Clean and install new pipe and connect to main drainage – 3804 East 2050 North , Nordic Valley

Time Frame: Unknown, dependent upon funding
Funding: Local, State, FEMA PDM
Estimated Cost: $7,260
Staff: County engineering
Jurisdictions: Weber County

Action 10: Replace and upgrade existing pipe – 3500 East across from ski resort
Time Frame: Unknown, dependent upon funding
Funding: Local, State, FEMA PDM
Estimated Cost: $25,220

Staff: County engineering
Jurisdictions: Weber County

Objective #4 (Priority MEDIUM): Implement and fund identified stormwater projects in the Lower Valley to lessen impact of flooding in the county.

Action 1: Raise MH that is covered – 2200 South and 4075 West
Time Frame: Unknown, dependent upon funding
Funding: Local, State, FEMA PDM
Estimated Cost: $10,000
Staff: County engineering
Jurisdictions: Weber County

Action 2: Pipe Warm Springs western drain water
Time Frame: Unknown, dependent upon funding
Funding: Local, State, FEMA PDM
Estimated Cost: $2,000
Staff: County engineering
Jurisdictions: Weber County

Action 3: Repair fence around detention pond in Industrial Park
Time Frame: Unknown, dependent upon funding
Funding: Local, State, FEMA PDM
Estimated Cost: $20,000
Staff: County engineering
Jurisdictions: Weber County

Action 4: Storm drain upgrades by school off Eastwood
Time Frame: Unknown, dependent upon funding
Funding: Local, State, FEMA PDM
Estimated Cost: Unknown
Staff: County engineering
Jurisdictions: Weber County

Action 5: Storm drain upgrades by school off Eastwood
Time Frame: Unknown, dependent upon funding
Funding: Local, State, FEMA PDM
Estimated Cost: Unknown
Staff: County engineering
Jurisdictions: Weber County

Action 6: Repair pipe west of 2100 East Combe Road
Time Frame: Unknown, based on funding
Funding: Local, State, FEMA PDM
Estimated Cost: $6,000
Staff: County engineering
Jurisdictions: Weber County

Action 7: Warm Springs western drain water, increase pipe size
Time Frame: Unknown, based on funding
Funding: Local, State, FEMA PDM
Estimated Cost: $60,000
Staff: County engineering
Jurisdictions: Weber County

Action 8: Fairground Pond-Large detention pond pipe
Time Frame: Unknown, based on funding
Funding: Local, State, FEMA PDM
Estimated Cost: $50,000
Staff: County engineering
Jurisdictions: Weber County

Action 9: Combe Road Inlet Box
Time Frame: Unknown, based on funding
Funding: Local, State, FEMA PDM
Estimated Cost: $5,000
Staff: County engineering
Jurisdictions: Weber County

Objective #4 (Priority LOW): Implement and fund identified stormwater projects in the Upper Valley to lessen impact of flooding in the county.

Action 1: Drainage at 3678 East 4350 North, Liberty
Time Frame: Unknown, based on funding
Funding: Local, State, FEMA PDM
Estimated Cost: $114,222
Staff: County engineering
Jurisdictions: Weber County

Action 2: Locate and find MH on storm drain, Willow Brook Lane and Willow Brook Circle
Time Frame: Unknown, based on funding
Funding: Local, State, FEMA PDM
Estimated Cost: $10,000
Staff: County engineering
Jurisdictions: Weber County

Action 3: Storm Drain Box – 3786 Abbeyon Drive
Time Frame: Unknown, based on funding
Funding: Local, State, FEMA PDM
Estimated Cost: $6,000
Staff: County engineering
Jurisdictions: Weber County

Action 4: Clean and sterilize Seed Gail Armstron Drain – 2300 North

Time Frame: Unknown, based on funding
Funding: Local, State
Estimated Cost: $53,280
Staff: County engineering
Jurisdictions: Weber County

Action 5: Catch Basins at bottom Elkridge Trail – clean and flush
Time Frame: Unknown, based on funding
Funding: Local, State
Estimated Cost: $10,000
Staff: County engineering
Jurisdictions: Weber County

Action 6: 2113 North 3850 East – clean and flush
Time Frame: Unknown, based on funding
Funding: Local, State
Estimated Cost: $2,000
Staff: County engineering
Jurisdictions: Weber County

Action 7: Shooting Range Pipe
Time Frame: Unknown, based on funding
Funding: Local, State
Estimated Cost: $8,000
Staff: County engineering
Jurisdictions: Weber County

Action 8: Modify grate on catch basin in detention pond below Moose Hallow
Time Frame: Unknown, based on funding
Funding: Local, State
Estimated Cost: $1,500
Staff: County engineering
Jurisdictions: Weber County

Objective #5 (Priority LOW): Implement and fund identified stormwater projects in the Lower Valley to lessen impact of flooding in the county.

Action 1: Catch Basin Modification – End of Canyon Road
Time Frame: Unknown, based on funding
Funding: Local, State, FEMA PDM
Estimated Cost: $5,000
Staff: County engineering
Jurisdictions: Weber County

Action 2: Combe Road Asphalt Gutter
Time Frame: Unknown, based on funding
Funding: Local, State, FEMA PDM
Estimated Cost: Unknown
Staff: County engineering

Jurisdictions: Weber County

Action 3: Burch Creek – clean rail crossing culverts
Time Frame: Unknown, based on funding
Funding: Local, State, FEMA PDM
Estimated Cost: Unknown
Staff: County engineering
Jurisdictions: Weber County

Action 4: 5500 South 4400 West Culvert
Time Frame: Unknown, based on funding
Funding: Local, State, FEMA PDM
Estimated Cost: $5,000
Staff: County engineering
Jurisdictions: Weber County

Action 5: Mud Creek Detention Basin
Time Frame: Unknown, based on funding
Funding: Local, State, FEMA PDM
Estimated Cost: Unknown
Staff: County engineering
Jurisdictions: Weber County

Action 6: Culvert under Hooper Canal and 3300 West
Time Frame: Unknown, based on funding
Funding: Local, State, FEMA PDM
Estimated Cost: $5,000
Staff: County engineering
Jurisdictions: Weber County

Action 7: Howard Slough Study
Time Frame: Unknown, based on funding
Funding: Local, State
Estimated Cost: Unknown
Staff: County engineering
Jurisdictions: Weber County

Action 8: Roy/West Haven Detention on Barlow Property
Time Frame: Unknown, based on funding
Funding: Local, State
Estimated Cost: Unknown
Staff: County engineering
Jurisdictions: Weber County

Action 9: 2700 North Diversion from Western to Willard Canal
Time Frame: Unknown, based on funding
Funding: Local, State
Estimated Cost: Unknown

Staff: County engineering
Jurisdictions: Weber County

Action 10: Culvert on 6700 West & 2550 North
Time Frame: Unknown, based on funding
Funding: Local, State
Estimated Cost: $5,000
Staff: County engineering
Jurisdictions: Weber County

Action 11: Rice Creek Detention Basin
Time Frame: Unknown, based on funding
Funding: Local, State
Estimated Cost: Unknown
Staff: County engineering
Jurisdictions: Weber County

Action 12: Culvert on 5900 West & 2400 North
Time Frame: Unknown, based on funding
Funding: Local, State
Estimated Cost: $5,000
Staff: County engineering
Jurisdictions: Weber County

Action 13: Culvert under 700 North & 7500 West
Time Frame: Unknown, based on funding
Funding: Local, State
Estimated Cost: $5,000
Staff: County engineering
Jurisdictions: Weber County

Action 14: Culvert under 700 North & 7000 West
Time Frame: Unknown, based on funding
Funding: Local, State
Estimated Cost: $5,000
Staff: County engineering
Jurisdictions: Weber County

Action 15: Culvert on 1900 North about 6350 West
Time Frame: Unknown, based on funding
Funding: Local, State
Estimated Cost: $5,000
Staff: County engineering
Jurisdictions: Weber County

Action 16: Culvert under 6700 West & 250 North
Time Frame: Unknown, based on funding
Funding: Local, State

Estimated Cost: $5,000
Staff: County engineering
Jurisdictions: Weber County

Action 17: Culvert at 3500 West & 900 South
Time Frame: Unknown, based on funding
Funding: Local, State
Estimated Cost: $5,000
Staff: County engineering
Jurisdictions: Weber County

Action 18: Culvert at 1600 South and 5100 West
Time Frame: Unknown, based on funding
Funding: Local, State
Estimated Cost: $5,000
Staff: County engineering
Jurisdictions: Weber County

Action 19: Culvert at 2550 South & 4700 West (UDOT Intersection)
Time Frame: Unknown, based on funding
Funding: Local, State
Estimated Cost: $5,000
Staff: County engineering
Jurisdictions: Weber County

Action 20: Culvert at 4000 South & 3550 West (West Haven City)
Time Frame: Unknown, based on funding
Funding: Local, State
Estimated Cost: $5,000
Staff: County engineering
Jurisdictions: Weber County

Action 21: Catch Basin and Pipe to Connect the West side of the rd to Fenster Farms
Time Frame: Unknown, based on funding
Funding: Local, State
Estimated Cost: Unknown
Staff: County engineering
Jurisdictions: Weber County

Severe Weather

Problem Identification:

Objective #1 (Priority MEDIUM):

Action 1: Long-term sheet flow flooding mitigation project in the area of 2300 North.

Time Frame: Unknown dependent on funding and easement acquisition
Funding: Local, FEMA PDM

Estimated Cost: Unknown
Staff: County Emergency Management/County Engineering
Jurisdictions: Countywide

Objective #2 (Priority MEDIUM): Help vulnerable populations be prepared in the case of severe weather.

Action 1: Continue with supporting the operations and public education regarding the Special Needs Registry. The registry notifies residents that need oxygen, medical equipment, etc. of coming severe storms, extreme heat, power outages and other hazards so they can plan ahead for back-up power, obtain extra supplies, etc.

Time Frame: Ongoing
Funding: State
Estimated Cost: Minimal
Staff: County Emergency Management/County Engineering
Jurisdictions: Countywide

Slope Failure

Problem Identification: Weber County has a significant number of landslide hazard areas.

Objective #1 (Priority HIGH): Reduce/stop sliding and sluffing along Old Snow Basin Road.

Action: Implement recommendations of studies completed; determine necessary actions

Time Frame: Unknown; based on funding
Funding: Local, State, FEMA PDM
Estimated Cost: Unknown
Staff: County Emergency Management/County Engineering
Jurisdictions: Weber County

Objective #2 (Priority MEDIUM): More narrowly define standards of care and construction for properties located in known geologic hazard areas to include: faults, slide scarps, problem soil areas.

Action: Update of County Geologic Hazards Building Ordinance

Time Frame: 3-5 years
Funding: Local
Estimated Cost: Minimal
Staff: County Engineering/County Attorney
Jurisdictions: Weber County

Drought

Wildland Fire

Problem Identification: The Wildland-Urban Interface (WUI) continues to be of concern in the Uintah Highlands, Wolf Creek, North Ogden and several areas in Ogden Valley.

Objective #1 (Priority MEDIUM): Reduce potential impact to life and property in WUI areas

Action 1: Work with Ogden City Fire Department to develop an Interagency Wildland Urban Interface Response Plan and Procedures

Time Frame: Within 1 year
Funding: County/City Emergency Management
Estimated Cost: Minimal
Staff: County/City Emergency Management, Weber Fire District, Ogden City

Action 2: Work with cities to develop and implement fireworks restrictions.

Time Frame: Ongoing
Funding: State, County
Estimated Cost: Minimal
Staff: County/City Emergency Management, Weber Fire District, North View Fire District, Public Officials
Jurisdictions: Countywide

Action 3: Continue to encourage communities implement "firewise" actions.

Time Frame: Ongoing
Funding: County
Estimated Cost: Minimal
Staff: County Emergency Management
Jurisdictions: Countywide

Epidemic/Pandemic

Problem Identification: Weber and Morgan Counties could experience 100,000 individual influenza cases, 50,000 outpatient doctor visits, 1500 additional hospitalizations and 400 deaths from a pandemic.

Action 1: Pandemic Influenza Planning

Time Frame: Ongoing
Funding: Centers for Disease Control and Prevention – Investigations and Technical Assistance Public Health Emergency Preparedness/Utah Department of Health
Estimated Cost: Unknown
Staff: Weber-Morgan Health Department
Jurisdictions: Countywide

Action 2: Public education, informative booklet: "Family Emergency Preparedness Guide and Flu Home Care Guide."

Time Frame: Ongoing
Funding: County

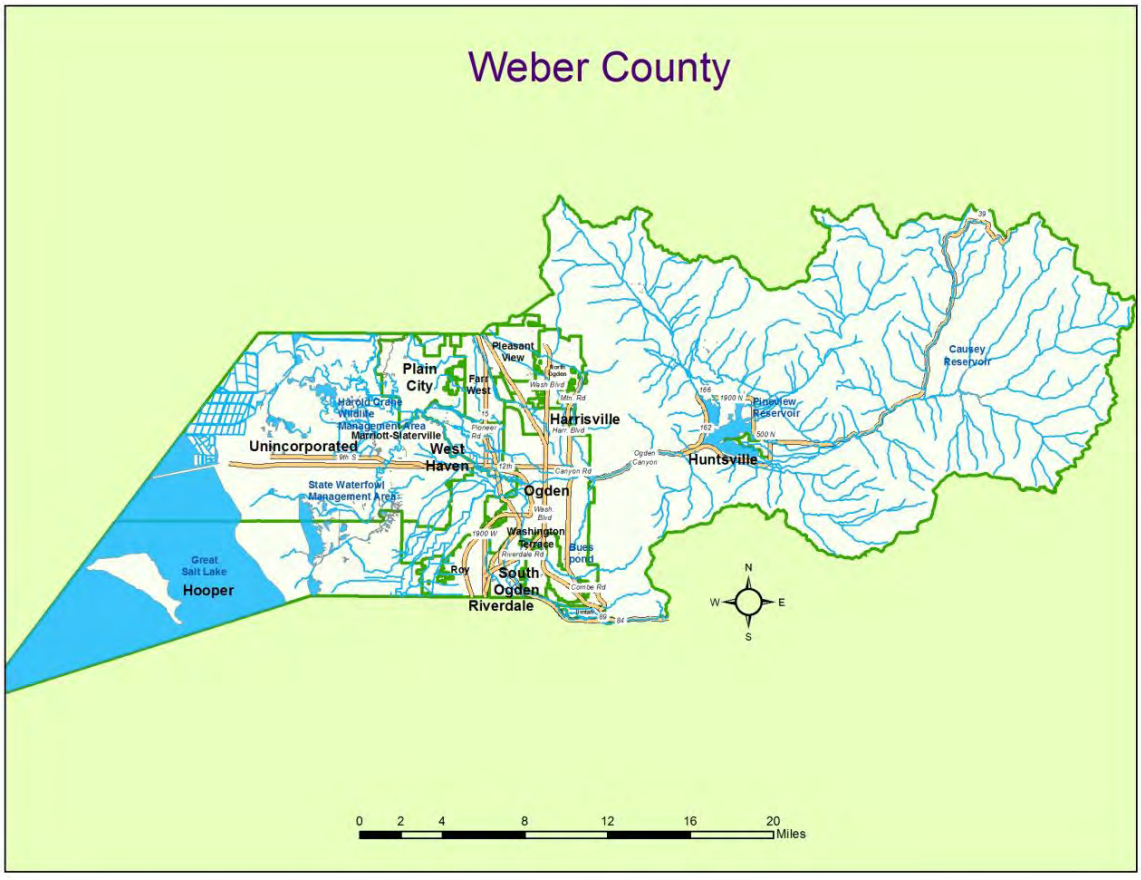
Estimated Cost: Unknown
Staff: Weber-Morgan Health Department
Jurisdictions: Countywide

Infestation

Insect infestation is mitigated by the Utah Department of Agriculture and Food at the state level. Weber County will support mitigation efforts as requested by the State.

PART XI. WEBER COUNTY COMMUNITIES

Weber County is home to 15 distinct municipalities with approximately 17,720 people living in the unincorporated areas of the County. Representatives from each of these communities participated in the planning process. They worked with the public and elected officials to identify the hazards affecting their community, worked with public works staff and emergency managers to develop mitigation strategies, and they provided background information and demographics. Land Use and General Plans were gathered and reviewed during the planning process in order to coordinate the plans to aid in efficient hazard mitigation. The results of this effort are laid out in this section of the Plan.



Map 10-1. Weber County Municipalities

As demonstrated in Table 10-1, Weber County is comprised mainly of small cities and towns; 10 of the County's municipalities have less than 10,000 people. These small, and often rural, communities have limited staff and resources to engage in a detailed hazard analysis. Despite these limitations, each community has prioritized the PDM planning effort in order to identify the major hazards that may impact their communities and to develop sound mitigation strategies.

Municipality	**Population**	**Growth** (since 2010 Census)
Farr West	6,140	3.6%
Harrisville	5,915	5.9%
Hooper	7,957	10.2%
Huntsville	619	1.5%
Marriott-Slaterville	1,737	1.9%
North Ogden	18,019	3.9%
Ogden	84,249	1.7%
Plain City	6,049	9.8%
Pleasant View	8,571	7.3%
Riverdale	8,560	1.6%
Roy	37,773	2.3%
South Ogden	16,789	1.6%
Uintah City	1,327	0.1%
Washington Terrace	9,164	1.1%
West Haven	11,248	9.5%
Unincorporated	17,720	4.0%
TOTAL	240,475	4.0%

Table 10-1 Population Estimates
Source: US 2010 Census and 2013/2014 estimates

FARR WEST CITY

Background Information

Was incorporated in 1981 and established in 1857. Current population is about 6800 and growing. Major businesses include Smith and Edwards, Cal Ranch, and Associated Foods.

Farr west has a mayor-Council form of government. The city has 6 fulltime employees handle City Administration and Public. Weber County Sheriff is contracted for police services

Specific Community Hazards

Some of the specific hazards include: earthquake, flooding (with 2 main canals, Willard Canal and Western Canal), Soils are an issue for pipes in the area.

Critical Facilities

There is a Now-Care medical office, City Hall, Fire Station, Walquist Junior High, Farr West Elementary, and Associated Foods distribution center.

Mitigation Strategies Implemented since the 2009 Plan

The city has spent $600k on the western Canal in the Remuda Area. A generator has been purchased for the Sewer Lift station in Remuda. Buildings have been built on piles for liquefaction mitigation, and GIS mapping of Sewer, and Storm Drain.

Planned Mitigation Strategies

Earthquake

Problem Identification: No power after an earthquake or other hazard.

OBJECTIVE #1 Priority High: Reduce the impact on city functions due to a major earthquake.

Action 1: Equip City Hall with a Generator.

Time Frame: Ongoing
Funding: Local and State
Estimated Cost: Unknown
Staff: City Emergency Manager, Public Works, Engineer, etc.
Jurisdictions : Farr West City

Action 2: Continue Mapping of Sewer and Storm Drain

Time Frame: Unknown; based on funding
Funding: Local and State
Estimated Cost: Unknown
Staff: City Engineer/Public Works
Jurisdictions: Farr West City

Flooding

Problem Identification: need of detention basins on the storm drain to reduce flood hazard.

OBJECTIVE #1 (Priority High): Reduce the impact of catastrophic flooding

Action 1: Construct 5 acre Pond/Park for flood mitigation.

Time Frame:	Ongoing
Funding:	Possible WACOG and Local and State funds
Estimated Cost:	Unknown
Staff:	City Emergency Manager, Public Works, Engineer, etc.
Jurisdictions :	Farr West City

HARRISVILLE CITY

Background Information

Harrisville is a fifth class city with a population of 5,915 and an estimated 1,850 households. The City's 2.7 square miles of land area is bounded by the neighboring cities of Ogden, North Ogden, Pleasant View and Farr West. Harrisville is located two miles northwest of downtown Ogden. The City has a growing high density housing area on the north end of the City bordering Pleasant View. There is also growing retail area on the southern border that is anchored by a Walmart Super Center.

The city government consists of a Mayor/ Council system with a part time city administrator. The city maintains its own 9-man police department and fire and EMS services are provided by the North View Fire District.

Specific Community Hazards

1. **Storm water flooding**. This threat is posed not only from storm water generated within the city but from surrounding cities that channel their excess storm water through Harrisville City.
2. **Earthquake damage**. This threat is posed mainly to critical infrastructure such as the City Office building, public schools and Public works facilities. There are also irrigation canals and natural creek drainages that are channeled under city streets and state highways that face the potential for collapse. The main threat faced by Harrisville City is the potential for loss of the City Office building is potential collapse and flooding as a result of an earthquake.

Mitigation Strategies Implemented since the 2009 Plan

To address the hazard of flooding, Harrisville City ongoing mitigation actions include City Stormwater Management Program and the interconnection of stormwater flood and overflow basins including ongoing regular maintenance and inspections. Additionally, all new development is integrated into the existing system to ensure city-wide protection.

Planned Mitigation Strategies

Storm Water Flooding

Problem Identification:

OBJECTIVE #1 (Priority Medium): Reduce the impact of catastrophic storm flooding due to excessive runoff from a large or long term storm or excessive spring runoff.

Action 1: Develop and maintain long term storm water management plan in cooperation with neighboring communities and county agencies.

Time Frame: Ongoing Program
Funding: Potential funding source is local storm water funds
Estimated Cost: $10,000
Staff: 1 quarter time public works employee
Jurisdictions: Harrisville City

Action 2: Maintain ongoing infrastructure inspections to ensure structures remain sound and water flow paths are not filled with debris.

Time Frame: Ongoing
Funding: Storm water funds
Estimated Cost: $10,000
Staff: 1 quarter time public works employee
Jurisdictions: Harrisville City

Action 3: Develop and maintain long term development plan to ensure new development is adequately connected to storm water drainage.

Time Frame: Ongoing
Funding: Funding for this program is paid by developers.
Estimated Cost: $0
Staff: City Planner
Jurisdictions : Harrisville City

Earthquake Damage

Problem Identification:

OBJECTIVE #1 (Priority {Low): Reduce the impact of catastrophic collapse and floofing flooding due to earthquake.

Action 1: Develop long trem plan to replace city office building with modern structures that will safely house all city services.

Time Frame: 5 year plan
Funding: Potential funding sources include Storm Water, Parks funds, allocated city funding and possible bonds.
Estimated Cost: $5,000,000
Staff: City Administrator
Jurisdictions: Harrisville City

Action 2: Ongoing inspection and maintenance.

Time Frame:	Ongoing
Funding:	City allocations and storm water
Estimated Cost:	$10,000
Staff:	Public works
Jurisdictions:	Harrisville City

HOOPER CITY

Background Information

Hooper City is in western Weber County bordered by the Great Salt Lake on the west, Roy and West Haven on the east and south until the Davis County line. The City encompasses 26.88 square miles, including Fremont Island in the Great Salt Lake. The population is 7,957 and the Governor's Office of Planning and Budget anticipates that Hooper will grow by 199.8% by 2060. Hooper has approximately 2,200 households with an average of 3.8 people per household.

The City provides vacuum sewer service, storm water management, and garbage service. Culinary water is provided by Hooper Water Improvement District and Taylor/West Weber Water District.

Hooper City has a five-member city council with the Mayor as Chairman. Ray Strong is a citizen-volunteer responsible for emergency planning.

Specific Community Hazards

Earthquake
Having a high water table makes Hooper City very susceptible to liquefaction during an earthquake.

Flooding
Most of the City is not located in the floodplain according to FEMA maps, but there is a threat of flooding from the Hooper and Howard Sloughs that run through the City.

Wildland Fire. Dry grasses and open fields can be threatened by wildfire, especially as farmers and ditch managers use controlled burns to manage weeds.

Critical Facilities

The City Building houses most City services and emergency response equipment. Adjacent to the City Building is the Public Works Facility. Hooper Elementary School and Quest Academy (a charter school) are within the City limits. Pump stations for the vacuum sewer are located throughout the City.

Mitigation Strategies Implemented since the 2009 Plan

The rapid growth in Hooper City underscores the need for pre-disaster mitigation planning and Hooper City has been proactive with ordinances and land use planning. All new developments are required to provide storm drain infrastructure: retention, detention and piping as needed. New development is also

reviewed by the Weber Fire Marshall to ensure it meets standards for fire hydrant placement and fire protection standards.

To address the high water table issue, the City requires that no basements are allowed unless a foundation drain is installed around the structure and is tied directly to an approved land drain system.

City ordinances require a 100-foot setback on both sides of the Hooper and Howard Sloughs.

The city has purchased two back-up generators for the City Shops and City Hall to be installed.

Planned Mitigation Strategies

Multi-Hazards

Problem Identification: Loss of power due to multi hazards that would disrupt services.

OBJECTIVE #1 (Priority: High): Provide electricity in the event of power failure for emergency needs.

Action 1: Install the Generators previously purchased including transfer switches at the City Shops and City Hall

Time Frame: Unknown
Funding: Local or State funds.
Estimated Cost: To be determined
Staff: Public Works
Jurisdiction: Hooper City

HUNTSVILLE TOWN

Background Information

Huntsville Town is a small, rural community with a population of about 620 people and 218 households. Huntsville was founded in 1860 by Jefferson Hunt. It is one of three small communities comprising what is known as "Ogden Valley," and is the only incorporated town of the three, incorporated in 1924. Huntsville is located twelve miles east of Ogden City up Ogden Canyon. Its elevation is just under 5,000 feet. At the south west end of the valley, a shimmering Pineview Reservoir forms a mirror for the mountains above.

Huntsville's government consists of a mayor and four council members elected at-large with staggered terms. The Mayor, currently Jim Truett, leads emergency management efforts with support from Kristen Johnson and local LDS Bishop John Bowen.

Specific Community Hazards

Huntsville officials are specifically concerned about the following hazards threatening their community:

Dam Failure: Huntsville Town is surrounded by Pineview Reservoir, created by a Bureau of Reclamation Dam.

Earthquake: Due to its mountainous geography, an issue of concern is that access points in Trappers Loop, Ogden Canyon, North Ogden Divide may be cut off in the event of an earthquake.

Critical Facilities and Infrastructure

Water Treatment Plant, Culinary water springs (3); water pumps; 1M gal water tank, Town Hall, Town Maintenance Shops.

Mitigation Strategies Implemented since the 2009 Plan

Huntsville has implemented a Drinking Water Source Protection (DWSP) plan zones and have been recorded to protect the springs.

Planned Mitigation Strategies

Multi-Hazards

Problem Identification: Response to an emergency in the community

OBJECTIVE #1 (Priority: MEDIUM): Provide effective response in the case of an emergency.

Action 1: Purchase a new CERT Trailer that can be pulled behind a truck in the event of an emergency. The current storage container leaks water and is rusty.

Time Frame: 2015-2016
Funding: Local and Private Donations. The Town has set aside about $3000.
Estimated Cost: Approximately $11,000
Staff: Mayor, Town Council
Jurisdictions : Huntsville Town

Problem Identification: Culinary Water feed for the community.

OBJECTIVE #1 (Priority: HIGH): Provide uninterrupted water supply for the community.

Action 1: Obtain a second water source for the system by drilling a new well.

Time Frame: 2015-2016
Funding: City and State funds
Estimated Cost: To be determined
Staff: Mayor, Town Council
Jurisdictions : Huntsville Town

Action 2: Install 3-phase generator for the pumps.

Time Frame: To be determined
Funding: City and State funds
Estimated Cost: To be determined
Staff: Mayor, Town Council

Jurisdictions : Huntsville Town

Action 3: Have reliable maps of the water system using GPS ties to the GIS map.

Time Frame: 2015-2016
Funding: City funds
Estimated Cost: To be determined
Staff: Mayor, Town Council
Jurisdictions : Huntsville Town

Flooding

Problem Identification: Protect properties from flooding

OBJECTIVE #1 (Priority: HIGH): Protect properties form flood waters in the South Fork River.

Action 1: Fund a study that will determine flood mitigation on South Fork that will coordinate with FEMA flood zones and property needs

Time Frame: Unknown
Funding: Local and Private Donations.
Estimated Cost: Unknown
Staff: Mayor, Town Council
Jurisdictions : Huntsville Town

MARRIOTT-SLATERVILLE

Background Information

Marriott-Slaterville is a community of 1,747 residents with 638 households. The City comprises a 7.3 square mile geographical area in Weber County about 38 miles north of Salt Lake City. Land area of the City ranges in elevation from 4,265 at the easternmost to 4,220 at the western edge. Farr West City borders Marriott-Slaterville on the north, Plain City is to the northwest, West Haven to south, and Ogden borders to the east.

Marriott-Slaterville is unique as the City is located at the heart of the main watercourses in Weber County and is prone to flooding. The Ogden and Weber Rivers join within the city limits and flow along the entire southern border of the City. Further, Mill Creek, Four Mile Creek, and Six Mile Creeks all flow through the City. Therefore, much of the City includes wetland and flood plain areas. Pertaining to tectonic stability liquefaction is a high risk in the community.

Marriott-Slaterville City is governed by a mayor and five-member city council. The City operates under the "mayor-council" form of government (also known as the "strong mayor"), rather than the traditional six-member council form of government in Utah. Bill Morris, the City Administrator, oversees emergency management and disaster preparedness efforts.

The City provides the following services: planning and zoning, building and code enforcement, law enforcement through a sheriff contract, roads, pressurized secondary irrigation through the dependent Pioneer Special Improvement District, parks and recreation, storm water and flood control, emergency services, senior citizens services, and sanitary sewer collection

Specific Community Hazards

Earthquake. Liquefaction risk is high in the City based upon sandy soils.

Landslide. Common during flood events along water ways as banks are washed away.
Wild Land Fire. Rare but has occurred in old growth forest areas along Weber River.

Soils. Liquefaction soils are prevalent in Marriott-Slaterville.

Dam Failure. The City would be devastated by a dam failure as the Weber River runs the course of the whole city and would inundate much of the City.

Flood. One-third of Marriott-Slaterville City is located in the FEMA floodplain. Many other areas of the City are flood prone due to Marriott-Slaterville being one of the lowest areas in Weber County. Flooding is common and is the greatest risk and threat to life and property in the City. Mitigation measures seek to prevent construction in flood prone areas and to acquire flood prone areas.

Drought. Drought creates additional wild fire risks and devastate recreation, water reliant businesses, and farming.

Infestation. The City secondary water system is susceptible to infestation of water insects that have disrupted irrigation in the past and present ongoing challenges. Insect can threaten farming which constitutes about 70% of the city land use.

Severe Weather. High winds and thunder storms occur frequently and can damage structures and present other challenges.

Epidemic/Pandemic. Marriott-Slaterville has two major I-15 exits/entrances (the most of any city in the county) and are vulnerable in epidemic/pandemic situations where transportation is required, the IRS and other businesses and schools are located in or near the city and present close working arrangements and present air-borne epidemic risks.

Critical Facilities and Infrastructure

SECONDARY WATER	
Sources	4
Reservoirs	2
Pumps	4
Mapping	1
SANITARY SEWER	
Major Trunk Lines	9
Mapping	1
OTHER	
CERT Closets	2

Mitigation Strategies Implemented since the 2009 Plan

Earthquake: Education and training, mitigation reconstruction, infrastructure retrofit, structural retrofit of existing buildings and facilities, non-structural retrofitting of existing buildings and facilities, post-disaster code enforcement.

Landslide: Waterway bank soil stabilization, property acquisition of hazard areas.

Wild Land Fire: Controlled burning wildfire mitigation, Weber Fire District programs.

Soils: Soil stabilization, property acquisition of hazard areas.

Dam Failure: While the City does not operate dams/reservoirs, the City will encourage education and training efforts regarding dam failure.

Flood: Education and training, property acquisition and structure demolition, property acquisition and structure relocation, structure elevation, mitigation reconstruction, dry flood-proofing of non-residential structures, dry proofing of historical residential structures, generators, localized flood risk reduction projects, non-localized flood risk reduction projects, post-disaster code enforcement, advance assistance, hazard mitigation planning, technical assistance, management cost.

Drought: Education and training, property acquisition and structure demolition, property acquisition and structure relocation, mitigation reconstruction, post-disaster code enforcement, advance assistance, hazard mitigation planning, technical assistance, management cost.

Infestation: Infrastructure retrofit, generators, advance assistance, infestation control measures (chemical application).

Severe Weather: Education and training, generators, structural retrofitting of existing buildings and facilities, non-structural retrofitting of existing structures and facilities, safe room construction.

Epidemic/Pandemic: Education and training, health department programs.

Planned Mitigation Strategies

Flooding

Problem Identification: Liquefaction risk is high in the City based upon sandy soils.

OBJECTIVE #1 (Priority HIGH): Reduce the impact of flooding and damage to structures and property.

Action 1: Floodplain and Flood Mitigation. Property acquisition and structure demolition/relocation along flood plain areas and adjoining properties, localized/non-localized flood reduction projects.

Time Frame: Ongoing

Funding: Federal and Local
Estimated Cost: $50,000,000
Staff: City Administration, Public Works, Engineering
Jurisdictions : Marriott-Slaterville City

Action 2: Structure Preservation. Mitigation reconstruction, dry flood proofing non-residential/residential historical structures

Time Frame: Dependent upon funding availability
Funding: Federal, State and Local
Estimated Cost: $5,000,000
Staff: City Administration, Engineering
Jurisdictions: Marriott-Slaterville City

Earthquake

Problem Identification: The Ogden and Weber Rivers join within the city limits and flow along the entire southern border of the City. Further, Mill Creek, Four Mile Creek, and Six Mile Creeks all flow through the City. This has caused historic flooding and caused significant damage.

OBJECTIVE #1 (Priority MEDIUM: Mitigate the potential structural damage caused by an earthquake.

Action : Public Works and Safety Project. Structural retrofitting/nonstructural retrofitting of existing buildings and facilities, safe room construction, infrastructure retrofit.

Time Frame: Dependent upon funding availability
Funding: Federal, State and Local
Estimated Cost: $2,000,000
Staff: City Administration, Public Works, Engineering
Jurisdictions : Marriott-Slaterville City

NORTH OGDEN CITY

Background Information

North Ogden City is located on the northern end of Weber County. It is located at the base of the Wasatch Front mountain range abutting mountains on its eastern and northern borders. The City is just over seven square miles with 18,019 residents and 5,441 households.

North Ogden City government includes a Mayor and five council members. Emergency Response is managed by Officer Paul Rhoades with the North Ogden Police Department and Mitigation efforts are overseen by Robert Scott, North Ogden City Planner.

Specific Community Hazards

Bordering along the mountain interface, some of North Ogden's hazards include **rock and landslides** and **wildfires**. With several canyons feeding from the mountains into the city, we also face the threat of **flooding**. There is an active **earthquake** fault traversing the mountainside along our east and north borders of the city, and our culinary water storage tanks are located along or near this fault-line

Critical Facilities and Infrastructure

Critical facilities include the Fire Department, (Building a new police Station in the future), IHC Health Clinic, and the Culinary Water System.

Mitigation Strategies Implemented since the 2009 Plan

Earthquake:

- North Ogden City is in the process of completing a new public works facility. The old facility was not built up to earthquake codes.
- The sewer department is in the process of installing Ultra-lining sewer lining into the existing sewer pipes to allow them to withstand the effects of an earthquake.
- The city parks department is also rebuilding restroom facilities at three of our parks that were determined to not be up to current codes and were not likely to withstand a moderate to substantial earthquake.
- 1 million gallon culinary reservoir in the Cove subdivision engineered to meet seismic standards

Flooding:

- The city is installing a storm water detention basin in an area of the city where there has not been a previous means to catch excess storm water runoff to prevent flooding.
- Retention basin in Wadman Soccer Complex

Multi-Hazards:

- The new restroom facilities have also had additional storage capacity where the city CERT teams store their disaster response gear.

Drought:

- SCADA valve system installation on the culinary water system
- Ben Lomond subdivision pipe retrofit

Avalanche:

- Avalanche and debris retention basin above Cove subdivision

Planned Mitigation Strategies

Earthquake

Problem Identification:

OBJECTIVE #1 (Priority HIGH): Reduce the impact of structural damage due to earthquake

Action 1: New Police Department/Public Works Complex built to meet current codes

Time Frame: Ongoing
Funding: Local and State
Estimated Cost: Unknown
Staff: City Emergency Manager, Public Works, Engineer, etc.
Jurisdictions : North Ogden City

Action 2: Continue ultra-lining sewer mains

Time Frame: Unknown; based on funding
Funding: Local and State
Estimated Cost: Unknown
Staff: Public Works, Engineer, etc.
Jurisdictions: North Ogden City

Flooding

Problem Identification:

OBJECTIVE #1 (Priority High): Reduce the impact of property damage due to *flooding*

Action 1: Storm Water Detention basin on 1700 N

Time Frame: Unknown, based on funding
Funding: Local, state and federal
Estimated Cost: Unknown
Staff: Public Works, Engineer, etc.
Jurisdictions: North Ogden City

Action 3: Upgrade storm water system and drains City wide

Time Frame: Unknown, based on funding
Funding: Local, state and federal
Estimated Cost: Unknown
Staff: Public works, engineer, etc.
Jurisdictions: North Ogden City

Action 3: Construct Storm water regional detention basin.

Time Frame: Unknown, based on funding
Funding: Local, state and federal
Estimated Cost: Unknown
Staff: Public works, engineer, etc.
Jurisdictions: North Ogden City

Multi-Hazard

Problem Identification:

OBJECTIVE #1 (Priority High): Reduce the impact of damage due to multiple hazards

Action 1: Reconstruct Park restrooms and CERT shed components in 3 parks.

Time Frame: Complete 1 of three, based on funding

Funding:	RAMP Grant and City Budget
Estimated Cost:	Unknown
Staff:	City emergency management
Jurisdictions:	North Ogden City

OGDEN CITY

Background Information

Ogden City is the county seat and largest city in Weber County with a population of 84, 249 in 27,000 households. The City is approximately 26.6 square miles and sits at the base of the Wasatch Mountains between 4,300-5,200 feet above sea level. Both the Ogden and Weber Rivers run through Ogden and converge just west of the City. Pineview Dam, an 110,000 acre feet reservoir, is just east of the city limits up Ogden Canyon. A large rail yard is in the middle of the city with lines running north and west out of the city before turning to the south. Ogden has several residential areas, commercial areas throughout the city, two distinct industrial parks, McKay-Dee Hospital, Weber State University and a downtown district. There are two interstates that border the City, I-84 to the south and I-15 on the west. Ogden is a hub for the Frontrunner commuter rail, and a major hub for the Utah Transit Authority's bus service. Ogden also has the second largest airport in Utah that is a class 1 category 3 index B with a ILS cat 1 approach and control tower.
Ogden is a full service city and provides utilities services with the exception of gas, power, and some supplemental secondary water.

Ogden utilizes a mayor-council form of government, with a full time mayor as executive and a seven member part-time council as a legislative branch.

Ethnic and racial minorities make up over 20% of Ogden's population, the largest minority group being Hispanic, followed by African Americans, Asians, American Indian/Alaska Native, and Native Hawaiian or other Pacific Islander.

Specific Community Hazards

Ogden City is subject to many different hazards due to its location at the base of the Wasatch Mountains. These threats are exacerbated by the aging infrastructure that is found in many locations throughout the City.

- Earthquake
- Drought
- Wildland Fire
- Hazardous Materials
- Flooding
- Dam Failure
- Landslides
- Severe Weather

Critical Facilities and Infrastructure

FACILITY	FACILITY TYPE
Airport	Airport
Municipal Building	Government
Public Works Building	Government
Parks/ Rec & Cemetery	Government
Francom Public Safety Building	Government
Justice Court	Government
Fleet Building & Fuel	Government
23rd Street Reservoir	Water Tank
23rd Street Reservoir	Water Tank
23rd Street Reservoir	Water Tank
36th St Tank	Water Tank
36th St Tank	Water Tank
46th St Tank	Water Tank
46th St Reservoir	Water Tank
Clear Well	Water Tank
Large Contact Tank	Water Tank
Hydropneumatic Tank	Water Tank
Filter Backwash Tank	Water Tank
36th St Tank	Water Tank
9th St Tank	Water Tank
9th St Tank	Water Tank
Taylor Canyon Water Tank	Water Tank
Station 5	Fire
Public Safety Building	Combined
Station 2	Fire
Station 3	Fire
Station 4	Fire
Station 6	Fire
Station 3 New	Fire
Bishops Storehouse	Resources
McKay Dee Hospital	Hospital
Ogden Regional Medical Center	Hospital
Aspen Care Center	Assisted Living
Emeritus Estates	Assisted Living
Gardens Assisted Living	Assisted Living
Trinity Mission Wide Horizon	Assisted Living
Harrison Regent Retirement	Assisted Living
Liberty Dialysis	Dialysis
Mark Lindsay Dialysis Center	Dialysis
Crestwood Care Center	Nursing
Desert Health & Rehab	Nursing
George E. Whalen Veterans Home	Nursing
Wasatch Care Center	Nursing

FACILITY	FACILITY TYPE
Weber Morgan Health Department	Shelter
Ogden Public Works	Shelter
Marshall White Center	Shelter
Ben Lomand High School	Shelter
Ogden High School	Shelter
Highland Middle School	Shelter
Mound Fort Middle School	Shelter
Mount Ogden Middle School	Shelter
BDO Gym	Shelter
Golden Hours	Shelter
Dee Community Center	Shelter
St Joes High School	Shelter
WSU	Shelter
OWATC	Shelter
St Pauls	Shelter

Mitigation Strategies Implemented since the 2009 Plan

In 2013, an ISES Study was conducted on the City Facilities. This comprehensive study provided a Facility Condition Assessment, outlining the renewal needs of the buildings over the next ten years. Non-Recurring project items and associated costs were identified as Immediate, Critical and Non-Critical. Seismic upgrades were identified as a Critical need for several buildings. Asbestos Remediation was also identified as a critical need.

Flooding:

- Ogden River Project 2010
- Weber River Project 2014-2018
- Harrison Flooding Storm Drain Project 2014-2015
- Flood plain ordinance update
- Rezoning flood plain areas
- Storm Drain Condition Assessment 2015

Drought

- Ogden Canyon Water line 2014
- 36th water tank reconstruction 2010
- 9th street water tank 2009
- 36th pumphouse 2010
- Taylor canyon water tank and pumphouse 2011
- 36-46 street water transmission line 2013
- 46th street water transmission line 2010
- 23rd street reservoir rehabilitation 2010
- 23rd street pumphouse rehab 2010
- Buchannan water line 2009
- 9th street water transmission line 2009

- Well field rehabilitation 2011
- 24th street water line 2014
- Washington Blvd Water lines 2010
- West Industrial Park Waterlines 2011
- Canyon Pressure improvements 2015
- Monroe Water line 2015
- Airport water line improvements 2013
- Trackline water improvements 2015
- 25th street water transmission line 2016
- Sodium Hyperchlorite upgrades 2012
- Water conservation program 2015+
- Water utility website
- Grant Avenue Water line 2008
- Treatment Plant construction 2014-15

Earthquake

- Lorin Farr Pavilion Seismic Upgrade 2014

Multi-Hazards:

- Casualty Collection Points (CCP) upgrades 2014
- Mobile EOC 2015-2016
- NIMS compliance training
- Shelters
- Upgrading ordinances regarding hazardous areas

Planned Mitigation Strategies

Earthquake

Problem Identification:

OBJECTIVE #1 (Priority: HIGH): Reduce the structural damage, injury or casualties cause by a potential earthquake.

Action 1: Fire Stations #2 and #5 have been upgraded. Fire station #4 is still in need of upgrading. Fire station #3 will be completely new construction instead of upgrading the old structure

Time Frame: Within 24 months
Funding: Federal and Local
Estimated Cost: $
Staff: Ogden City Fire Department, Public Works, Engineering
Jurisdictions : Ogden City

Action 2: Ogden Airport Seismic Proofing of Terminal Tower

Time Frame: Unknown; dependent on funding

Funding: Federal, State and Local
Estimated Cost: Unknown
Staff: Airport Management, Engineering, Public Works
Jurisdictions: Ogden City

Action 3: Ogden City Fire Seismic Shutoff Valves for Natural Gas Mains

Time Frame: Unknown; dependent on funding
Funding: Local, state and federal
Estimated Cost: Unknown
Staff: Ogden City Fire
Jurisdictions: Ogden City

Flooding

Problem Identification:

OBJECTIVE #1 (Priority: HIGH): Reduce the threat of flooding to residents, infrastructure and property.

Action 1: Complete repairs to the Serge Simmons facilities damaged in the 2011 declared flooding disaster

Time Frame: Within 3 years
Funding: Federal and Local
Estimated Cost: Unknown
Staff: Public Works, Engineering
Jurisdictions : Ogden City

Action 2: 17th Street Pump Station and Storm Water

Time Frame: 2015
Funding: Federal, State and Local
Estimated Cost: Unknown
Staff: Engineering, Public Works
Jurisdictions: Ogden City

Action 3: Replace ineffective and dangerous dip stones throughout the City

Time Frame: By 2030
Funding: Local
Estimated Cost: Unknown
Staff: Engineering, Public Works
Jurisdictions: Ogden City

Action 4: Slip lining of sanitary sewer to prevent flooding damage.

Time Frame: 2015
Funding: Local
Estimated Cost: Unknown

Staff: Engineering, Public Works
Jurisdictions: Ogden City

Multi-Hazards

Problem Identification:

OBJECTIVE #1 (Priority: MEDIUM): Increase the availability of emergency shelters.

Action 1: Remodel the Ogden City Airport basement to accommodate emergency sheltering.

Time Frame: Unknown; dependent on funding
Funding: Federal and Local
Estimated Cost: Unknown
Staff: Public Works, Engineering
Jurisdictions : Ogden City

PLAIN CITY

Background Information

Plain City is a rural, bedroom community in northwest Weber County. The City covers nearly 12 square miles, with 6,049 residents in 1,866 households. The City government consists of a Mayor and five city council members.

Specific Community Hazards

Plain City faces the following hazards:

- Flooding. The Weber River runs through Plain City. Willard Bay, a 10,000 acre reservoir, is located just to the north of the City.
- Earthquake. Transportation infrastructure damage is of particular concern in Plain City where all major access points cross bridges.
- Hazardous materials. The City stores 1,500 gallons of chlorine at the sewer lagoons.

Critical Facilities and Infrastructure

Plain City's critical facilities include the infrastructure necessary to provide sewer collection, sewer treatment, fire, storm drain management, roads and landfill services. Due to its flat geography, Plain City has 16 sewer lift stations located throughout the City.

Plain City is home to two public schools: Fremont High School and Plain City Elementary School.

Mitigation Strategies Implemented since the 2009 Plan

Plain City takes fire prevention seriously and works to educate residents on fire safety and requires burn permits for controlled fires.

To mitigate drought conditions, the City employs water conservation practices.

Planned Mitigation Strategies

Earthquake

Problem Identification: Critical City Facilities do not meet seismic standards.

OBJECTIVE #1 (Priority HIGH): Bring City buildings up to current seismic standards.

Action 1: City Hall Seismic Upgrades

Time Frame: Ongoing
Funding: Local, FEMA PDM
Estimated Cost: Unknown
Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions : Plain City

Action 2: Fire Station Seismic Upgrades

Time Frame: Ongoing
Funding: Local, FEMA PDM
Estimated Cost: Unknown
Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions : Plain City

Multi Hazards

OBJECTIVE #1 (Priority MEDIUM): Increase City's capability to plan for and respond to an emergency

Action 1: Purchase a generator for City Hall

Time Frame: Unknown, dependent on funding
Funding: Local, State
Estimated Cost: Unknown
Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions : Plain City

Action 2: Purchase a mobile generator

Time Frame: Unknown, dependent on funding
Funding: Local, State
Estimated Cost: Unknown
Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions : Plain City

Action 3: Purchase a trailer to house generator, lights, supplies for emergency situations.

Time Frame: Unknown, dependent on funding
Funding: Local, State

Estimated Cost: Unknown
Staff: City Administration, Public Works
Jurisdictions : Plain City

Action 4: Chlorine monitor/detector, 4-gas detector

Time Frame: Unknown, dependent on funding
Funding: Local, State
Estimated Cost: Unknown
Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions : Plain City

OBJECTIVE #2 (Priority LOW): Sewer Lift Station to increase capacity

Action 1: Sewer Lift Station

Time Frame: Ongoing
Funding: Local and State
Estimated Cost: $170,000 for basic lift station, $300,000 for equipped lift station
Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions : Plain City

PLEASANT VIEW CITY

Background Information

Pleasant View City is a picturesque community nestled at the base of Mount Ben Lomond in Weber County. With a population of about 8,500 and 2,300 households, Pleasant View offers a variety of housing options, from a view in the foothills, farmland and townhomes, to homes with access to I-15 for commuters. Because of the open space and agricultural land that dots the landscape, Pleasant View retains much of a rural appearance and feel.

Pleasant View occupies an area of approximately 6.7 square miles. It is a gateway community to Weber County for travelers going south on Highway 89 and I-15 and is a last-stop for those heading north along the Wasatch Front.

Pleasant View operates under a six-member form of government, with an elected Mayor and five Council Members. The day-to-day operations and the majority of executive authorities are delegated to a City Administrator, who works hand-in-hand with the Mayor to ensure all city operations are well-run. City operations include a 24-7 police department, part-time animal services, a municipal court, water, garbage/recycling, streets, stormwater, snow removal, community development, and parks and recreation programming. The City has a current full-time staff of 23 employees with Melinda Greenwood, City Administrator, overseeing emergency management and pre-disaster mitigation responsibilities.

Specific Community Hazards

- **Wildland Fire.** Much of Pleasant View City is located in the foothills, increasing the risk for brushfires.
- **Landslides.** The mountainside and foothill areas are also at risk from landslides.
- **Problem soils.** Blasting at the gravel pit in Pleasant View is a concern.
- **Dam failure.** Many water systems throughout the community have small storage reservoirs.
- **Earthquake.** Pleasant View's proximity to the mountains and fault line puts it at risk of earthquake damage.

Critical Facilities and Infrastructure

Culinary Water:

FACILITY	HAZARD/RISK	MITIGATION
Little Missouri Spring and Water Reservoir	Water contamination, flooding, dam failure	Purchase property to expand source protection zone
500 West Water Reservoir	Water contamination, flooding, dam failure	Enhance SCADA
Jessie Creek Water Reservoir, Well House, Pump and Generator	Water contamination, flooding, dam failure	Enhance security
Alder Creek 1 Water Reservoir, Spring	Water contamination, flooding, dam failure	Enhance security
Alder Creek 2 Water Reservoir Well House and Generator	Water contamination, flooding, dam failure	Enhance security
Mac's Water Reservoir, Well House, Pump and Generator	Water contamination, flooding, dam failure	Enhance security
Fred's Well Water Reservoir and Well House	Water contamination, flooding, dam failure	Add a generator; Enhance security
SCADA for Water System	Water contamination; flooding	Enhance system
Water lines	Water contamination; flooding	N/A
37 System Regulators	Water contamination; flooding	N/A

Sanitary Sewer:

Sewer Main Lines (EDA Area, 600 West, 1000 West, 2550 North)	Health hazards; Water system contamination	N/A
500 West Sewer Line (High velocity)	Health hazards; Water system contamination	N/A
900 West Sewer Line (High velocity)	Health hazards; Water system contamination	N/A

CERT:

CERT House	Loss of disaster response supplies	N/A
8 CERT Sheds	Loss of disaster response supplies	N/A

Buildings and Facilities:

City Offices	Loss of vital city records; communication vehicles; day to day functions	TBD
Police Department	Loss of vital police records; impact to day to day functions	TBD
Old Shop	Loss/damage to response equipment	Retrofit for EQ and cure structural issues
Public Works Shop	Loss/damage to response equipment	N/A
IT Network and Server	Loss of communications	Enhance security
EOC	Loss of operability for EOC	Equip EOC; Complete connection to fiber/analog lines
Main Generator for City Office	Loss of power for critical operations	Enhance security

Stormwater:

AG Detention Basin	Flooding	N/A
Barker Retention Basin	Flooding	Dredge and de-silt
Alder Creek Detention Basin	Flooding	Replace box and gate infrastructure
Approximately 17 other Detention Basins	Flooding	TBD
Storm Drain Lines and boxes	Flooding	N/A

Main Arterial Roads:

500 West	Destruction, evacuation and response concerns	N/A
600 West	Destruction, evacuation and response concerns	N/A
900 West	Destruction, evacuation and response concerns	N/A
1000 West	Destruction, evacuation and response concerns	N/A
1100 West	Destruction, evacuation and response concerns	N/A

Elberta Drive	Destruction, evacuation and response concerns	N/A
Pleasant View Drive	Destruction, evacuation and response concerns	N/A

Mitigation Strategies Implemented since the 2009 Plan

Pleasant View City is beginning to take the steps necessary to create an emergency management plan for the City.

Planned Mitigation Strategies

Dam Failure/Flooding

Problem Identification: Vulnerable storage reservoirs and culinary water infrastructure.

OBJECTIVE #1 (Priority MEDIUM): Enhance security and operations of culinary water systems.

Action 1: Purchase property to expand source: Little Missouri Spring and Water Reservoir.

Time Frame: Unknown, based on funding
Funding: Federal, State and Local
Estimated Cost: $100,000
Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions : Pleasant View City

Action 2: Enhance SCADA: 500 West Water Reservoir

Time Frame: Unknown, based on funding
Funding: Federal, Local and State
Estimated Cost: $8,000
Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions: Pleasant View City

Action 3: Enhance security: Jessie Creek Water Reservoir, Well House, Pump and Generator

Time Frame: Unknown, based on funding
Funding: Federal, Local and State
Estimated Cost: $15,000
Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions: Pleasant View City

Action 4: Enhance security: Alder Creek 1 Water Reservoir, Spring

Time Frame: Unknown, based on funding
Funding: Federal, Local and State
Estimated Cost: $15,000

Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions: Pleasant View City

Action 5: Enhance security: Alder Creek 2 Water Reservoir Well House and Generator

Time Frame: Unknown, depending on funding

Funding: Federal, Local and State
Estimated Cost: $15,000
Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions: Pleasant View City

Action 6: Enhance security: Mac's Water Reservoir, Well House, Pump and Generator

Time Frame: Unknown, depending on funding
Funding: Federal, Local and State
Estimated Cost: $15,000
Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions: Pleasant View City

Action 7: Add a back-up generator and enhance security: Fred's Well Water Reservoir and Well House

Time Frame: Unknown, depending on funding
Funding: Federal, Local and State
Estimated Cost: $15,000
Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions: Pleasant View City

Action 8: Enhance SCADA for entire water system.

Time Frame: August 2015
Funding: Federal, Local and State
Estimated Cost: $40,000
Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions: Pleasant View City

Earthquake

Problem Identification: Critical facilities do not meet seismic standards

OBJECTIVE #1 (Priority MEDIUM): Retrofit facilities to seismic standards.

Action 1: Public Works Shop: Seismic retrofit and repair core structural issues.

Time Frame: Unknown, depending on funding
Funding: Federal, State and Local

Estimated Cost: $12,000
Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions : Pleasant View City

Flooding

Problem Identification: Need the stormwater infrastructure necessary to handle flood flows.

OBJECTIVE #1 (Priority MEDIUM): Upgrade stormwater infrastructure.

Action 1: Dredge and de-silt Barker Retention Basin.

Time Frame: Unknown, depending on funding
Funding: Federal, State and Local
Estimated Cost: $12,000
Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions : Pleasant View City

Action 2: Replace box and gate infrastructure at the Alder Creek Detention Basin

Time Frame: Unknown, depending on funding
Funding: Federal, State and Local
Estimated Cost: $10,000
Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions : Pleasant View City

Action 3: Upgrades to 17 Detention Basins throughout the City

Time Frame: Unknown, depending on funding
Funding: Federal, State and Local
Estimated Cost: $700,000
Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions : Pleasant View City

Action 4: Remove all canal stormwater collection and channel to detention basins.

Time Frame: Unknown, depending of funding
Funding: Federal, State and Local
Estimated Cost: $250,000
Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions: Pleasant View City

Wildland Fire

Problem Identification: Need the stormwater infrastructure necessary to handle flood flows.

OBJECTIVE #1 (Priority MEDIUM): Fuels mitigation

Action 1: Work in tandem with homeowners to remove fuels and create fire breaks.

Time Frame: Unknown, depending on funding
Funding: Federal, State and Local
Estimated Cost: $25,000

Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions: Pleasant View City

Action 2: Create a public service campaign to inform residents about fuels reduction, fire breaks, and other mitigation tactics.

Time Frame: Unknown, depending on funding
Funding: Federal, State and Local
Estimated Cost: $2,500
Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions: Pleasant View City

Landslide

<u>Problem Identification:</u> Need to identify of vulnerable areas and debris paths.

OBJECTIVE #1 (Priority MEDIUM): Conduct a sensitive land study.

Action 1: Dredge and de-silt Barker Retention Basin.

Time Frame: September 2015
Funding: Federal, State and Local
Estimated Cost: $40,000
Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions: Pleasant View City

Action 2: Based on study results, implement a slope development ordinance.

Time Frame: 2015-16
Funding: Federal, State and Local
Estimated Cost: $5,000
Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions: Pleasant View City

Action 3: Complete and implement an excavation ordinance.

Time Frame: 2015-16
Funding: Federal, State and Local
Estimated Cost: $5,000
Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions: Pleasant View City

Problem Soils

<u>Problem Identification:</u> Problems areas within city limits are not mapped.

OBJECTIVE #1 (Priority MEDIUM): Identify areas with problems soils.

Action 1: Conduct a study to determine problem areas.

Time Frame: Unknown, depending on funding
Funding: Federal, State and Local
Estimated Cost: $30,000
Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions: Pleasant View City

Multi-Hazards

Problem Identification: The City does not have an emergency management plan in place and communication networks are vulnerable.

OBJECTIVE #1 (Priority HIGH): Improve communications, mitigate the impacts of and be prepared for emergency situations and hazards.

Action 1: Create an Emergency Management Plan

Time Frame: 2015
Funding: Federal and Local
Estimated Cost: $25,000
Staff: City Administration, Public Works, Engineer, etc.
Jurisdictions: Pleasant View City

Action 2: Enhance IT Network and Server Security

Time Frame: Unknown, depending on funding
Funding: Local and State
Estimated Cost: $20,000
Staff: City Administration, Public Works
Jurisdictions: Pleasant View City

Action 3: Fully Equip EOC and complete connection to fiber/analog lines.

Time Frame: Unknown, depending on funding
Funding: Local, state and federal
Estimated Cost: $40,000
Staff: City Administration, Public Works
Jurisdictions: Pleasant View City

Action 4: Enhance security of the main generator for the City Offices.

Time Frame: Unknown, depending on funding
Funding: Local, state and federal
Estimated Cost: *$5,000*
Staff: City Administration, Public Works
Jurisdictions: Pleasant View City

RIVERDALE CITY

Background Information

Riverdale City is situated at the extreme south end of Weber County, sharing its south boundary with Davis County, and its north boundary with the cities of Ogden and South Ogden. The City extends to the city of Roy on the west and the cities of South Ogden and Washington Terrace to the east. Riverdale City is approximately 4.6 square miles in land area size with a population of approximately 8,560 with 3,300 households. The daytime population balloons to 40,000-50,000 people on average due to the significant number of commercial and retail establishments in the City.

Riverdale City provides water, sewer, storm drainage, police, fire, public works, community development, economic development, recreation services, senior care facility and programs, justice court, drug court, redevelopment agency oversight, and other volunteer services.

The leadership structure of the community is a mayor-council form of government with a city administrator who is appointed by the mayor and ratified by the city council. The Fire Department and City Administrator are responsible for Emergency Planning activities in Riverdale City.

Specific Community Hazards

Flooding. Riverdale is located along the Weber River. During the 2011 declared flooding disaster, City facilities, trails, and homes sustained significant damage. Wetland areas and sensitive habitat also exist within the Weber River corridor.

Dam Failure. There are major dams along the Weber River and failure of any of those would significantly affect Riverdale downstream. These dams include Rockport, Echo, and East Canyon.

Landslide. Riverdale's geography along the river puts it at a low point relative to the surrounding cities. Slopes bound Riverdale on the east, west, and south.

Man-made Hazards. Hill Air Force Base is directly adjacent to Riverdale City on the south end. The high daytime population in commercial areas brings risks as well.

Earthquake. Riverdale, like most Utah communities, is subject to the hazards of earthquake and would be particularly impacted if the earthquake were to damage dams on the Weber River.

Drought. Only one of Riverdale's three wells is currently operable with one having poor water quality and the other needing equipment upgrades.

Wildland Fire. Riverdale City has a small area of wildland interface. Residents in this area need to be informed as to actions they could take to prevent their property from being affected by a wild fire.

Critical Facilities and Infrastructure

Three water tanks	Culinary water lines	One stationary generator
Three culinary water wells	Numerous small buildings/	30 miles of roads
Sanitary sewer lines	sheds	City-owned bridge

Railroad	Hill Air Force Base	Interstate 84
Davis-Weber Canal	Interstate 15	

Civic Center
4600 South Weber River Dr
Riverdale, Utah 84405

Police Station
4580 South Weber River Dr
Riverdale, Utah 84405

Fire Station
4334 South Parker Drive
Riverdale, Utah 84405

Community Center
4360 South Parker Drive
Riverdale, Utah 84405

Senior Center & Housing Facility
4433 South 900 West
Riverdale, Utah 84405

Public Works
4550 Union Pacific Drive
Riverdale, Utah 84405

Mitigation Strategies Implemented since the 2009 Plan

Riverdale City currently has a "Hillside" ordinance within the City Code (under 10-13F) which regulates development and use of land along any hillsides within the community.

Hill Force Base has an Air Installation Compatible Use Zone (AICUZ) area in place along South Weber Drive for incoming planes into the Air Force Base.

Riverdale City currently has a "Flood Damage Prevention" ordinance in place and found in the City Code under 10-27 which regulates flood plain usage and potential impacts to structures located along the Weber River bank areas.

Other projects/activities identified by the Public Works Department or other departments within Riverdale City are River Bank Restoration, Upgrade of One City Well with Power Generator, Upgrade of City Owned Generator at Fire Station.

Planned Mitigation Strategies

Multi-Hazard

Problem Identification: City EOC is currently not functional. Phone lines need to be updated, including new phones and computer cabling

OBJECTIVE #1 (Priority MEDIUM)

Action 1: Update EOC

Time Frame: Ongoing
Funding: Local
Estimated Cost: $25,000
Staff: Riverdale City, Contractors
Jurisdictions : Riverdale City

Action 2: Identify needs for sustaining long-term EOC operations. Ensure food supply, water, comfort items, etc.

Time Frame: Ongoing
Funding: Local
Estimated Cost: $10,000
Staff: Riverdale City
Jurisdictions: Riverdale City

Action 3: Familiarize Staff with Web EOC

Time Frame: Ongoing
Funding: Local
Estimated Cost: Unknown
Staff: Riverdale City
Jurisdictions: Riverdale City

Flooding

Problem Identification: The Weber River in its current condition may flood adjacent housing, businesses, critical city facilities and damage infrastructure.

OBJECTIVE #1 (Priority HIGH) Complete projects along the Weber River to increase flood resilience.

Action 1: Weber River bank overflow and relief control between Riverdale Mobile Home Estates and City Hall Bridge crossing at 4600 South Street

Time Frame: Unknown, dependent on funding
Funding: Local, State, FEMA PDM, CDBG-NDRC
Estimated Cost: $400,000
Staff: Riverdale City Engineer, Public Works
Jurisdictions : Riverdale City

Action 2: New Vehicle/Pedestrian Bridge - Bridge structure at 4600 south over Weber River

Time Frame: Unknown, dependent on funding
Funding: Local, State, FEMA PDM, CDBG-NDRC
Estimated Cost: $3,200,000
Staff: Riverdale City Engineer, Public Works
Jurisdictions : Riverdale City

Action 3: Riverdale City Park Floodplain Features

Time Frame: Unknown, dependent on funding
Funding: Local, State, FEMA PDM, CDBG-NDRC
Estimated Cost: $400,000
Staff: Riverdale City Engineer, Public Works
Jurisdictions : Riverdale City

Action 4: Remediation and construction of utility improvements though-out Riverdale City and Weber River

Time Frame: Unknown, dependent on funding
Funding: Local, State, FEMA PDM, CDBG-NDRC
Estimated Cost: $350,000
Staff: Riverdale City Engineer, Public Works
Jurisdictions : Riverdale City

Action 5: Acquisition of approximately one acre of privately held property for over bank relief control and recreational improvement near 4600 South.

Time Frame: Unknown, dependent on funding
Funding: Local, State, FEMA PDM, CDBG-NDRC
Estimated Cost: $250,000
Staff: Riverdale City Engineer, Public Works
Jurisdictions : Riverdale City

Action 6: Riprap at bridge crossings 4600 South, Weber River Pathway Bridge south of City Hall and City Kayak Park trail head.

Time Frame: Unknown, dependent on funding
Funding: Local, State, FEMA PDM, CDBG-NDRC
Estimated Cost: $250,000
Staff: Riverdale City Engineer, Public Works
Jurisdictions : Riverdale City

Action 7: Trail way construction of board walk to allow overbank flows and build offset levee protection for City subdivisions along the Weber River.

Time Frame: Unknown, dependent on funding
Funding: Local, State, FEMA PDM, CDBG-NDRC
Estimated Cost: $300,000

Staff: Riverdale City Engineer, Public Works
Jurisdictions : Riverdale City

OBJECTIVE #2 (Priority MEDIUM) Update Storm Drain Master Plan

Action 1: Identify possible projects for upgrading.

Time Frame: Ongoing
Funding: Local
Estimated Cost: Unknown
Staff: Riverdale City Engineer, Public Works
Jurisdictions : Riverdale City

Wildland Fire

Problem Identification: Riverdale City has a small area of wildland interface. Residents in this area need to be informed as to actions they could take to prevent their property from being affected by a wild fire.

OBJECTIVE #1 (Priority MEDIUM)

Action 1: Public Education Campaign

Time Frame: Ongoing
Funding: Local
Estimated Cost: Unknown
Staff: Riverdale City Fire Department
Jurisdictions : Riverdale City

Drought

Problem Identification: Riverdale's potable water is currently supplied by one functioning well.

OBJECTIVE #1 (Priority HIGH): Establish a redundant water source within the City.

Action 1: Complete a feasibility study for a new well location

Time Frame: Within 1 year
Funding: Local
Estimated Cost: Unknown
Staff: Riverdale City Administration, Public Works
Jurisdictions : Riverdale City

ROY CITY

Background Information

Roy City is a community at the center of industry and transportation in Weber County. Bordered by I-15, Hill Air Force Base, the Ogden Airport, Riverdale, Hooper, Ogden, and West Haven; Roy City has a unique convergence of opportunities and hazards. The City has a population of approximately 38,000 with a population density of 4,968 people per square mile.

The Governing Body of Roy City is comprised of the Mayor and five Council Members. All members are elected by the residents of the City during a municipal election held every two years, and serve a four year term.

Specific Community Hazards

Roy City is vulnerable to natural and technological hazards that threaten the health, welfare and security of its citizens. Of specific concern are **earthquakes, flooding, and severe weather/storms.**

Critical Facilities and Infrastructure

TRANSPORTATION

- Union Pacific Railway
- Interstate 15
- Utah Transit Authority's Roy FrontRunner Station
- Ogden Municipal Airport. There have been multiple airplane crashes in Roy in the last ten years. Allegiant Air, a commercial airline, is now operating passenger flights out of the Ogden Airport transporting up to 220 passengers several times per week.

EDUCATION

- North Park Elementary School
- Weber County Library (currently under construction)

WATER

- Hooper Water Improvement District Tanks (2)
- Davis & Weber Counties Canal (secondary water)
- Roy Water Conservancy District retention basins, canal
- Roy City Culinary Water Tanks.

Mitigation Strategies Implemented since the 2009 Plan

Roy City ordinances require that new commercial buildings are built to current codes. The new North Park Elementary School was built to current seismic and fire codes.

The City has made significant also made efforts in updating water, sewer and storm drain infrastructure. The following projects have been recently completed.

- New storm Drains along 1900 West in Roy and also Riverdale Road (2014)
- Upgrading of water lines and storm drain at Midland Dr. from 4000 South to 3100 West
- New water lines on 1900 West
- New water lines on 4975 South

- New water lines 5950 South and 2100 West
- Piped ditch from 4800 South to 5500 South on 4300 West to help with flooding in the northwest area of Roy
- Curb and gutter on 5200 South from 3100 West to 3350 West with new stormwater inlet boxes.
- Catch basin tied into storm drain on 5200 South
- Upgrading of storm drain at Kentwood Estates increasing the size from 4" to 12" pipe.

To address the potential threats of hazardous material transportation, the City has updated their yellow DOT guides for HAZMATs and they are on every City emergency vehicle.

Planned Mitigation Strategies (Need one for each hazard: Earthquake, flood, severe weather/storms)

Earthquake

Problem Identification: Areas of high liquefaction in the western areas of Roy and the vulnerability of critical facilities is unknown.

OBJECTIVE #1 (Priority HIGH): Reduce the impact of potential earthquakes.

Action 1: Develop and implement an emergency operations plan similar to other school districts.

Time Frame: In progress
Funding: Local
Estimated Cost: $
Staff:
Jurisdictions : Roy City

Action 2: Develop a training document for schoolteachers showing non-structural mitigation activities for classrooms.

Time Frame: Ongoing
Funding: Local
Estimated Cost: $
Staff:
Jurisdictions : Roy City

Action 3: Develop an earthquake vulnerability study for identified critical facilities.

Time Frame: Ongoing. Weber School District is also planning to conduct a study in the future.
Funding: Local
Estimated Cost: $
Staff:
Jurisdictions : Roy City

SOUTH OGDEN CITY

Background Information

South Ogden City comprises 3.7 square miles in south-eastern Weber County. South Ogden has a population of 16,789 with 5,466 households. Over the last 50 years businesses, schools, churches, fire and police departments, sewer and water lines continued to grow or to be expanded to serve the growing population. South Ogden boasts a comfortable balance of residential areas and business districts.

South Ogden is governed by a Mayor and five-member city council. Emergency management is overseen by Fire Chief Cameron West.

Specific Community Hazards

Wildfire and Landslide

Portions of South Ogden City are along mountain foothills creating an urban/wildland interface. The Southern edge of the City drops of steeply into lower Uintah subjecting the above residential area to potential wildfire and subsequent landslide.

Flooding

The City experiences frequent flooding along Burch Creek.

Earthquake

Earthquake is a high-risk, high-probability, and severe-consequence threat to South Ogden. The Wasatch Fault parallels the east edge of South Ogden. The tilting of the valley floor along the Wasatch Fault and liquefaction of the soil would cause catastrophic damage to the above ground water storage tanks, infrastructure, utilities, roads, bridges, business districts, and residential areas.

Severe Weather

Wind damage resulting in power outages, downed trees and blocked streets. Localized flash flooding; heavy snows resulting in roof collapse, transportation issue due to blocked streets and piled up snow.

Critical Facilities and Infrastructure

Above ground steel water storage tanks, water distribution system, sewer, utilities, roads, bridges, fire station 82, public works, predesignated incident facilities and health care facilities.

Mitigation Strategies Implemented since the 2009 Plan

NIMS (All Hazard Training) for key personnel responsible for staffing the EOC.
Designed and built (stay alive props and fire hazard props) used in training the community through emergency preparedness fairs, safety fairs and grade school education.
New, large CERT shed equipped with various life safety, incident stabilization and property conservation supplies.

Planned Mitigation Strategies

Wildfire and Landslide

Problem Identification: South Ogden has several areas of Urban/wildland interface. Residents in this area need to be informed as to actions they could take to prevent their property from being affected by a wildfire.

OBJECTIVE #1 (Priority MEDIUM)

Action 1: Public Education Campaign
Fireworks restrictions on urban wildland interfaces

Time Frame: Ongoing
Funding: Local
Estimated Cost: Unknown
Staff: South Ogden City Fire Department
Jurisdictions: South Ogden City

Severe Weather

Problem Identification: South Ogden has several areas of Urban/wildland interface. Residents in this area need to be informed as to actions they could take to prevent their property from being affected by severe weather.

OBJECTIVE #1 (Priority MEDIUM)

Action 1: Public Education Campaign

Time Frame: Ongoing
Funding: Local and State
Estimated Cost: Unknown
Staff: South Ogden City Fire Department and CERT
Jurisdictions : South Ogden City

Action 2: Remove or trim trees where overhead power lines run.

Time Frame: Ongoing
Funding: Local and State
Estimated Cost: Unknown
Staff: South Ogden City Fire Department and CERT
Jurisdictions: South Ogden City

Action 3: CERT members educate community on personal preparedness items and personal emergency preparedness training and 72 hr. kits

Time Frame: Ongoing
Funding: Local and State
Estimated Cost: Unknown

Staff: South Ogden City Fire Department and CERT
Jurisdictions: South Ogden City

Action 4: Purchase Honda Generators (2)

Time Frame: Ongoing
Funding: Local and State
Estimated Cost: $4,800.00
Staff: City Fire Chief, Public Works, Engineer, etc.
Jurisdictions: South Ogden City

Action 5: Purchase durable goods or equipment

Time Frame: Unknown; based on funding
Funding: Local and State
Estimated Cost: $5,000.00
Staff: City Fire Chief, Public Works, Engineer, etc.
Jurisdictions: South Ogden City

Flooding

Problem Identification: South Ogden has Burch Creek running through the city from east to west. Residents in this area need to be informed as to actions they could take to prevent their property from flooding by keeping debris out of the creek.

OBJECTIVE #1 (Priority MEDIUM)

Action 1: Public Education Campaign
Remove debris from creek and adjacent areas.
CERT members patrol areas where grating and debris catch areas might gather limbs and garbage. Report problems to the fire department and public works.

Time Frame: Ongoing
Funding: Local
Estimated Cost: Unknown
Staff: South Ogden City Fire Department and CERT
Jurisdictions: South Ogden City

Action 2: Public works, CERT and resident education
Remove debris from storm sewer grates.
CERT members, resident and public works patrol areas where storm sewer grating catches the debris and garbage. Remove debris or contact public works to help stop local flooding in the event of flash floods.

Time Frame: Ongoing
Funding: Local
Estimated Cost: Unknown
Staff: South Ogden Public Works, CERT and Residents.
Jurisdictions: South Ogden City

Earthquake

Problem Identification: Earthquake is a high-risk, high-probability, and severe-consequence threat to South Ogden. The Wasatch Fault parallels the east edge of South Ogden. The tilting of the valley floor along the Wasatch Fault and liquefaction of the soil would cause catastrophic damage to the above ground water storage tanks, infrastructure, utilities, roads, bridges, business districts, and residential areas.

OBJECTIVE #1 (Priority MEDIUM)

Action 1: Public Education Campaign

Training and education through safety fairs at local churches, businesses and the South Ogden Fire Department. Education on personal preparedness, first aid training, baby sitting classes, fire extinguisher training, CERT training and structural and content safety before an earthquake.

Time Frame: Ongoing
Funding: Local
Estimated Cost: Unknown
Staff: South Ogden City Fire Department and CERT
Jurisdictions: South Ogden City

UINTAH CITY

Background Information

Uintah is a rural farm and residential community at the mouth of Weber Canyon, in the Weber River valley, west of the Wasatch Mountains. Uintah has a population of approximately 1,327 people with 450 households.

The City provides the following services: fire suppression/rescue/hazardous materials, EMS (through Municipal Fire Department), culinary water, roads, floodplain management, waste management, secondary water, stormwater management, and weed abatement. Uintah City contracts with the Weber County Sheriff for law enforcement services.

The controlling authority of the city is a five-member city council. The Uintah Fire Department oversees emergency management and hazard mitigation activities.

Specific Community Hazards

- **Earthquake** is a high-risk, high-probability, and severe-consequence threat to Weber County and Uintah. The Weber Fault and several smaller faults cross Uintah through the higher density business and residential area.
- **Hazardous Materials**.
    - The Union Pacific railroad averages 30 to 40 trains through the city each day, many with 38,500-gallon tank cars of chemicals including ethanol, chlorine and oxidizers. Chemical spill potential resulting from train derailment is a high-risk/severe-consequence threat specific to Uintah.
    - There is also a 12" natural gas pipeline installed through residential areas. The evacuation zone for a leak affects 1/3 of Uintah residents.
    - The city is adjacent to Hill Air Force Base identified Accident Potential Zone. The base is home for 48 F- 16's and will add 72 F-35's starting in 2015. Air traffic includes C-5 and C-17 transports and KC-135 air-to-air refueling tankers carrying up to 30,000 gallons of jet fuel.
- **Wildland Fire.** Uintah is a wildfire Community at Risk as identified by Utah Division of Forestry, Fire & State Lands and is rated 10 on a scale of 0 – 12 where 12 is extreme risk. The only factor keeping Uintah from a rating of 12 is the availability of the Uintah Fire Department.
- **Severe Weather.** Utah Highway U-89, through Uintah, has Average Automobile Daily Traffic of 48,000 vehicles. US I-84 crosses U-89 in Uintah with Annual Truck Daily Traffic of about 18,000 vehicles, many with hazardous cargo. U-89 and I- 84 have significant grades and increased accidents in Uintah jurisdiction during inclement weather which includes black ice, snow, extreme canyon winds and heavy rain.
- **Flooding.** The Weber River, bordering the city on the south, is a FEMA designated flood zone rated High Risk by the State of Utah. Floods in the Weber River have occurred due to torrential rainfall and sudden significant melting of snowpack in the mountains. I-84 is on an elevated road base south of the river, driving excess flows north into residential areas.

Mitigation Strategies Implemented since the 2009 Plan

No mitigation items since 2009

Planned Mitigation Strategies (Need to identify one for each hazard: earthquake, hazardous materials, wildland fire, severe weather, flooding)

Update the water system. Look at replacement of old pipes
SCADA for isolating water tanks.

Flooding

Problem Identification: Protect against property damage due to flooding events

OBJECTIVE #1 (Priority: High): Separate storm drainage from the irrigation ditches

Action 1: Install a separate system that will isolate the ditch system from the storm drain system.

Time Frame: Unknown
Funding: Local and State
Estimated Cost: Unknown
Staff: Public Works and Engineer
Jurisdictions : Uintah City

Action 2: Study and install locations and needs for berms near the weber River to protect against flooding.

Time Frame: Unknown
Funding: Local, State and possibly Federal
Estimated Cost: Unknown
Staff: Public Works
Jurisdictions: Uintah City

Multi Hazard

Problem Identification: Protect the water system against vulnerabilities from multi hazards.

OBJECTIVE #1 (Priority: High): Separate storm drainage from the irrigation ditches

Action 1: Install SCADA to be able to turn off water at the tanks in the event of a main shear.

Time Frame: Unknown
Funding: Local and State
Estimated Cost: Unknown
Staff: Public Works and Engineer
Jurisdictions : Uintah City

Action 2: Study and install locations and needs for berms near the weber River to protect against flooding.

Time Frame: Unknown
Funding: Local, State and possibly Federal
Estimated Cost: Unknown
Staff: Public Works
Jurisdictions: Uintah City

CITY OF WASHINGTON TERRACE

Background Information

Washington Terrace is a city totaling about two square miles situated between South Ogden City and Riverdale City. The population is approximately 9,164 with 3,019 households. The governing body is a six member City Council and a City Manager.

Washington Terrace City provides Water /Sewer, Garbage pickup, Road Maintenance, Fire/EMS services for its citizens. Washington Terrace City contracts with Weber County Sheriff's Office for law enforcement services. The Washington Terrace Fire Department oversees emergency response and hazard mitigation efforts.

Specific Community Hazards

- **Earthquake**
- **Landslide.** Washington Terrace is situated on an elevated area above Riverdale, making it particularly susceptible to landslide. The major hillside in the City has been designated as a sensitive lands area by the City's consulting engineer
- **Wildland Fire.** Wildland fire on the hillside compounds the landslide concern as it may increase erosion and instability.

Critical Facilities and Infrastructure

Tanks
Fire station

EDUCATION

- Bonneville High School
- T.H. Bell Junior High School
- Washington Terrace Elementary School
- Roosevelt Elementary School

MUNICIPAL

- Public Works Facility (located on a hillside designated as a possible land slide area)

Mitigation Strategies Implemented since the 2009 Plan

Landslide. A steep hillside in Washington Terrace has been designated as a possible landslide area. The City has taken precautions to limit the amount of water that can be used in the area as well as implementing fire restrictions to minimize the risk of the hillside sloughing off. The hillside has been designated as a sensitive lands area by the City's consulting engineer.

Planned Mitigation Strategies (need one for each hazard: e.g. earthquake, wildland fire, etc.)

Landslide

Problem Identification: The City's Public Works Facility is located on a hillside that has been designated as a possible land slide area.

OBJECTIVE #1 (Priority HIGH): Reduce the possibility of landslide impacting the public works facility that may impede the ability to provide necessary services to residents.

Action 1: Public Works Facility Relocation.

Time Frame: Unknown
Funding: Federal, Local and State
Estimated Cost: $6,000,000
Staff: Public Works, Engineer, City Administration
Jurisdictions : Washington Terrace City

Emergency generator
Tank seismic upgrade
Relocate Public Works facility to another location
Need more detention basins

WEST HAVEN CITY

Background Information

West Haven City is a community of 11,248 people and 3,000 households in western Weber County. It is in the lower valley and has mostly flat terrain which lends itself to diverse land uses including rural farmland, industrial, commercial and residential.

The governing body is a Mayor and a five-member City Council. Stephanie Carlson, City Council Member, has the responsibilities as Emergency Preparedness Manager and CERT Program Coordinator.

Specific Community Hazards

- Flood
- Wildland Fire
- Problem Soils

- Earthquake
- Drought

Critical Facilities and Infrastructure

- City Hall (EOC location)
- Maintenance Building (backup EOC)
- Sewer building
- Pump Stations (3)
- Ground Station
- Arena – houses large animals

Mitigation Strategies Implemented since the 2009 Plan

Flooding

- Culverts enlarged at 3500 West and 4000 South
- Increased capacity at 3300 South from 2700 West to 2900 West
- Increased capacity at 5100 West from 3300 South to 3600 South
- Culvert at 4000 South and 4500 West
- Detention pond at 3330 West and 4000 South
- Enlarged pipe and culvert at 2550 South and Wilson Canal

Planned Mitigation Strategies (Also need one for each hazard: wildland fire, problem soils, earthquake)

Flooding

Problem Identification:

OBJECTIVE #1 (Priority HIGH): Lower flood potential by correcting flood hazards

Action 1: Increase capacity by replacing, upsizing and dredging culverts and pipes

- 2550 S - Enlarge pipe and culvert ($250,000)
- Secrest Acres - replace syphon/culvert at Hooper Canal crossing ($75,000)
- 4450 W & 3800 S Culvert ($100,000)
- Howard Slough – Increase capacity and upsize pipe on 3600 S from Midland to 3450 South ($900,000)
- 2700 W (3300 S to 3600 S) – reroute, enlarge pipe & culverts
- Midland & 3450 S – Enlarge culverts & piping ($1,000,000)
- 4700 W & 3500 S – Connect the storm drain to 5100 W, increase capacity, add pipe ($250,000)
- Wilson Slough & Century Mobile Home Park – Increase capacity by dredging ($250,000)
- I-15 and 2200 S (Comfort Suites) – Increase pipe ($90,000)

- Buttermilk Slough – Increase capacity & enlarge 3 culverts ($300,000)
- 2150 S & 2700 W - eliminate connection to Hooper Canal and extend storm drain and connect to the Hooper Slough ($100,000)
- 1668 S & 1900 W (Harbertsons & Weber River) - reinforce and raise bank ($100,000)
- Eliminate 3500 W 4100 S land drain pump station & redirect to Howard Slough ($100,000)

Time Frame: Unknown
Funding: Federal, State and Local
Estimated Cost: $4,015,000
Staff: City Emergency Manager, Public Works, Engineer
Jurisdictions : West Haven City

OBJECTIVE #2 (Priority LOW): Work with canal companies to ensure the canals are structurally up-to-date

Action 1: Hooper Canal (4800 S to 3800 S) - above grade canal - break risk

Time Frame: Unknown
Funding: Local
Estimated Cost: Unknown
Staff: City Emergency Manager, Public Works, Engineer
Jurisdictions : West Haven City

Action 2: Wilson Canal (21st to Ogden boundary) - above grade canal - break risk

Time Frame: Unknown
Funding: Local
Estimated Cost: Unknown
Staff: City Emergency Manager, Public Works, Engineer
Jurisdictions : West Haven City

Drought

<u>Problem Identification:</u> The City needs redundant water sources in case of interrupted water delivery

OBJECTIVE #1 (Priority HIGH): Work with water companies to connect systems and provide redundant water sources

Action 1: Connect West Haven Water to Taylor West Weber and Bona Vista

Time Frame: Unknown
Funding: Federal, State and Local
Estimated Cost: $75,000

Staff: City Emergency Manager, Public Works, Engineer, Water Companies
Jurisdictions: West Haven City

Multi-Hazards

Problem Identification: Improve Emergency Response Capabilities and Communications

OBJECTIVE #1 (Priority HIGH): Acquire Emergency Power Equipment

Action 1: EOC Generator

Time Frame: Unknown
Funding: Federal, State and Local
Estimated Cost: $130,000
Staff: City Emergency Manager, Public Works, Engineer
Jurisdictions : West Haven City

Action 2: Maintenance Shop Generator

Time Frame: Unknown
Funding: Federal, State and Local
Estimated Cost: $80,000
Staff: City Emergency Manager, Public Works, Engineer
Jurisdictions : West Haven City

Action 3: Sewer Maintenance Building Generator

Time Frame: Unknown
Funding: Federal, State and Local
Estimated Cost: $5,000
Staff: City Emergency Manager, Public Works, Engineer
Jurisdictions : West Haven City

OBJECTIVE #2 (Priority HIGH): Acquire Emergency Supplies

Action 1: EOC Equipment

Time Frame: Unknown
Funding: Federal, State and Local
Estimated Cost: $70,000
Staff: City Emergency Manager, Public Works, Engineer
Jurisdictions : West Haven City

Action 2: Emergency Response Equipment

Time Frame: Unknown
Funding: Federal, State and Local

Estimated Cost: $30,000
Staff: City Emergency Manager, Public Works, Engineer
Jurisdictions : West Haven City

Action 3: Emergency Sewer Equipment and Supplies

Time Frame: Unknown
Funding: Federal, State and Local
Estimated Cost: $30,000
Staff: City Emergency Manager, Public Works, Engineer
Jurisdictions : West Haven City

Action 4: Emergency Communication Equipment

Time Frame: Unknown
Funding: Federal, State and Local
Estimated Cost: $10,000
Staff: City Emergency Manager, Public Works, Engineer
Jurisdictions : West Haven City

OBJECTIVE #3 (Priority MEDIUM): Increase and strengthen emergency communications to residents

Action 1: Increase social media access to emergency information, educate residents concerning cell phone 911 registration, improve & increase methods of distributing emergency information, test emergency communication systems (reverse 911/city notification etc.)

Time Frame: Unknown
Funding: Local
Estimated Cost: $5,000
Staff: City Emergency Manager
Jurisdictions : West Haven City

OBJECTIVE #4 (Priority MEDIUM): Acquire and Train Personnel and Volunteers

Action 1: Train the following personnel:

- Mayor
- City Council (5)
- City Employees (13)
- City Contract Personnel (1)
- HAM Radio Operators (43 within city boundaries, 7 active ARES)
- CERT Members (105)

Time Frame: Unknown
Funding: Local
Estimated Cost: $5,000
Staff: City Emergency Manager, Public Works, Engineer
Jurisdictions : West Haven City

PART XII. SPECIALIZED LOCAL DISTRICTS

Utah State Code, Annotated, Section 17B-1-102, defines Specialized Local Districts (SLD) as a local district that is a cemetery maintenance district, a drainage district, a fire protection district, an improvement district, an irrigation district, a metropolitan water district, a mosquito abatement district, a public transit district, a service area or a water conservancy district. An SLD is a body corporate with perpetual succession, a quasi-municipal corporation, and is a political subdivision of the state.

SLDs may be created to provide services consisting of: airport operations; cemetery operations; fire, paramedic, and emergency services; garbage collection and disposal; health care including health department or hospital service; library operations; abatement or control of mosquitoes and other insects; park or recreation facilities or services; sewage system operations; street lighting; construction and maintenance of curb, gutter and sidewalk; transportation, including public transit and providing streets and roads; water system operations, including the collection, storage, retention, control, conservation, treatment, supplying, distribution, or reclamation of water, including storm, flood, sewage, irrigation, and culinary water, whether the system is operated on a wholesale or retail level or both.

Because SLDs are defined as quasi-municipal, they may be eligible for FEMA disaster funding reimbursement under the Stafford Act. Most of the SLDs have jurisdictional boundaries within a specific county. Others, such as the Utah Transit Authority (UTA) and Weber Basin Water Conservancy District, have jurisdictional boundaries that include multiple counties and conduct hazard mitigation planning on a regional or state level and did not participate in this local plan.

Some SLDs in Weber County serve only a small number of users and limited geographical areas. These districts were invited to participate but due to their having very limited resources they were not able to participate in the plan at this point.

Specialized local districts identified in Weber County are listed below.

Bona Vista Water Improvement District 1483 Wall Avenue Ogden, UT 84044 (801) 621-0474	**Central Weber Sewer District** 2618 West Pioneer Road Ogden, UT 84404 (801) 731-3011
Eden Park Service District 2544 North East Eden, UT 84310 (801) 745-3942	**Green Hills Estate Water & Sewer Improvement District** 8975 East Pineview Drive Huntsville, UT 84317 (801) 745-0722
Hooper Irrigation Co. (801) 388-3956	**Hooper Water Improvement District** 5555 West 5500 South Hooper, UT 84315 (801) 985-1991
Huntsville Hollow Sewer Improvement District 10331 East Highway 39 Huntsville, UT 84317	**Little Mountain Service Area** 10,000 West 900 South Ogden, UT 84044

(435) 745-4409	(801) 732-2205
North View Fire District 315 East 2550 North North Ogden, UT 84414-2221 (801) 782-8159	**Ogden School District** 1950 Monroe Blvd., Ogden, UT 84401 (801) 737-8837
Pineview Water Systems 471 W. 2nd St., Ogden, UT 84404 (801) 621-6555	**Pioneer Special Service District** Marriott Slaterville City 1570 W. 400 N. Marriott Slaterville, UT 84404
Powder Mountain Water and Sewer Improvement District 1623 Hislop Dr Ogden, UT 84404 (801) 621-4075	**Roy Water Conservancy Sub-District** 5440 S. Freeway Park Drive Riverdale, UT 84405 (801) 825-9744
Taylor-West Weber Water Improvement District 4660 West 1150 South Ogden, UT 84404 (801) 731-1668	**Uintah Highlands Water Sewer Improvement District** 2401 East 6175 South Ogden, UT 84403 (801) 476-0945
Utah Transit Authority (statewide) 3600 South 700 West Salt Lake City, UT 84119 (801) 262-5626	**Warren – West Warren Water District** 1688 South 7500 West Ogden, UT 84404 (801) 621-0721
Weber Area Dispatch 911 and Emergency Services District 2186 Lincoln Avenue Ogden, UT 84401 (801) 629-8007	**Weber Basin Water Conservancy District** (serves Davis, Weber and Morgan Counties) 2837 East Highway 193 Layton, UT 84040 (801) 771-1677
Weber-Box Elder Conservation District (serves Weber and Box Elder Counties) South Ogden Conservation District Ogden River Water Users Association 471 West 2nd Street, Ogden, UT 84404 (801) 621-6555	**Weber County Service Area #5 (Liberty Park)** Liberty, UT 84310 (801) 458-4187
Weber County Service Area #6 947 South 7900 West Ogden, UT 84404	**Weber Fire District** 1871 North 1350 West Ogden, UT 84404 (801) 782-3580
Weber School District 5320 South Adams Ogden, UT 84405 (801) 476-7825	**West Haven Special Services District** 4150 South 3900 West West Haven, UT 84401 (801) 731-5819
West Weber Sanitary Sewer District 4214 West 4275 South	

West Haven, UT 84315 (801) 731-7917	

Specialized Local Districts (SLD) are subject to the same hazards as the local jurisdictions in which they are located. The following general mitigation objectives have been developed for SLD's.

Problem Identification: Infrastructure Vulnerability – Special Local Districts

Objective: Retrofit or replace critical lifeline facilities and or their backup facilities that are shown to be vulnerable to damage in natural disasters

Objective: Conduct comprehensive programs to identify and mitigate problems with facility contents, architectural components, and equipment that will prevent critical buildings from being functional after major natural disasters

Objective: Develop and maintain a system of interoperable communications for first responders from cities, counties, special service districts, local school districts, state and federal agencies.

Objective: Identify and undertake cost effective retrofit measures on critical facilities when these buildings undergo major renovations.

Objective: Engage in, support and or encourage research by others on measures to further strengthen transportation, water, sewer, and power systems so that they are less vulnerable to damage in natural disasters.

Objective: Encourage a higher priority for funding seismic retrofit of existing transportation and infrastructure systems.

WATER DISTRICTS

BONA VISTA WATER IMPROVEMENT DISTRICT

Background Information

Bona Vista Water Improvement District was organized in 1956 under Sec. 17-6 of the Utah Code Annotated. The District was established to provide water to the communities of Harrisville, Marriott-Slaterville, Farr West, Plain City and Portions of Pleasant View and West Haven. The District service area is approximately 20,860 acres with approximately 191.21 miles of water mains of various sizes. Bona Vista serves a population of about 19,500 with a total of 6,653 connections; 5,963 residential, 627 commercial, 20 industrial, and 43 institutional.

The Executive Board is comprised of the following individuals:
Chairman C. Lee Dickemore- Farr West

Bruce Richins -Harrisville
Keith Butler – Marriott Slaterville
Bruce Higley - Plain City
Ronald Stratford – Unincorporated County

Jerry Allen, General Manager, is responsible for emergency planning for Bona Vista.

Specific District Hazards

Earthquake: Rupture of lines
Landslide: Inclusion of lines causing damage
Wildland Fire: Need for high fire flows
Soils: Hot soils
Dam Failure: waterlines within the inundation boundary
Flood: Drought: need of providing water for culinary use
Severe Weather: Cold weather freezing of shallow lines and hot weather demands
Epidemic/Pandemic: Sanitation

Critical Facilities and infrastructure

Bona Vista Water District maintains a database and GIS mapping of its critical facilities. In order to protect these facilities from man-made threats, the District has chosen not to publish a list in this public document.

Mitigation Strategies Implemented since the 2009 Plan

Waterline replacement in hot soils areas is on-going. Hot soils deteriorate the metal pipeline quickly and are being replaced with PVC pipes. There have been several projects the District has worked on in the past several years.

2014 - Rulon White Blvd Project replacement of 8200 feet of pipe ($830,000)
2012 – US-89 Waterline Project replacement of 1065 feet of pipe for ($64,000)
2012 - 2150 N Waterline Project replacement of 1560 feet of pipe for ($128,000)
2011 - Ben Lomond Golf Couse Waterline Project replacement of 9760 feet of pipe for ($374,000)

Planned Mitigation Strategies

Earthquake

Problem Identification: Infrastructure may be damaged during an earthquake, interrupting water delivery.

OBJECTIVE #1 (Priority HIGH): Complete seismic retrofits on infrastructure.

Action 1: Reservoir Seismic Retrofit

Time Frame: Unknown
Funding: Local
Estimated Cost: $500,000
Staff: District General Manager, Engineer

Jurisdictions : Bona Vista Water Improvement District

Action 2: Seismic Outlet Joints: North Ogden, Warm Springs, Roy 1, Roy 2, Industrial Park

Time Frame: Unknown
Funding: Local
Estimated Cost: $100,000 each, $500,000 total
Staff: District General Manager, Engineer
Jurisdictions : Bona Vista Water Improvement District

PINEVIEW WATER SYSTEMS

South Ogden Conservation District • Ogden River Water Users Association • Weber Box-Elder Conservation District

Multi-Hazards

Problem Identification: Hazards may interrupt water delivery.

OBJECTIVE #1 (Priority MEDIUM): Upgrade infrastructure and equipment to be resilient during hazards/disasters.

Action 1: Back-up Generator for the Farr West Wells

Time Frame: Unknown
Funding: Local
Estimated Cost: $50,000
Staff: District General Manager, Engineer
Jurisdictions : Bona Vista Water Improvement District

Action 2: Tank Shut-off Valves: North Ogden and Roy Tanks

Time Frame: Unknown
Funding: Local, State and Federal
Estimated Cost: $300,000 (x2)
Staff: District General Manager, Engineer
Jurisdictions : Bona Vista Water Improvement District

Action 3: Tank Shut-off Valves: North Ogden and Roy Tanks

Time Frame: Unknown
Funding: Local, State and Federal
Estimated Cost: $300,000 each, $600,000 total
Staff: District General Manager, Engineer
Jurisdictions : Bona Vista Water Improvement District

Action 4: Replacement of AC pipe at Weber Industrial.

Time Frame: Unknown
Funding: Local, State and Federal
Estimated Cost: $572,100
Staff: District General Manager, Engineer
Jurisdictions : Bona Vista Water Improvement District

Action 5: Replacement of AC pipe at 750 West and 2550 North

Time Frame: Unknown
Funding: Local, State and Federal
Estimated Cost: $244,800
Staff: District General Manager, Engineer
Jurisdictions : Bona Vista Water Improvement District

Background Information

Ogden River Water Users Association, organized in 1933, who operates Pineview Dam, delivers irrigation (secondary) water through a 72 inch, 5.2 mile pipeline down Ogden Canyon into two canal systems, South Ogden Conservation District and Weber Box-Elder Conservation District. Supplying irrigation water to almost 25,000 acres of land lying between the Wasatch Mountains and the Great Salt Lake. The Associations water is present in 10 cities, namely, Washington Terrace, Riverdale, South Ogden, Ogden, North Ogden, Pleasant View, Farr West, Plain City, Willard, Perry and Brigham City.

The South Ogden Conservation District and its 8 equalizing reservoirs deliver water to project lands south of Ogden Canyon through a siphon that overhangs the mouth of the canyon. Approximately 10,000 households are served. Approximate size household property is .20 acre.

The Weber Box-Elder Conservation District and its 16 reservoirs and 9 pump stations deliver water to project lands north of Ogden Canyon through a surge tank near the mouth of Ogden Canyon. Approximately 14,000 households are served. Approximate size household property is .33 acre.

All three water districts are each governed by the General Manager and a Board of Trustees, they all meet once a month in their respective meetings at Pineview Water Systems office in Ogden, Utah.

Specific District Hazards

South Ogden Conservation District has reached its "built out" stage, there are no more new services being installed. We are replacing old lines each year to stay ahead of the leaks.

Weber Box-Elder Conservation District is still growing, mostly to the North and West. There are a lot of new Subdivision under construction requiring new services. Willard and Perry city's used to be orchards and farm grounds, each year another farm will sell off ground to a subdivider and use the same water in a pressurized system which helps in conserving water.

The canal in Ogden City and proceeding North to Brigham City is 80 years old, while some section have been replaced by concrete pipe or a concrete covering, there are so many more sections needing work. For instance in Unit A, which is above Harrison Blvd. going north from 12th South to 800 North, the concrete is cracked about every 10 feet and has been for some time.

Critical Facilities and Infrastructure

In order to protect critical facilities and infrastructure from man-made threats, Pineview water has chosen not to publish a list in this public document.

Mitigation Strategies Implemented since the 2009 Plan

Planned Mitigation Strategies

Multi-Hazards

Problem Identification: Hazards may interrupt water delivery.

OBJECTIVE #1 (Priority HIGH): Upgrade infrastructure and equipment to be resilient during hazards/disasters.

Action 1: Piping Combination Sections at the Ogden Brig Canal

Time Frame: Unknown
Funding: Local, State and Federal
Estimated Cost: $500,000
Staff: District General Manager, Engineer
Jurisdictions : Bona Vista Water Improvement District

Action 2: SCADA Base Unit

Time Frame: Unknown
Funding: Local, State and Federal
Estimated Cost: $100,000
Staff: District General Manager, Engineer
Jurisdictions : Bona Vista Water Improvement District

Action 3: Wasteway SCADA and Control

Time Frame: Unknown
Funding: Local, State and Federal
Estimated Cost: $250,000
Staff: District General Manager, Engineer
Jurisdictions : Bona Vista Water Improvement District

Action 4: Canal Control at Surge Tank

Time Frame: Unknown
Funding: Local, State, and Federal
Estimated Cost: $50,000
Staff: District General Manager, Engineer
Jurisdictions : Bona Vista Water Improvement District

Action 5: Regulating gates: WBCD, Perry, NOC, SOCD

Time Frame: Unknown
Funding: Local, State, and Federal
Estimated Cost: $1,300,000
Staff: District General Manager, Engineer
Jurisdictions : Bona Vista Water Improvement District

Action 5: Canal control: SOCD Headend and NOC Headend

Time Frame: Unknown
Funding: Local, State, and Federal
Estimated Cost: $100,000
Staff: District General Manager, Engineer
Jurisdictions : Bona Vista Water Improvement District

Action 6: Mobile Generators

Time Frame: Unknown
Funding: Local, State, and Federal
Estimated Cost: $3,000
Staff: District General Manager, Engineer
Jurisdictions : Bona Vista Water Improvement District

ROY WATER CONSERVANCY DISTRICT

Background Information

Roy Water Conservancy District's service area is completely within Weber County and is located within the Weber Basin Water Conservancy District boundaries. The service area is primarily Roy City but has grown to include small portions of West Haven, Hooper, and Riverdale.

The District maintains over 10,000 secondary water connections for approximately 40,000 residents. The District maintains approximately 135 miles of pressurized pipe. The District services 5,528 acres of domestic lawn and garden watering along with a small portion of agriculture.

Specific District Hazards

Flooding in general of breech caused by landslide? Earthquake?

1. Breech of concrete lined reservoir.
2. Breech of 48" and 30" pipes underneath I-15.
3. Breech of 42" pipe underneath UPRR/UTA tracks.
4. Breech of approximately 10,000 feet of AC pipe of various sizes and lengths throughout the entire water distribution system.

Critical Facilities and Infrastructure

Mitigation Strategies Implemented since the 2009 Plan

The District has been proactive with projects that have already been completed to minimize possible damage from possible breeches.

Planned Mitigation Strategies

Flooding

Problem Identification: A breech of the water system could cause damage to homes, major transportation corridors, and other infrastructure.

OBJECTIVE #1 (Priority HIGH): Reduce the impact of a breech by allowing for water delivery to be shut off quickly.

Action 1: Install automatic valve controls for existing 48" and 30" valves located near I-15 and the District's reservoir.

Time Frame: Unknown
Funding: Local, State, Bureau of Reclamation
Estimated Cost: Unknown
Staff: District General Manager, Engineer
Jurisdictions : Roy Water Conservancy District service area

SEWER DISTRICT

CENTRAL WEBER SEWER DISTRICT

Background Information

Central Weber Sewer Improvement District provides sewer treatment service for approximately 185,000 people located in Weber and Davis Counties. The cities of Farr West, Harrisville, North Ogden, Ogden, Pleasant View, Riverdale, South Ogden, South Weber, Washington Terrace and West Haven, along with Uintah Highlands Special Service District are completely serviced by the District. Portions of Hooper, Marriott-Slaterville, Plain City, Roy and unincorporated Weber County are also serviced by the District. During 2014 the District averaged 32,700,000 gallons of water treated per day.

Mitigation Strategies Implemented since the 2009 Plan

In 2011, the Central Weber Sewer Improvement District's started the Treatment Plant Upgrade and Expansion Project a Geotechnical Study was conducted during the pre-design phase of the project. Part of the study was a seismic analysis to comply with the seismic zone requirements designated for the location of the Treatment Plant. The findings of the Geotechnical Report were used in the design of the

pipelines, water bearing structures and buildings associated with the upgrade and expansion of the Treatment Plant.

WATER BEARING STRUCTURES
- Two Primary Clarifiers
- Four Aeration Basins connected as one structure
- Four Secondary Clarifiers
- Chlorine Contact Chamber
- Two Anaerobic Digester

BUILDINGS
- Headworks / Influent Pumping Station
- Blower Building
- Raw Sludge Pump Station
- RAS/WAS Pump Station
- Utility Water Pump Station
- Thickening Building
- Digester Control Building
- Effluent Pump Station

PIPELINES
- 108-inch diameter Outfall Sewer Line
- 54 to 42 inches in diameter Outfall Line
- Miscellaneous Yard Piping 72 inches to 8 inches in diameter

During the design seismic considerations were given based on the Geotechnical Report and Uniform Building Code requirements for our Seismic Zone. The Headworks and Water Bearing Structures were giving specific consideration to prevent the floating or uplift of structures in the occurrence of seismic activity. Methods used to mitigate potential damage were the construction of some of the structures on foundation piles. Other structures such as the Headworks Building were built with the bottom floors being in places up to 10 feet thick.

In the consideration of the new pipeline construction in many locations poor soils were removed and more stable soils place to create a firm foundation for the new pipelines. This was done based on geotechnical information to mitigate movement of the pipelines in the event of seismic liquefaction as well as for settlement consideration.

Looking to the future and possible mitigation it is hoped that if there are isolated pipeline failures temporary diversion channels could be created around the breakage while repairs are being made. The treatment plant does have redundancy to keep the wastewater flowing in the event of mild to moderate emergencies.

UTWARN

Central Weber Sewer Improvement District is also a member of UTWARN which is a recently created coalition of Utah governmental entities that have agreed to help each other out in the situation of major emergencies. These emergencies would include events such as earthquakes, flooding, landslides, severe weather instances. Barring a statewide disaster this could be a significant facture in future mitigation of disasters is isolated areas.

FIRE DISTRICTS

NORTH VIEW FIRE DISTRICT

Background Information

North View Fire District serves the cities of North Ogden, Pleasant View and Harrisville. We cover an area of approximately 16.96 square miles with an urban wildland interface from North Ogden divide on the east to the Weber County line to the west. North View Fire District provides fire suppression, EMT advanced ambulance service, hazmat and wildland response. North View Fire District Serves a population of 32,505 including the cities of North Ogden, Pleasant View and Harrisville for a total of 9,743 households.

The District is governed by an elected 7-member board with an annual budget of 2.2 million. David K. Wade, Fire Chief, is responsible for emergency management and planning for North View Fire District.

Specific Community Hazards

Of specific concern to the District is a gated community (Pole Patch) which is located in the upper most northwest corner of their jurisdiction. The community contains approximately 20 high-end homes on 5 acre lots. With only a single access road, the District is concerned about limited access, limited water supply and dense brush.

Mitigation Strategies Implemented since the 2009 Plan

The District has implemented a Pole Patch fuel reduction plan to address the concerns in that community.

WEBER FIRE DISTRICT

Background Information

The Weber Fire District was established in 1982 as a special service area by the Weber County Commissioners. Prior to its creation, the department was known as the Weber County Fire Department. The District provides emergency fire and medical services to all of the unincorporated areas of Weber County, and the incorporated cities of Farr West, Hooper, Huntsville, Marriott-Slaterville, and West Haven.

The District protects a growing community located in Weber County. Situated along the Wasatch Mountain Range, and around the City of Ogden, the District covers an area of approximately 511 square miles and serves a population of 43,000.

The District is governed by a nine member Board of Trustees consisting of both appointed and elected members (the elected members from unincorporated Weber County and appointed members from incorporated cities). The board meets monthly and approves the annual operational budget of the agency.

Costs of the annual budget are allocated from the cities and county on a property tax-based assessment evaluation.

The Chain-of-Command for the District would start with the governing body, then the Fire Chief, Deputy Chief, Fire Marshall, three Shift Captains (one per shift), and finally, Company Officers (Captains). David Austin, Fire Chief, and Paul Sullivan, Deputy Chief, are responsible for emergency management and planning for Weber Fire District.

Specific Community Hazards

The District is a gateway to the Ogden Valley's outdoor recreational areas, consisting of three ski resorts including Snowbasin, the site of the 2002 Winter Olympic Downhill events. The District serves a diversified service area consisting of the urban/wildland interface, agricultural, suburban, industrial, manufacturing and commercial occupancies.

Additionally a major Union Pacific railroad line bisects the county, as does I-15, I-84, and US-89 all of which are major transportation routes for numerous types of hazardous materials. Several underground petroleum pipelines traverse Weber County, as do large natural gas delivery lines. Weber County also has an extensive wildland/urban interface that exists in the eastern portion of the District and borders the Wasatch National Forest. These wild-land fires always involve a combined County and State effort. Add to all of the above mentioned, the existence of the Wasatch Earthquake Fault in the central portion of the County, the potential for a major emergency is even greater.

Critical Facilities and Infrastructure

The District provides service from six (6) fire stations and has an area wide Insurance Service Office (ISO) a 5/9 class rated fire protection.

Mitigation Strategies Implemented since the 2009 Plan

To address the threat of Wildland Fire, Weber County and Weber Fire District have three Community Wildfire Protection Plans/projects:

1. Causey Estates
2. Pineview Estates
3. Nordic Valley

The District is also proactive in public education for both the public schools and general public. Fire Marshal Brandon Thueson runs our public education program, and helps produce and facilitate these programs (to include our CERT program). We also do fire inspections, which assists in mitigating fire hazards in businesses. Also, in his role as Weber County's fire marshal, in acts safety ordinances for fireworks, open burning, and other restrictions/allowances as needed to keep our communities safe and compliant.

On a response level, we respond to disasters of all kinds. For example, with the recent flooding, we received seven flood related calls in one evening. We mostly provided labor for the citizens involved, but are always seeking ways to obtain and receive support for the hazards we face.

The District seeks to always proactively work with the communities we serve to provide mitigation assistance and projects where we can.

The following are the current Wildland projects and their cost:

- Causey Estates: fuel reduction of ingress and egress and chipping 2014 to 2015 $18,000
- Pineview Estates: fuel reduction of ingress and egress and a shaded fuel break 2014 to 2015. $55,000
- Nordic Valley: Defensible spacing and chipping $4.162
- Powder Mountain: Shaded fuel break 2014 only $45,000 (this is a completed project).

Other costs are normal operating budget items for the District.

Planned Mitigation Strategies

Earthquake

Problem Identification: Critical facilities need to be made less vulnerable to from the impacts of earthquakes to remain in service and allow emergency response and housing of emergency personnel. The following fire stations are not built to withstand seismic events:

- Weber Fire Station 62: 5550 E 2200 N, Eden, UT
- Weber Fire Station 63: 4646 W 4000 S, West Haven, UT
- Weber Fire Station 64: 2175 Eastwood Blvd, South Ogden, UT

OBJECTIVE (Priority HIGH): Older stations need to be rebuilt or retrofitted to withstand seismic events.

Status: No action as of yet.

Flood

No stations are currently within flood plain, no hazard has been identified.

Status: No action taken to date.

Severe Weather

Problem Identification: Stations are vulnerable to impacts of severe weather; specifically windstorms that occur along the Wasatch Front. The most vulnerable station to such events is Fire Station 64: 2175 Eastwood Blvd, South Ogden. This station sits in the "crash zone" of the Wasatch Mountains and can be hit by high winds.

OBJECTIVE (Priority HIGH): a structural assessment should occur to ascertain the degree of vulnerability, to include soundness of communication systems attached to the building.

Action 1: Identify which stations are vulnerable to the impacts of severe weather.

Time Frame: Unknown
Funding: Local, State and Federal

Estimated Cost: Unknown
Staff: Fire Chief, Engineer
Jurisdictions : Weber County

Action 2: Make structural upgrades to impacted stations.

Time Frame: Unknown
Funding: Local, State and Federal
Estimated Cost: Unknown
Staff: Fire Chief, Engineer, Weber County
Jurisdictions : Weber County

Status: No action as of yet.

Wildfire

Problem Identification: Stations may be vulnerable to the effects of wildfire. Some stations have defensible space, but can be impacted by smoke, debris, and embers from large fires.

Currently the biggest concern are stations located in the Upper Valley and in the Uintah Highlands. These are:

- Weber Fire Station 62: 5550 E 2200 N, Eden, UT
- Weber Fire Station 64: 2175 Eastwood Blvd, South Ogden, UT
- Weber Fire Station 65: 7925 E 500 S, Huntsville, UT

OBJECTIVE (Priority MEDIUM): defensible space should be maintained and steps made during a wildfire to protect the building.

Status: Defensible Space is currently being maintained. No further actions. Steps to be taken are institution of protective measure should a given station become threatened.

Dam Failure

Problem Identification: Stations may be vulnerable to dam failure. Currently the biggest concern is our stations located downstream. These are:

- Weber Fire Station 61: 2023 W 1300 N, Farr West, UT
- Weber Fire Station 66: 3641 W 2200 S, Ogden, UT

Neither of these stations are directly in the flood path, but operations would be severely hampered should flooding occur.

Another concern is the impact a dam failure would have on the Upper Valley stations. A dam failure would effectively close the Ogden Canyon, decreasing rapid access to the upper valley.

OBJECTIVE (Priority MEDIUM): Determine which stations are vulnerable to dam failure and what actions can be taken to protect them.

Status: No action as of yet.

SCHOOL DISTRICTS

Problem Identification: Vulnerability of Critical Educational Facilities

Objective: Retrofit or replace critical education facilities that are shown to be vulnerable to damage in natural disasters.

Objectives: Conduct comprehensive programs to identify and mitigate problems with facility contents, architectural components, and equipment that will prevent critical buildings from being functional after major natural disasters

Objective: Identify and undertake cost effective retrofit measures on critical facilities when these buildings undergo major renovations

Objective: Develop and maintain a system of interoperable communications for first responders from cities, counties, special service districts, local school districts, state and federal agencies.

Objective: As a secondary focus, assess the vulnerability of non-critical educational facilities to damage in natural disasters based on occupancy and structural type, make recommendations on priorities for structural improvements or occupancy reductions, and identify potential funding mechanisms.

OGDEN SCHOOL DISTRICT

Background Information

Ogden City School District provides educational services to students residing within the boundaries of Ogden City. The district operates 14 elementary, three junior high and three senior high schools and an early childhood program for special education students. The district is governed by the seven-member Ogden City School Board of Education. The District has approximately 12,400 students enrolled. Zac Williams, Director of Communications, is responsible for emergency management and planning efforts for Weber School District.

Specific Community Hazards

Earthquake. Ogden School District faces the same hazard present in Ogden City with particular concern that older schools and district buildings meet seismic standards.

Critical Facilities and Infrastructure

Mitigation Strategies Implemented since the 2009 Plan

As Ogden School District replaces schools they are built to the new codes. The Dee School replacement is one of the projects currently underway.

Planned Mitigation Strategies

Earthquake

Problem Identification: Older school buildings and other district buildings do not meet current seismic standards.

OBJECTIVE #1 (Priority HIGH): Complete seismic retrofits to bring structures up to current standards.

Action 1: Seismic Upgrades at the following schools

- Bonneville Elementary School
- Gramercy Elementary School
- Hillcrest Elementary School
- Horace Mann Elementary School
- Older sections of James Madison Elementary School
- Polk Elementary
- Taylor Elementary School
- T.O. Smith Elementary School
- Wasatch Elementary School
- Highland Junior High School
- Mound Fort Junior High School
- Mount Ogden Junior High School
- George Washington High School

Time Frame: Unknown
Funding: Federal, State and Local
Estimated Cost: Unknown
Staff: Ogden School District, Engineer
Jurisdictions : Ogden City

Objective #2 (Priority HIGH): Reduce the impact of non-structural events following an earthquake

Action 1: Develop and implement a manual similar to Salt Lake City (SLC) school districts

Time Frame: Immediate
Funding: School District, State Earthquake Program Grant
Estimated Cost: Minimal if using SLC School District template
Staff: School District, County Emergency Management
Jurisdictions: Countywide

Action 2: Develop a training document for schoolteachers showing non-structural mitigation activities for classrooms

Time Frame: Ongoing
Funding: County Emergency Services, School Districts, State Earthquake Program
Estimated Cost: Minimal
Staff: County Emergency Services, School District
Jurisdictions: Countywide

OBJECTIVE #3 (Priority MEDIUM): Make upgrades and purchase equipment to prepare buildings for hazard events and to be allow them to be used as community emergency shelters.

Action 1: Purchase backup generators for the following buildings

- Highland
- Mound Fort
- T.O Smith
- Taylor
- Hillcrest
- Wasatch

Time Frame: Unknown
Funding: Federal, State and Local
Estimated Cost: Unknown
Staff: Ogden School District, Engineer
Jurisdictions : Ogden City

Action 2: Purchase a portable boiler system that uses diesel fuel in case of an interruption in the gas supply

Time Frame: Unknown
Funding: Federal, State and Local
Estimated Cost: Unknown
Staff: Ogden School District
Jurisdictions : Ogden City

WEBER SCHOOL DISTRICT

Background Information

Weber School District, created in 1905, is located in Weber County, 30 miles north of Salt Lake City, and covers approximately 548 square miles. With the exception of Ogden City, the District's boundaries are conterminous with the county. Weber School District Serves 33,000 students from 14 different communities and unincorporated Weber County. The district is ranked as the sixth largest school district among the State's 41 districts.

The district is served by a Board of Education which is responsible for determining policies for management of the district. The board has the duty to do all things necessary to the maintenance, prosperity and success of the schools and the promotion of education. The board is divided into seven representative precincts and a member of the board is elected from each of the seven precincts. Members serve four-year terms which are staggered to provide continuity. Nate Taggart, Community Relations Manager, is responsible for emergency planning for Weber School District.

Specific Community Hazards

Weber School District has identified that its facilities may be vulnerable to the following hazards:

- Dam failure. Some schools and facilities are in dam inundation areas were there to be a dam failure.
- Flooding. Some schools are located within identified floodplains
- Concerns of the impact of hazards on the transportation hub
- Storage of hazardous materials
- Earthquake/fault zones

Critical Facilities and Infrastructure

Weber School Districts critical facilities include 44 schools: 28 elementary schools, 9 junior high schools, 4 high schools, 1 alternative high school, 1 college prep high school and 1 special needs school.

Mitigation Strategies Implemented since the 2009 Plan

The district has regular drills and training for various types of disasters.

The district works closely with local jurisdictions and groups to lessen loss in the event of a catastrophe. They have conducted surveys and studies in areas such as seismic, radon, asbestos, etc.

Planned Mitigation Strategies

We have six schools constructed before 1970. This is down from 16 just a decade ago. One of the main concerns with these structures has been seismic safety. Replacement of the remaining school will be approximately $150 million.

Problem Identification: Non-structural hazards in the Weber County schools are a threat to students, employees, and facilities while also causing increases in recovery time/activities following an earthquake.

Objective #1 (Priority HIGH): Reduce the impact of non-structural events following an earthquake

Action 1: Develop and implement a manual similar to Salt Lake City (SLC) school districts

Time Frame: Immediate
Funding: School District, State Earthquake Program Grant
Estimated Cost: Minimal if using SLC School District template
Staff: School District, County Emergency Management
Jurisdictions: Countywide

Action 2: Develop a training document for schoolteachers showing non-structural mitigation activities for classrooms.

Time Frame: Ongoing
Funding: County Emergency Services, School District, State Earthquake Program
Estimated Cost: Minimal
Staff: County Emergency Services, School District
Jurisdictions: Countywide

Other Service Districts

WEBER AREA DISPATCH 911 and EMERGENCY SERVICES DISTRICT

Background Information

Weber Area Dispatch serves 251,085 people and a land area of 1,185 square miles in Weber and Morgan Counties. Services the district provides are PSAP capabilities as well as consolidated police, fire and emergency medical dispatching for all agencies in the two-county area. The district is overseen by an Administrative Control Board, the cities throughout the two counties are overseen by mayors and city councils. Jim White is responsible for emergency planning for the district.

Specific Community Hazards

The service area of the Weber Area Dispatch is susceptible to same hazards as Weber County generally including: earthquake, landslide, wild land fire, dam failure, flood, drought, infestation, severe weather, and epidemic/pandemic.

Planned Mitigation Strategies

Earthquake

Objective #1 (Priority HIGH)

Action 1: Seismic isolation systems on an upcoming building project

Time Frame: Begin within one year
Funding: Unknown

Estimated Cost: $1,000,000
Staff: Weber Area Dispatch
Jurisdictions: Countywide

Multi-Hazards

Problem Identification: A new communications center is needed.

Objective #1 (Priority MEDIUM)

Action 1: Construct a new communications center

Time Frame: Begin within one year
Funding: Unknown
Estimated Cost: Unknown
Staff: Weber Area Dispatch
Jurisdictions: Countywide

WEBER HUMAN SERVICES

Background Information

Weber Human Services (WHS) operated as a Department of Weber County Government from 1970 through 1993. In August 1993, the Boards of Commissioners from Weber and Morgan Counties under the authority of the Interlocal Cooperation Act, established Weber Human Services to provide the three mandated Human Services for Weber and Morgan Counties. Under the terms of this Interlocal Agreement, Weber Human Services is a subdivision of the State of Utah, and sole source provider of Aging, Mental Health and Substance Abuse services for a time period of fifty (50) years.

At the time Weber Human Services was established, Weber County transferred cash fund balances, buildings and furnishings (including equity) and related assets to the new entity. Weber Human Services is part of the EOC within Weber County. Randy Bates is responsible for emergency planning for WHS.

In 2014, Weber Human Services estimates shows the following client breakdown:

Clients receiving Substance Use Disorder Treatment
Adults 1262
Youth 276
Total 1538

57% (877) Male, 43% (661) Female

72% (1107--631 M, 476 F) White
18% (277--158 M, 118 F) Hispanic
2% (31--18 M, 13 F) Black
8% Other

Clients receiving Mental Health Treatment

Adults 4253
Youth 1639
Total 5892

Specific Hazards

Currently Weber Human Services Information Technology is stored in the basement of its main building and currently has no electrical power back-up. The WHS Building is built upon underground rivers. If power failed our basement would flood. Pumps are required to prevent flooding in the basements of the main building.

WHS provides 800 meals daily to senior citizens throughout Weber County. The Kitchen is located in the Ogden Industrial Park at the top of the hill west of Autoliv. This location is believed to not be in a flood plain and could serve as a backup IT storage facility for WHS, as well as be instrumental in feeding not only the elderly but other entities as needed. It also serves as the storage location of our fleet called the "The Ride". With both the ability to feed individuals, utilize transportation and be a backup facility for WHS, I.T., this facility could be very important to Weber County in the event of a major catastrophe. WHS, as part of the EOC, will need to have access to current clientele records as well as being able to provide services for anyone in crisis. The importance of accessing current records for mental health, the aging population, and documentation of any additional person during a crisis is critical. These electronic records provide addresses and phone numbers for people receiving dialysis, medications and other critical health issues that put people at risk, if intervention and services cannot be delivered. This includes coordination with outside home health agencies.

Critical Facilities and Infrastructure

Main building at 237 26th Street in Ogden
Nutrition Kitchen in the Ogden Industrial Park
"The Ride" fleet

Senior Centers

Farr West Center
Happy Hour/Marshall White
Marriot-Slaterville Center
Northview Center
Plain City Center
Roy Hillside Center
Washington Terrace Center
Golden Hours Center
Lakeview Center
Ogden Valley Center
Riverdale Center
South Ogden Center
Morgan Center

Mitigation Strategies Implemented since the 2009 Plan

WHS provides an overview of its Emergency Plan to staff annually at staff meeting.

Planned Mitigation Strategies

Multi-Hazards

Problem Identification: Given the vulnerability of the main building to flooding, WHS needs to prevent flooding and establish a fully-functional and disaster resilient secondary facility.

OBJECTIVE (Priority HIGH): The Nutrition Kitchen is an excellent facility that can be very resourceful in an emergency situation. This location is the Hub for "The Ride" which is where several vans and carsare stationed, that can be used for providing transportation across the county. The Kitchen can provide meals if it is structurally sound and has its own power source. An electrical generator would be needed to power the equipment needed to make meals and power computers that would have contact information for many vulnerable individuals. This facility would also need to be able to withstand natural disasters. This facility would probably benefit from having a water storage tank and possibly its own natural gas supply.

Action 1: Electrical Generator for Nutrition Kitchen

Time Frame: Unknown
Funding: Federal, State and Local
Estimated Cost: Unknown
Staff: Weber Human Services
Jurisdictions : Weber County

Action 2: Water Storage Tank for Nutrition Kitchen

Time Frame: Unknown
Funding: Federal, State and Local
Estimated Cost: Unknown
Staff: Weber Human Services
Jurisdictions : Weber County

Action 3: Propane Tank

Time Frame: Unknown
Funding: Federal, State and Local
Estimated Cost: Unknown
Staff: Weber Human Services
Jurisdictions : Weber County

Action 4: Seismic Analysis and Structural Updates

Time Frame: Unknown
Funding: Federal, State and Local
Estimated Cost: Unknown
Staff: Weber Human Services, Engineer
Jurisdictions : Weber County

OBJECTIVE (Priority HIGH): At WHS the computers are stored in the basement and the potential for flood is high if the power goes out. Therefore a backup generator at WHS is needed to keep computers and pumps operational as well as critical need for refrigeration of medicines in the Medical Clinic.

Action 1: Electrical Generator

Time Frame:	Unknown
Funding:	Federal, State and Local
Estimated Cost:	Unknown
Staff:	Weber Human Services
Jurisdictions :	Weber County

PART XIII. PLAN MAINTENANCE AND IMPLEMENTATION

Monitoring, Evaluating and Updating the Plan

Periodic monitoring and updates of this Plan are required to ensure that the goals and objectives for the Region are kept current and that local mitigation strategies are being carried out. This Plan has been designed to be user-friendly in terms of maintenance and implementation. This portion of the Plan outlines the procedures for completing such revisions and updates. The Plan will also be revised to reflect lessons learned or to address specific hazard incidents arising out of a disaster.

The Weber County LEPC meets quarterly to review emergency management efforts in the County. This meeting is open to the public and attended by County and City governmental officials, local businesses, hospitals, fire departments, the Sierra Club and local citizens. To keep the Pre-Disaster Mitigation Plan up-to-date, the LEPC will conduct a quarterly review to discuss the incorporation of new hazards, mitigations or other data into the plan.

Annual Review Procedures

Weber County will annually review the mitigation strategies described in this Plan, as required by the Utah Department of Emergency Management (DEM), or as situations dictate, such as following a disaster declaration. The process will include the County organizing a Mitigation Planning committee comprised of individuals from organizations responsible to implement the described mitigation strategies. Progress toward the completion of the strategies will be assessed and revised as warranted. The County Emergency Manager will regularly monitor the Plan and is responsible to make revisions and updates.

Five Year Plan Review

The entire Plan including any background studies and analysis shall be revised and updated every five years by the participating jurisdictions to determine if there have been any significant changes in the region that would affect the Plan. Increased development, increased exposure to certain hazards, the development of new mitigation capabilities or techniques and changes to Federal or State legislation are examples of changes that may affect the condition of the Plan.

The Hazard Pre-Disaster Mitigation Planning Committee will be reconstituted for the five year review/update process. Typically, the same process that was used to create the original Plan will be used to prepare the update.

If the participating jurisdictions or DEM determine that the recommendations warrant modification to the Plan, an amendment may be initiated as described below.

Plan Amendments

The Utah DEM State Hazard Mitigation Officer, Local Mitigation Committee, or Mayor/City Manager of an affected community, will initiate amendments and updates to the Plan.

Upon initiation of an amendment to the Plan, DEM will forward information on the proposed amendment to all interested parties including, but not limited to, all affected city or county departments, residents and businesses. Depending on the magnitude of the amendment, the full planning committee may be reconstituted.

At a minimum, the information will be made available through public notice in a newspaper of general circulation or on the DEM website at http://dem.utah.gov. The review and comment period for the proposed Plan amendment will last for not less than forty-five (45) days.

At the end of the comment period, the proposed amendment and all review comments will be forwarded to participating jurisdictions for consideration. If no comments are received from the reviewing parties within the specified review period, such will be noted accordingly. DEM will review the proposed amendment along with comments received from other parties and submit a recommendation to FEMA within sixty (60) days.

In determining whether to recommend approval or denial of a Plan amendment request, the following factors will be considered:

1. There are errors or omissions made in the identification of issues or needs during the preparation of the Plan; and/or
2. New issues or needs have been identified which were not adequately addressed in the Plan; and/or
3. There has been a change in information, data or assumptions from those on which the Plan was based.
4. The nature or magnitude of risks has changed.
5. There are implementation problems, such as technical, political, legal or coordination issues with other agencies.

Upon receiving the recommendation of DEM, a public hearing will be held. DEM will review the recommendation (including the factors listed above) and any oral or written comments received at the public hearing. Following that review, DEM will take one of the following actions:

1. Adopt the proposed amendment as presented.
2. Adopt the proposed amendment with modifications.
3. Defer the amendment request for further consideration and/or hearing.
4. Reject the amendment request.

Implementation through Existing Programs

Once the Plan is promulgated, participating cities and the County will be able to include this Plan's information in existing programs and plans. These could include the General or Master Plan, Capital Improvements Plan, Emergency Operations Plan, State Mitigation Plan, City Mitigation Plans. Many of the mitigation actions developed by the cities and counties have elements of mitigation implementation including the National Flood Insurance Program (NFIP), the Utah Wildland-Urban Interface Code, the Building Code Effectiveness Grading System (BCEGS), and Community Rating System (CRS), all of which have been implemented.

Process

It will be the responsibility of Mayor/Council/Commissioner(s) of each jurisdiction, as he/she/they see fit, to ensure these actions are carried out no later than the target dates unless reasonable circumstances prevent their implementation (i.e. lack of funding availability).

Funding Sources

Although all mitigation techniques will likely save money by avoiding losses, projects may be costly to implement. The County and jurisdictions shall continue to seek outside funding assistance for mitigation projects in both the pre- and post-disaster environment. This portion of the Plan identifies the primary Federal and State grant programs for the jurisdictions to consider, and also briefly discusses local and non-governmental funding sources.

Federal Programs

The following federal grant programs have been identified as funding sources which specifically target hazard mitigation projects:

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 Natural Hazard Pre-Disaster 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: Flood Mitigation Assistance Program
Agency: Federal Emergency Management Agency

FEMA's Flood Mitigation Assistance program (FMA) provides funding to assist states and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes and other structures insurable under the National Flood Insurance Program (NFIP). FMA was created as part of the National Flood Insurance Reform Act of 1994 (42 USC 4101) with the goal of reducing or eliminating claims under the NFIP.

FMA is a pre-disaster grant program, and is available to states on an annual basis. This funding is available for mitigation planning and implementation of mitigation measures only, and is based upon a 75% Federal share/25% non-Federal share. States administer the FMA program and are responsible for selecting projects for funding from the applications submitted by all communities within the state. The state then forwards selected applications to FEMA for an eligibility determination. Although individuals cannot apply directly for FMA funds, their local government may submit an application on their behalf.

Title: Hazard Mitigation Grant Program
Agency: Federal Emergency Management Agency

The Hazard Mitigation Grant Program (HMGP) was created in November 1988 through Section 404 of the Robert T. Stafford Disaster Relief and Emergency 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: 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: Small Business Administration (SBA) Disaster Assistance Program
Agency: U.S. SBA

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 people. The CDBG program also provides grants for post-disaster hazard mitigation and recovery following a Presidential disaster declaration.

Funds can be used for activities such as acquisition, rehabilitation or reconstruction of damaged properties and facilities and for the redevelopment of disaster areas.

State Programs

Local

Local governments depend upon local property taxes as their primary source of revenue. These taxes are typically used to finance services that must be available and delivered on a routine and regular basis to the general public. If local budgets allow, these funds are used to match Federal or State grant programs when required for large-scale projects.

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 American Red Cross, hospitals, land trusts and other non-profit organizations.

Paramount to having a Plan deemed to be valid is its implementation. There is currently no new fiscal note attached to the implementation of this Plan.

Continued Public Involvement

Throughout the planning process, public involvement has been critical to the development of the Plan and its updates. The Plan will be available on the Weber County and Utah DEM websites to provide opportunities for public participation and comment. The Plan was also made available for review at the Weber County offices. Weber County prepared informational materials that were distributed at the City offices of each municipality describing the planning process, purpose and how the public could provide input.

Public Meetings

Throughout the PDM Planning Process, LEPC meetings have been held involving County and City governmental officials, local businesses, hospitals, fire departments, the Sierra Club and local citizens. The LEPC was initially established to coordinate hazardous materials emergencies, but the County has adopted an approach to handle the broad range of hazards that may affect the County. These meetings are held monthly and are open public meetings as required by the Federal SARA and CERCLA Acts. In the meetings and trainings, Pre-Disaster Mitigation planning and strategies have been discussed and public comment from these meetings have been implemented in this Plan. To maintain and implement the Plan, the LEPC will

conduct a quarterly review of the hazards and strategies outlined in the Plan to keep them up-to-date and to keep the public informed.

Emergency management staff from each jurisdiction in Weber County had the responsibility of presenting the plan to the elected officials of their municipality. The plan was presented at a public meeting and allowed for public comment prior to the approval of plan by the city/town council or county commission. All interested parties were welcome and invited to attend such meetings, as they were public and open to all.

Comments, both oral and written, were solicited and accepted from any interested party. Comments, as far as possible, will be included in the final draft of the Plan.

Specific to risk assessment and hazard mitigation, needs analysis, and capital investment strategies, the County contacted and solicited input from each incorporated jurisdiction within the County. All input was voluntary.

STEP 5. The following policies guided Weber County staff in making access and input to the Hazard Pre-Disaster Mitigation Plan as open and convenient as possible:

A. Participation

All citizens of the County were encouraged to participate in the planning process, especially those who may reside within identified hazard areas. The County and Cities will take actions possible to accommodate special needs of individuals including the impaired, non-English speaking, persons of limited mobility, etc.

B. Access to Meetings

Adequate and timely notification to all area residents will be given as outlined above to all hearings, forums, and meetings.

C. Access to Information

Citizens, public jurisdictions, agencies and other interested parties will have the opportunity to receive information and submit comments on any aspect of the Hazards Pre-Disaster Mitigation Plan, and/or any other documents prepared for distribution.

D. Technical Assistance

Residents as well as local jurisdictions may request assistance in accessing the program and interpretation of mitigation projects. Weber County staff has assisted to the extent practical, however, limited staff time and resources may prohibit staff from giving all the assistance requested. At monthly Emergency Manager's meetings, Weber County has provided guidance on how to identify the hazards in each jurisdiction and emergency manager's coordinated with elected officials, public works staff and city engineers to establish mitigation strategies based on the applicable hazards and threats to their communities.

E. Future Revisions:

Future revisions of the Plan shall include:

1. Expanded vulnerability assessments to include flood and dam failure inundation.
2. Continue the search for more specific mitigation actions.

3. An analysis of progress of the Plan as it is revised.
4. Expanded look into how the identified natural hazards will affect certain populations including the young and elderly.

APPENDIX A. ENVIRONMENTAL CONSIDERATIONS

Natural disasters are naturally occurring phenomena. They play an integral part in maintaining balance in our world. Meteorological, geological, or hydrological processes have shaped Utah for millions of years and will continue to shape the valley for millions more. These unique phenomena only cause disasters when they affect humans and their structure. Modern engineering has made it possible to prevent damage from natural hazards. However, the economic and environmental costs can be rather high. Tampering with natural systems can also create an imbalance in the natural environment. The effects of many of these imbalances are still unknown. It is better to live with a small amount of risk, respecting natural processes where appropriate, than to construct mitigation at every chance. Nature provides its own mitigation and measures the need to be identified, protected and/or strengthened. To ensure that our environment is not harmed through mitigation measures, all applicable city/county ordinances and state/federal laws pertaining to the environment must be followed. The majority of the proposed mitigation programs in this Plan will be funded through federal programs, and thus tied to federal funding.

"44 CFR 10.8(d)(2)(iii) excludes this rule from the preparation of an environmental assessment or environmental impact statement, where the rule relates to actions that qualify for categorical exclusions under 44 CFR 10.8(d)(2)(iii), such as the development of plans under this section" (United States 2002).

The following acts will be taken into consideration and will be incorporated when needed while organizing and implementing the PDM Plan: Clean Air Act, Clean Water Act, Endangered Species Act, Floodplain Management, National Historic Preservation Act.

Clean Air Act (CAA) 1970: The Clean Air Act is the comprehensive Federal Law that covers the entire country under the Environmental Policy Act regulating air emissions from area, stationary, and mobile sources. This law sets limits or National Ambient Air Quality Standards (NAAQS), on how much of a pollutant can be in the air anywhere in the United States and the emissions of air pollutants. These limits ensure that all Americans have the same basic health and environmental protections. Maximum pollutant standards were set, though states may have stronger pollution controls than the national standards. Each state explains how it will do its job under the Clean Air Act by developing a mandated "state implementation plan" (SIP) that must be approved by the Environmental Protection Agency (EPA). The 1977 amendment set new dates for areas of the country that failed to meet the initial deadlines for achieving NAAQS. The 1990 amendments addressed problems such as acid rain, ground-level ozone, stratospheric ozone depletion, and air toxins. This act required facilities with large amounts of certain hazardous chemicals to have a special emergency planning requirement. Based on a facilities potential threat or risk from chemical spills, fires, explosions, etc., facilities prepare a Risk Management Plan (RMP) that includes hazard identification, assessments, design and maintenance of a safe facility, necessary steps to prevent releases and ways to minimize the consequences from an accidental release (US 1970).

Clean Water Act (CWA): The Federal Water Pollution Control Act Amendments of 1972 came about because of the growing awareness for the need to control water pollution. As amended in 1977, this law became known as the Clean Water Act, whose mission is to establish the basic structure for regulating discharges of pollutants into the waters of the United States, and to reduce and maintain the chemical, biological, and physical veracity. The act gave the EPA the authority to set wastewater standards for industry. The act also requires that each state adopt water quality standards, act to protect wetlands, and limit industrial and municipal discharges into navigable waters unless permitted. It funded the construction of wastewater treatment plants for nearly every city in the United States through construction grant programs from the EPA and recognized the need for planning for future threats from nonpoint source pollution. (United States 1977a)

Clean Water Act, Section 404 – Wetland Preservation: This section regulates activities in wetland areas and authorizes the EPA to restrict or prohibit the use of an area as a disposal site for dredged or fill material if the discharge will have adverse affects on municipal water supplies, shellfish beds and fishery areas, wildlife or recreational areas. A permit must be issued that is based on regulatory guidelines developed in conjunction with the U.S. Army Corps of Engineers and the EPA. (United States 1977a)

Endangered Species Act of 1973: This act provides a plan for the protection of threatened or endangered plants and animals and the habitats in which they are found. Congress declared that various species of fish, wildlife, and plants in the United States have been caused to become extinct, or are so depleted in numbers they are in danger of becoming extinct as a result of economic development and expansion without adequate concern for conservation. Aesthetic, ecological, educational, historical, recreational, and scientific importance come from these species and are a value to our nation and its people. The U.S. will conserve, to a practicable extent, the species that face extinction and will encourage the States through federal assistance to develop and maintain conservation programs. The reason for the Act is to provide a means by which ecosystems with endangered and threatened species will be conserved. It is also declared that all state and local agencies resolve water resource issues in connection with conservation of endangered species (United States 1973).

Floodplain Management Policy: The main points of this policy are to reduce the loss of life and property and the disruption of societal and economic pursuits caused by flooding or facility operations as well as to restore, sustain and enhance the natural resources, ecosystems and other functions of the floodplains. Activities will search for a balance between the sometimes competing uses of floodplains in a way that provides the most benefit to society. Activities will pursue and encourage the appropriate use of floodplains, avoid long and short term negative impacts associated with the development and modification of floodplains, and avoid direct and indirect support of floodplain development whenever there is a practicable alternative. "Functions of floodplains include natural moderation of floods; fish, wildlife, and plant resources and habitat; groundwater recharge; and water quality maintenance. Uses of floodplains include storm water management, erosion control, open space, natural beauty, opportunity for scientific study, outdoor education, recreation, and cultural preservation, and compatible economic utilization of floodplain resources by human society." (United States 1977b).

National Historic Preservation Act of 1966 (NHPA): This act was enacted by Congress because "the spirit and direction of the Nation are founded upon and reflected in its historic heritage…the historical and cultural foundations of the Nation should be preserved as a living part of our community life and development in order to give a sense of orientation to the American people." Another main point of the act mandates the awareness of historic properties that are being lost or substantially altered. The preservation will continue a legacy of cultural, educational, aesthetic, inspirational, economic and energy benefits for future generations. The knowledge of historic resources and the encouragement of their preservations will improve the planning and execution of Federal and federally-assisted projects and will assist economic growth and development. The act uses measures that will foster conditions in which historic resources can exist in productive harmony with present and future generations (United States 2000).

Section 106 of NHPA "requires all Federal agencies to take into account the effects of their actions on historic properties, and provide ACHP with a reasonable opportunity to comment on those actions and the manner in which Federal agencies are taking historic properties into account in their decisions" beginning at the early stages of planning to mitigate any adverse effects on historic properties (United States 2000).

APPENDIX B. GENERAL MITIGATION STRATEGIES

For the purpose of this mitigation Plan, mitigation strategies will be divided into one of five categories according to how they accomplish mitigation. The six categories include:

- Emergency Services
- Natural Resource Protection
- Prevention
- Property Protection
- Public Information and Involvement
- Structural Protection

Emergency Service: Emergency Services protect people during and after a disaster.

Examples include:

- Mutual aid agreements
- Protection of critical facilities
- Health and safety maintenances
- Inventory of assets
- EMS/Police/Fire response and skill

Natural Resource Protection: Natural Resource Protection includes strategies that preserve or restore natural areas or the natural function that an area provides.

Examples include:

- Wetlands protection
- Pollution reduction
- Erosion and sediment control
- Fuels reduction
- Watershed maintenance

Prevention: Prevention measures are intended to prevent the problem from occurring and/or keep it from getting worse.

Examples include:

- Planning, zoning, and ordinance regulations
  - Open space preservation
  - Floodplain and wetland development regulations
  - Storm water management
  - Minimum set back requirements
  - Evacuation plans

Property Protection: Property protection measures are used to modify buildings within high-risk areas in an attempt to reduce damage. For the most part property protection measures do not affect a buildings appearance or use making them less expensive and particularly suitable for historical sites and landmarks.

Examples include:

- Utility relocation
- Burying or flood proofing
- Non-structural earthquake mitigation
- Backup protections
- Insurance and other financial loss minimization actions
- Technical evaluations and mapping

Public Information and Involvement: Public information and involvement activities are intended to advise property owners, potential property owners, and visitors about the particular hazards associated with a property and ways to protect people and property from these hazards.

Examples include:

- Education
  - NFIP
  - URWIN areas
  - Hazard Identification
- Maps with high hazard locations identified
- Informational mailings
- Workshops
- Real estate disclosures for natural hazards
- Real estate insurance

Structural Protection/Projects: These are man-made structures, which prevent damage from impacting property.

Examples include:

- Detention/retention basins
- Larger culverts
- Elevated seismic design
- Floodwalls
- Debris basins
- Landslide stabilization and levees

1. Flood/ Riverine Mitigation

Generic Mitigation

The following are generic mitigation strategies appropriate for addressing the hazard of flooding. Many of these strategies are expanded upon in the text that follows.

- Avoidance, land-use planning and zoning ordinances
- Better flood routing through communities
- Annual warning of risk information on how to protect property and lives
- Flood insurance awareness, emphasis, and marketing
- Projects such as levees/dams
- Funding by a storm water tax in cooperation with Federal and State programs

- Additional SNOTEL sites and enhanced instrumentation
- Protection of roads and bridges
- Greater reservoir capacities
- Curtail development in flood-prone areas
- General infrastructure protection
- Develop river corridor parkways
- Protection of wastewater treatment facilities from excessive inflows
- Protection of drinking water supply systems
- Gather hazard and risk data/information
- Development of improved mitigation techniques
- Education of local officials, developers, and citizens
- Protecting natural floodplain resources
- Good watershed management

A. Emergency Services

Flood Warning: Warning systems designed to alert residence of rising floodwaters. Warning systems can disseminate the information through a number of means such as sirens, radio, television, mobile public address system, reverse 911, or door-to-door contact. Multiple or redundant warning systems are most effective, giving people more than one opportunity to be warned.

Flood Response: Flood response refers to the actions that are taken to prevent or reduce damage once a flood starts. An example of flood response is the turning of State Street into a river during the 1983 flood event. Many of the below actions should be part of an Emergency Operations Plan (EOP) developed in coordination with the agencies that share responsibilities. The EOP once developed should be exercised and continually evaluated so when the Plan is needed key players know what to do.

Flood response actions might include:

- Activation of the emergency operations center
- Sandbagging designated areas
- Closing streets and bridges
- Shutting off power to threatened areas
- Protective actions for children in schools
- Ordering an evacuation
- Opening evacuation shelters

Critical Facilities Protection: Protecting critical facilities is vital, yet this protection draws workers and resources away from protecting other parts of a town or county. For this reason listed below are vital facilities and facilities with the potential of causing a secondary disaster if destroyed. It is important to keep these locations in mind when considering potential mitigation projects.

Facilities or locations vital to flood response efforts:

- Emergency operations centers
- Police and fire stations
- Hospitals
- Highway garages
- Selected roads and bridges

- Evacuation routes

Facilities and locations which, if flooded would create a secondary disaster:

- Facilities housing hazardous materials
- Wastewater treatment plants
- Schools
- Nursing homes

Health and Safety Maintenance: Response to floods or other natural disasters should include measures to prevent damage to health and safety such as:

- Patrolling evacuated areas to prevent looting
- Providing safe drinking water
- Vaccinating residents for tetanus
- Clearing streets
- Cleaning up debris

Many of these recommendations should be integrated into a public information program to educate citizens on the benefits of health and safety precautions.

B. Natural Resource Protection

Wetlands Protection: Wetlands are capable of storing large amounts of floodwater, slowing and reducing downstream flows, and filtering the water. Any development that is proposed in a wetland is regulated by either federal and/or state agencies. Mitigation techniques are often employed, which might consist of creating a wetland on another site to replace what would be lost through the development. This is not an ideal practice, however, since it takes many years for a new wetland to achieve the same level of quality as an existing one.

Erosion and Sedimentation Control: Controlling erosion and sediment runoff during construction and on farmland is important, since eroding soil will typically end up in downstream waterways. Sediment tends to settle where the water flow is slower. It will gradually fill in channels and lakes, reducing their ability to carry or store floodwaters. Sediment and erosion control have two principal components: minimize erosion with vegetation and capture sediment before it leaves the site. Slowing runoff increases infiltration into the soil, thereby controlling the loss of topsoil from erosion and the resulting sedimentation. Runoff and erosion control can be done through vegetation, terraces, contour strip farming, no-till farm practices and impoundments.

C. Prevention Measures

Planning and Zoning: Land use plans are put in place to guide future development, recommending where development should or should not take place. Sensitive and vulnerable lands can be designated for uses that would be compatible with occasional flood events. Zoning ordinances can regulate development in these sensitive areas by limiting or preventing some or all development.

Open Space Preservation: Preserving open space is the best way to prevent flooding and flood damage. Open space preservation should not be limited to the flood plain. Other areas within the watershed may contribute to controlling the runoff that exacerbates flooding.

Floodplain Development Regulations: Floodplain development regulations typically do not prohibit development in the special flood hazard areas, but they do impose construction standards on what is built

there. The intent is to protect roads and structures from flood damage and to prevent the development from aggravating the flood potential. Floodplain development regulations are generally incorporated into subdivision regulations, building codes, and/or floodplain ordinances.

Subdivision Regulations: These regulations govern how land will be divided into separate lots or sites. In some Utah cities these are known as Site Based Ordinances.

Building Codes: Standards can be incorporated into building codes that address flood proofing all new improved or repaired buildings.
Floodplain Ordinances: Communities that participate in the National Flood Insurance Program (NFIP) are required to adopt the minimum floodplain management regulations, as developed by FEMA. The regulations set minimum standards for subdivision regulations and building codes. Communities may adopt more stringent standards than those set forth by FEMA.

Storm Water Management: Development outside of a floodplain can contribute significantly to flooding by covering impervious surfaces, which increase storm water runoff. Storm water management is usually addressed in subdivision regulations. Developers are typically required to build retention or detention basins to minimize any increase in runoff caused by new or expanded impervious surfaces, or new drainage systems. Most larger cities and counties within Utah enforce an ordinance prohibiting storm water from leaving a site at a rate higher than it did before the development.

Drainage System Maintenance: Ongoing maintenance of channel and detention basins is necessary if these facilities are to function effectively and efficiently over time. A maintenance program should include regulations that prevent dumping in or altering watercourses or storage basins; grading and filling should also be regulated.

D. Property Protection
Relocation: Moving structures out of the floodplain is the surest and safest way to protect against damage. Relocation is expensive, so this approach will probably not be used except in extreme circumstances.

Acquisition: Acquisition by governmental entity of land in a floodplain serves two main purposes: it ensures that the problem structure is addressed; and it has the potential to convert problem areas into community assets

Building Elevation: Elevation of a building above the base flood elevation is the best on-site protection strategy. The building could be raised to allow water to run underneath it, or fill could be brought in to elevate the site on which the building sits.

Insurance: Above and beyond standard homeowners insurance, there is other coverage a homeowner can purchase to protect against flood hazard. Although this doesn't mitigate the problem it does allow the homeowner to shift the financial loss/risk to another party. Two of the most common insurances offered against flood loss are:

> National Flood Insurance: When a community participates in the NFIP, any local insurance agent is able to sell separate flood insurance policies under rules and rates set by FEMA. Rates do not change after claims are paid because they are set on a national basis.

Basement Backup Insurance: National Flood Insurance offers an additional deductible for seepage and sewer backup, provided there is a general condition of flooding in the area that was the proximate cause of the basement getting wet.

E. Public Information and Involvement

Outreach Programs: Outreach projects are proactive; giving the public information even if they have not asked for it. Outreach projects should be designed to encourage people to seek out more information and take steps to protect themselves and their properties. Examples include:

- Mass mailing or newsletters to all residents
- Notices directed to high risk area residents
- Displays in public buildings
- Newspaper articles and special sections
- Radio and TV news releases and interviews
- A detailed property owners handbook tailored for local conditions
- Presentations at public meetings and neighborhood groups

Real Estate Disclosure: Disclosure of information regarding flood or hazard prone properties is important if potential buyers are to be in a position to mitigate damage. Federally regulated lending institutions are required to advise applicants that a property is in the floodplain. However, this requirement needs to be met only five days prior to closing, and by that time the applicant is typically committed to the purchase. This only includes flood prone areas, at the exclusion of other hazards.

Map Information: Flood plain maps developed by FEMA outline the boundaries of the flood hazard areas. These maps can be used by anyone interested in a particular property to determine if it is in the floodplain. These maps are available from FEMA, the Utah Division of Emergency Services, and at many city and county planning offices. In addition the Utah Geologic Survey creates and maintains maps illustrating geologic hazards. These maps are available for sale at the Division of Natural Resources books store.

F. Structural Projects

The intent behind structural projects for flood mitigation is to prevent floodwaters from reaching properties. The shortcomings of almost all structural mitigation projects are that:

- They can be very expensive
- They disturb the land, disrupt natural water flows, and destroy natural habitats.
- They are built to an anticipated flood event, and may be exceeded by a greater than expected flood.
- They can create a false sense of security

Reservoirs: Reservoirs control flooding by holding water behind dams or in storage basins. After a flood peaks, water is released or pumped out slowly at a rate the river downstream can handle. Reservoirs are expensive to build, occupy large tracts of land, require maintenance, and, if they fail, often result in greater down stream flooding than would occur during a natural flooding event.

Levees/Floodwalls: One of the best-known structural flood control measures, levees and floodwalls are earthen, steel or concrete structures placed between the watercourse and the land.

Diversions: A diversion is simply a new channel that sends floodwaters to a different location, thereby reducing flooding along an existing watercourse. Diversion structures can consist of surface channels,

overflow weirs, or tunnels. During normal flows, the water stays in the old channel but during flooding events floodwaters spill over into the diversion channel.

Channel Modifications: Channel modifications include making a channel wider, deeper, smoother, or straighter. Common channel modifications include:

Dredging: Dredging is often cost-prohibitive because the dredged material must be disposed of somewhere else, and dredged streams usually fill back in with sediment.

Drainage Modifications: These include man-made ditches and storm sewers that help drain areas where the surface drainage system is inadequate or where underground drainage ways may be safer or more attractive.

Storm Water Management: Mitigation techniques for managing storm water include installing storm water systems, enlarging pipes, and street improvements in existing storm water systems.

2. Earthquakes

Generic Mitigation

Below is a list of generic earthquake mitigation strategies pertaining to secondary threats often associated with earthquakes.

Generic Ground Shaking Mitigation

- Understand peak horizontal acceleration and recurrence interval
- Design appropriately
- Zoning ordinances and building codes

Generic Liquefaction Mitigation

- Move soil out
- Densify soils in place
- Remove ground water
- Structural design

Generic Surface Fault Rupture Mitigation

- Avoidance
- Zoning ordinances
- Earthquake resistant building design codes
- Retrofitting of critical facilities and supporting equipment
- Retrofitting under-designed buildings
- Annual warning of risk/info on how to protect property and lives
- Projects to seismically upgrade critical public facilities/utilities and shelters
- Gather hazard and risk data/information
- Protection of roads and bridges

- General infrastructure protection
- Development of improved mitigation techniques
- Education of local officials, developers, and citizens

A. Emergency Services

Emergency Operations Planning: Maintain an earthquake response plan to account for secondary problems, such as fire and hazardous material spills.

Critical Facilities Protection: Protecting critical facilities are vital as the facilities play an important role in coordinating response and recovery following an earthquake. For this reason listed below are vital facilities and facilities with the potential of causing a secondary disaster if destroyed.

- Facilities or locations vital to earthquake response efforts
- Emergency operations centers
- Police and fire stations
- Hospitals
- Highway garages
- Selected roads and bridges
- Evacuation routes

Facilities and locations, which if destroyed would create a secondary disaster:

- Facilities housing hazardous materials
- Wastewater treatment plants
- Schools
- Nursing homes

B. Natural Resource Protection

- Design of pipelines
- Land-use planning
- Community master plans and zoning ordinances

C. Prevention

While earthquakes are not preventable proper planning, zoning, and building codes can prevent much of the damage common with earthquakes. Planning, zoning, and building codes should address minimums setbacks, critical faculty locations, steep slopes, areas with liquefiable soils, and insure high factor of safety ratings for critical facilities. Community master plans and zoning ordinances define hazard areas and require developers to show that any existing hazards have been investigated and new construction will not be exposed to unacceptable risk.

D. Property Protection

Nonstructural Mitigation: Nonstructural mitigation consist of mitigation measures that don't affect the overall look or purpose of the building yet prevent damage to no structural aspects and reduce the loss of life. In addition buildings with non-structural mitigation are frequently usable after an event.

- Tie downs
- Flexible utility connections
- Mylar film on windows to prevent the glass from shattering
- Added bracing

Retrofitting: Retrofitting upgrades the seismic safety of a building through structural and nonstructural mitigation techniques.

Insurance: Above and beyond standard homeowners insurance, there is other coverage a homeowner can purchase to protect against earthquake hazard, something not covered under most homeowner's insurance plans. Although this doesn't mitigate the problem it does allow the homeowner to shift the financial loss/risk onto another party.

E. Public Information and Involvement

Public information and involvement for earthquakes is similar to the mitigation strategies outlined in the flood and riverine section mentioned above.

Real Estate Disclosure: Disclosure of information regarding earthquakes and hazard prone properties are important if potential buyers are in a position to mitigate damage. Unlike floodplains there are no federal laws, which require disclosure of earthquakes.

F. Structural Protection/Projects

Mitigation measures can be any type of activity that reduces the likelihood or modifies what is at risk from the hazard. Earthquake mitigation can be accomplished through building codes that ensure safe and adequate construction including earthquake resistant designs and construction. Older building should be retrofitted to comply with the codes.

3. Dam Failure

Generic Mitigation

- Proper floodplain maps, including dam breach flood potential
- Public knowledge of floodplains for the general public and emergency managers
- Updated Emergency Operation Plans (EOP) integration with GIS Systems
- Maintain proper floodplain/ wetland geometry and vegetation for flood routing
- Floodplain usage compatible with floodplain needs
- More debris dams; they help to maintain flooding, debris, and mud
- Flood control pool in existing dams
- Protection of roads and bridges
- General infrastructure protection
- More authority to help with snowmelt floods/runoff- releases, better forecasting
- Gather hazard and risk data/information
- Development of improved mitigation techniques
- Education of local officials, developers, and citizens

A. Emergency Service

- Good emergency management and emergency action plans
- Dam conditioning monitoring
- Warning system and monitoring
- Understand standard operating procedures

B. Natural Resource Protection

- Zoning of downstream usage
- Risk assessment
- Good watershed management

C. Prevention

- Dam failure inundation maps
- Planning/zoning/open space preservation to keep downs stream areas clear
- Building codes with flood elevations based on dam failure
- Dam safety inspections
- Draining the reservoir when conditions appear unsafe

D. Property Protection

- Acquisition of building in the path of a dam breach flood
- Flood insurance

E. Public Information and Involvement

- Communication and education of dam owners
- Communication and education with the public
- Evacuation procedures

F. Structural Protection/Projects

- Dam improvements
- Spillway enlargements
- Remove unsafe dams
- Design and construction review
- Direction for consulting engineers
- Instrumentations and monitoring of dams
- Remedial repair procedures
- Incremental damage assessment

4. Wildfire

Generic Wildfire Mitigation

- Avoidance
- Define, create, and maintain a defensible space
- Plant drought and fire resistant vegetation
- Ordinances
- Modification of fuel loading in high hazard interface areas
- Wildland fire training and experience for fire department personnel
- Public education effort for people living in the interface
- Additional suppression equipment needs of fire departments and the Utah Division of Forestry, Fire, and State Lands

- Fuel modification in moderate hazard interface areas
- Protection of roads and bridges
- Annual warning of risk/info on how to protect life and property
- Gather hazard and risk data/information
- General infrastructure protection
- Development of improved mitigation techniques
- Education of local officials, developers, and citizens
- Protection of drinking water supply systems

A. Emergency Service

- Fire fighting

B. Natural Resource Protection

- Prohibit development in high-risk areas.
- Vegetation control

C. Prevention

- Zoning ordinances to reflect fire risk zones
- Planning and zoning to restrict development in areas near fire protection and water resources
- Requiring new subdivisions to space buildings, provide firebreaks, on-site water storage, wide roads and multiple accesses
- Building code standards for roof materials, spark arrestors
- Maintenance programs to clear dead and dry bush trees
- Regulations on open fires

D. Property Protection

- Retrofitting of roofs and adding spark arrestors
- Landscaping to keep bushes and trees away from structures
- Insurance rates based on distance from fire protection
- Planning how to deal with WUI fires before they occur
- Good visibility

E. Public Information and Involvement

- Educating homeowners and future homeowners about risk
- Planning how to deal with WUI fires before they occur
- Emergency warning system, action plan
- Communication tree between fire departments and homeowners
- Community actions
- Adequate water supply and systems

F. Structural Protection/Projects

- Building and property assessments
- Use appropriate construction materials
- Adequate access to buildings

5. Landslides

Generic Mitigation

- Avoidance
- Recognize landslide area
- Zoning ordinances
- Remove landslide materials
- Drain subsurface materials
- Install surface drains
- Remove materials for the head of the landslide
- Re-grade
- Build buttress or retaining wall at the toe of the slope
- Install soil nails and rock anchors
- Maintain natural vegetation
- Improved geologic mapping to identify potential landslide problems
- Zoning ordinances prohibiting construction in or adjacent to areas with high landslide potential
- Soil moisture sensors at SNOTEL sites
- Gather hazard and risk data/information
- Protection of roads and bridges
- Development of improved mitigation techniques
- Education of local officials, developers, and citizens
- Protection of drinking water supply systems
- Generic Rock Fall Mitigation
- Avoidance
- Stabilize rocks
- Prerelease
- Build berms or benches
- Build structures to stop rocks

A. Emergency Services

- Warning systems
- Hazard identification and areas at risk

B. Natural Resource Protection

C. Prevention

- Land use planning ordinances
- Identify old landslides
  - Old landslides: irregular or subdued hill-like topography
  - Younger or more recently occurring landslides: hummocky terrain, scarps, inclined trees, ground cracks, sharp vegetation differences, and numerous depressions or ponds
- Identify unstable slopes

- Identify areas that could be affected by slope failures
    - Potential rock falls: steep cliff areas or where bedrock crops out onto mountain slopes

D. Property Protection

- Good land-use practices
- Avoid slope-irrigation, undercutting, and over-steepening

E. Public Information and Involvement

- Communications systems
- Proper property assessments of slope conditions

F. Structural Protection/Projects

- Proper assessments of slope conditions
- Grading or removing the material from the top and placing it at the toe of a slope can lessen the slope gradient
- Subsurface drainage control used to dewater and stabilize slopes
- Retaining structures
    - Concrete block walls or large masses of compacted earth
- Constructing debris basins
- Building deflection walls upslope of structures
- Avoiding ground level windows that face upslope
- Catchment fences
- Tieback walls
- Rock bolts
- Cut benches and berms

6. Severe Weather

A. Emergency Services

- Early warning systems
- Communication systems

B. Natural Resource Protection

C. Prevention

- Building code standards for light frame construction
- Ordinances that include weather resistant designs

D. Property Protection

E. Public Information and Involvement

- Listen to a weather radio
- Watch and listen to weather forecasts and warnings

- Develop a plan so you know where to take your family for shelter
- Understand risk and identify ways of reducing the impacts

F. Structural Protection/Projects

- Strengthen un-reinforced masonry

7. Problem Soils

Generic Problem Soil Mitigation

- Avoidance
- Presoak and Compact
- Remove problem soil
- Landscape so that runoff moves away from foundations

A. Emergency Service

B. Natural Resource Protection

- Soil awareness

C. Prevention

- Landscaping with vegetation that does not concentrate or draw large amounts of water from the soil near foundations
- Insulating floors or walls near heating or cooling units to prevent evaporation that could cause local changes in soil moisture
- Avoid areas underlain by limestone and dolomite to prevent ground water contamination and foundation problems in karst terrain
- Use soil tests to find gypsum; do not plant high level of water plants near the house
- Reduce piping damage by limiting construction that disturbs natural drainage
- Peat deposits should be removed or avoided at construction sites
- Avoid abandoned mine areas
- Sands, and calcareous loamy soils are highly erodible

D. Property Protection

- Special foundation designs
- Installing gutters and downspouts that direct water at least 10 feet away from foundation slabs
- Landscape with vegetation that does not concentrate or draw large amounts of water from the soil near foundations

E. Public Information and Involvement

F. Structural Protection

- Special foundation designs
- Installing gutters and downspouts

- Proper drainage along roads and around structures

8. Drought

A. Emergency Service

- Provide low interest loans or private assistance for farmers and ranchers

B. Natural Resource Protection

- Manage wildlife during drought periods
- Incorporate wildfire hazard mitigation planning
- Integrate financial assistance for transportation or water hauling for livestock

C. Prevention

- Implement cloud seeding during drought years to enhance precipitation
- Protect culinary water systems and/or provide culinary water to people or systems
- Incorporate a drought management plan
- Introduce more water resources such as wells, ponds, reservoirs, and reservoir capacity

D. Property Protection

E. Public Information and Involvement

- Create or join water conservation programs that are designed to reduce water consumption
- Incorporate a drought management plan
- Drought resource coordination

APPENDIX C. HAZARD HISTORIES

	Injuries	% of Total Injuries	Fatalities	% of Total Fatalities	Property Damage	% of Total Property Damage	Crop Damage	% of Total Crop Damage
Avalanche	0.51	1%	**0.75**	**20%**	$87,920	0%	$0	0%
Extreme Cold	0.17	0%	0.03	1%	$538,617	2%	**$1,421,035**	**21%**
Flooding	0.24	0%	**0.51**	**14%**	**$13,350,713**	**40%**	**$4,892,050**	**71%**
Fog	1.80	2%	0.40	11%	$67,560	0%	$0	0%
Hail	**6.07**	**7%**	0.02	1%	$442,494	1%	$159,821	2%
Heavy Snow	**53.11**	**61%**	**1.83**	**50%**	**$4,107,199**	**12%**	$177,978	3%
Ice	0.00	0%	0.00	0%	$60,386	0%	$0	0%
Lightning	1.24	1%	0.02	1%	$69,901	0%	$690	0%
Tornado	**8.00**	**9%**	0.00	0%	$1,071,245	3%	$7,599	0%
Wind	**16.58**	**19%**	0.09	2%	**$13,258,674**	**40%**	**$259,115**	**4%**
TOTAL	87.71	100%	3.66	100%	$33,054,709	100%	$6,918,288	100%

Table C-1. Major Disaster Statistics 1962-2005, Weber County
(HVRI 2007)

	Injuries	% of Total Injuries	Fatalities	% of Total Fatalities	Property Damage	% of Total Property Damage	Crop Damage	% of Total Crop Damage
1960s	2.9	3%	0.07	2%	$2,093,847	6%	$117,817	2%
1970s	**31.5**	**36%**	0.43	12%	$4,484,717	14%	**$1,941,634**	**28%**
1980s	0.2	0%	0.24	7%	$7,457,690	22%	**$4,668,534**	**67%**
1990s	**41.0**	**47%**	**1.77**	**48%**	**$17,893,117**	**54%**	$126,446	2%
2000s	11.8	14%	**1.15**	**31%**	$1,266,907	4%	$63,857	1%
TOTAL	**87.4**	**100%**	**3.66**	**100%**	**$33,196,278**	**100%**	**$6,918,288**	**100%**

	Number of Events	Events Per Year	Injuries Per Event	Fatalities Per Event	Property Damage Per Event	Crop Damage Per Event	Total Monetary Loss Per Event	Total Annualized Losses
Avalanche	6	0.1	0.1	**0.1**	$14,653	$0	$14,653	$1,998
Extreme Cold	9	0.2	0.0	0.0	$59,846	**$157,893**	**$217,739**	$44,538
Flooding	**20**	**0.5**	0.0	0.0	**$667,536**	**$244,602**	**$912,138**	**$414,608**
Fog	2	0.0	**0.9**	**0.2**	$33,780	$0	$33,780	$1,535
Hail	6	0.1	**1.0**	0.0	$73,749	**$26,637**	$100,386	$13,689
Heavy Snow	**97**	**2.2**	0.5	0.0	$42,342	$1,835	$44,177	**$97,390**
Ice	1	0.0	0.0	0.0	$60,386	$0	$60,386	$1,372
Lightning	5	0.1	0.2	0.0	$13,980	$138	$14,118	$1,604
Tornado	5	0.1	**1.6**	0.0	**$214,249**	$1,520	**$215,769**	$24,519
Wind	**58**	**1.3**	0.3	0.0	**$228,598**	$4,468	**$233,065**	**$307,222**
TOTAL	209	4.8	0.4	0.0	$158,157	$33,102	$191,258	$908,477

Table C-2. Major Disaster Event and Annual Statistics 1962-2005, Weber County
(HVRI 2007)

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX D. CRITICAL FACILITIES

The following identifies an inventory of all the critical facilities within each county. Critical facilities are of particular concern because of the essential products and services to the general public they provide. These critical facilities can also fulfill important public safety, emergency response, and/or disaster recovery functions. The critical facilities identified in this Plan include amateur radio repeaters, emergency operations centers, electric and oil facilities, hospitals, fire and police stations, schools, water and wastewater treatment plants. (Mod = Moderate)

Weber County

	Amateur Radio Repeaters										
Call sign (Location, Band)	***Dam Failure***	***Flood***	***Ground Shaking***	***Hail***	***Lightning***	***Liquefaction***	***Problem Soils***	***Slope Failure***	***Tornado***	***Wildfire***	***Wind***
W7SU (Little Mountain, 146.820)	Low	Unk	High	Low	Low	Low	NA	Low	Low	Low	High
W7SU (Little Mountain, 448.575)	Low	Unk	High	Low	Low	Low	NA	Low	Low	Low	High
W7SU (Mount Ogden, 448.600)	Low	Unk	High	Low	Low	Low	NA	Low	Low	Low	High
W7SU (Mount Ogden, 146.900)	Low	Unk	High	Low	Low	Low	NA	Low	Low	Low	High

Table D-1. Amateur Radio Repeater Vulnerability, Weber County

	Electric Generation Facilities										
Name	***Dam Failure***	***Flood***	***Ground Shaking***	***Hail***	***Lightning***	***Liquefaction***	***Problem Soils***	***Slope Failure***	***Tornado***	***Wildfire***	***Wind***
Causey Dam	High	High	High	Low	Low	Low	Low	Low	Low	Low	High
Gateway Power Plant	High	Low	High	Low	Low	Low	Low	Mod	Low	Low	High
Little Mountain Power Plant	Low	Unk	High	Low	Low	High	Low	Low	Low	Low	High
Pineview Dam	High	High	High	Low	Low	Low	High	Mod	Low	Low	High
Pioneer Power Plant	High	Low	High	Low	Low	High	Low	Low	Low	Low	High

Table D-2. Electric Generation Facility Vulnerability, Weber County

	Emergency Operations Centers

Name	*Dam Failure*	*Flood*	*Ground Shaking*	*Hail*	*Lightning*	*Liquefaction*	*Problem Soils*	*Slope Failure*	*Tornado*	*Wildfire*	*Wind*
Farr West City EOC	High	Low	High	Low	Low	High	Mod	Low	Low	Low	High
Harrisville City EOC	Low	Low	High	Low	Low	Mod	Mod	Low	Low	Low	High
Hooper City EOC	Low	Low	High	Low	Low	High	Mod	Low	Low	Low	High
Huntsville City EOC	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Marriot-Slaterville City EOC	High	Low	High	Low	Low	High	Mod	Low	Low	Low	High
North Ogden EOC	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
Ogden City EOC	Low	Low	High	Low	Low	High	Mod	Low	Low	Low	High
Ogden City EOC – Alt.	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Plain City EOC	Low	Low	High	Low	Low	High	Mod	Low	Low	Low	High
Pleasant View City EOC	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Riverdale City EOC	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
Riverdale City EOC – Alt.	High	Mod	High	Low	Low	Mod	Low	Low	Low	Low	High
Roy City EOC	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
S. Ogden City EOC	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
S. Ogden City EOC – Alt.	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Uintah City EOC	High	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Washington Terrace City EOC	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Weber Co JIC	Mod	Low	Mod	Low	Low	Low	Low	Low	Low	Low	High
Weber County EOC	High	Low	High	Low	Low	High	Low	Low	Low	Low	High
Weber County EOC – Alt.	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Weber-Morgan Health Dept EOC	Low	Low	Mod	Low	Low	Low	Low	Low	Low	Low	High
Weber State University EOC	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
West Haven City EOC	Low	Low	High	Low	Low	High	Low	Low	Low	Low	High

Table D-3. Emergency Operations Center Vulnerability, Weber County

	Fire Stations										
Name	***Dam Failure***	***Flood***	***Ground Shaking***	***Hail***	***Lightning***	***Liquefaction***	***Problem Soils***	***Slope Failure***	***Tornado***	***Wildfire***	***Wind***
North View Fire (Station 21)	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
Ogden Fire Station 1	High	Low	High	Low	Low	High	Low	Low	Low	Low	High
Ogden Fire Station 2	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Ogden Fire Station 3	Low	Low	High	Low	Low	High	Low	Low	Low	Low	High
Ogden Fire Station 4	Low	Low	High	Low	Low	High	Low	Low	Low	Low	High
Ogden Fire Station 5	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Ogden Fire Station 6	High	Low	High	Low	Low	High	Low	Low	Low	Low	High
Plain City Fire	Low	Low	High	Low	Low	High	Low	Low	Low	Low	High
Riverdale Fire	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
Roy Fire Station 31	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
Roy Fire Station 32	Low	Low	High	Low	Low	High	Low	Low	Low	Low	High
South Ogden Fire	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Uintah Fire	High	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Washington Terrace Fire	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Weber Fire District Station 61	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
Weber Fire District Station 62	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Weber Fire District Station 63	Low	Low	High	Low	Low	High	Low	Low	Low	Low	High
Weber Fire District Station 64	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Weber Fire District Station 65	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Weber Fire District Station 66	Low	Low	High	Low	Low	High	Low	Low	Low	Low	High

Table D-4. Fire Station Vulnerability, Weber County

	Hospitals										
Name	***Dam Failure***	***Flood***	***Ground Shaking***	***Hail***	***Lightning***	***Liquefaction***	***Problem Soils***	***Slope Failure***	***Tornado***	***Wildfire***	***Wind***
McKay Dee Hospital	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Ogden Regional Medical Center	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High

Table D-5. Hospital Vulnerability, Weber County

	Police Stations										
Name	***Dam Failure***	***Flood***	***Ground Shaking***	***Hail***	***Lightning***	***Liquefaction***	***Problem Soils***	***Slope Failure***	***Tornado***	***Wildfire***	***Wind***
Harrisville Police	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
North Ogden Police	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Ogden Police	High	Low	High	Low	Low	High	Low	Low	Low	Low	High
Pleasant View Police	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Riverdale City Police	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
Roy Police	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
South Ogden Police	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Weber County Sheriff's Office	High	Low	High	Low	Low	High	Low	Low	Low	Low	High
Weber State University Police	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High

Table D-6. Police Station Vulnerability, Weber County

	Schools										
Name	***Dam Failure***	***Flood***	***Ground Shaking***	***Hail***	***Lightning***	***Liquefaction***	***Problem Soils***	***Slope Failure***	***Tornado***	***Wildfire***	***Wind***
Parley Bates Elementary	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Ben Lomond High	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Bonneville Elementary	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
Bonneville High	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Canyon View School	High	Low	High	Low	Low	High	Low	Low	Low	Low	High
Club Heights Elementary	Low	Low	High	Low	Low	Low	Low	High	Low	Low	High
Country View Elementary	Low	Low	High	Low	Low	High	Low	Low	Low	Low	High
DaVinci Academy	High	Low	High	Low	Low	High	Low	Low	Low	Low	High
Dee Elementary	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Farr West Elementary	Low	Low	High	Low	Low	High	Low	Low	Low	Low	High
Freedom Elementary	Low	Low	High	Low	Low	High	Low	Low	Low	Low	High
Fremont High	Low	Low	High	Low	Low	High	Low	Low	Low	Low	High
Gramercy Elementary	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High

	Schools										
Name	***Dam Failure***	***Flood***	***Ground Shaking***	***Hail***	***Lightning***	***Liquefaction***	***Problem Soils***	***Slope Failure***	***Tornado***	***Wildfire***	***Wind***
Grandview Elementary	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Green Acres Elementary	High	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
H. Guy Child Elementary	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Highland Middle	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
Hillcrest Elementary	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Hooper Elementary	Low	Low	High	Low	Low	High	Low	Low	Low	Low	High
Horace Mann Elementary	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
James Madison Elementary	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Kanesville Elementary	Low	Low	High	Low	Low	High	Low	Low	Low	Low	High
Lakeview Elementary	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
Lincoln Elementary	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
Lomond View Elementary	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Lynn Elementary	High	Low	High	Low	Low	High	Low	Low	Low	Low	High
Majestic Elementary	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
Mar Lon Hills Elementary	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Midland Elementary	Low	Low	High	Low	Low	High	Low	Low	Low	Low	High
Mill Creek High	High	Low	High	Low	Low	High	Low	Low	Low	Low	High
Mound Fort Middle	High	Low	High	Low	Low	High	Low	Low	Low	Low	High
Mount Ogden Middle	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Mountain View Elementary	High	Low	High	Low	Low	High	Low	Low	Low	Low	High
Municipal Elementary	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
North Ogden Elementary	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
North Ogden Junior High	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
North Park Elementary	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
Ogden High	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Ogden Preparatory Academy	High	Low	High	Low	Low	High	Low	Low	Low	Low	High
Orion Junior High	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
Pioneer Elementary	High	Low	High	Low	Low	High	Low	Low	Low	Low	High
Plain City Elementary	Low	Low	High	Low	Low	High	Low	Low	Low	Low	High
Polk Elementary	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Quest Academy	Low	Low	High	Low	Low	High	Low	Low	Low	Low	High

	Schools										
Name	***Dam Failure***	***Flood***	***Ground Shaking***	***Hail***	***Lightning***	***Liquefaction***	***Problem Soils***	***Slope Failure***	***Tornado***	***Wildfire***	***Wind***
Riverdale Elementary	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
Rocky Mountain Junior High	Low	Low	High	Low	Low	High	Low	Low	Low	Low	High
Roosevelt Elementary	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Roy Elementary	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
Roy High	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
Roy Junior High	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
Sand Ridge Junior High	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
Snow Crest Junior High	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
South Ogden Junior High	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
T.H. Bell Junior High	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Thomas O. Smith Elem.	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Two Rivers High	High	Low	High	Low	Low	High	Low	Low	Low	Low	High
Uintah Elementary	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Valley Elementary	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Valley View Elementary	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
Venture Academy	High	Low	High	Low	Low	High	Low	Low	Low	Low	High
Wahlquist Junior High	High	Low	High	Low	Low	High	Low	Low	Low	Low	High
Wasatch Elementary	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Washington High	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Washington Terrace Elem.	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Weber High	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	High
Weber Valley Detention Center	Low	Low	High	Low	Low	Mod	Low	Low	Low	Low	High
West Haven Elementary	Low	Low	High	Low	Low	High	Low	Low	Low	Low	High
West Weber Elementary	High	Low	High	Low	Low	High	Low	Low	Low	Low	High

Table D-7. School Vulnerability, Weber County

	Water and Wastewater Treatment Facilities										
Name	***Dam Failure***	***Flood***	***Ground Shaking***	***Hail***	***Lightning***	***Liquefaction***	***Problem Soils***	***Slope Failure***	***Tornado***	***Wildfire***	***Wind***
WBWCD Weber Aqueduct	Low	Mod	High	Low	Low	Low	Low	High	Low	Low	Low
WBWCD South Weber WTF	Low	Low	High	Low	Low	Low	Low	Low	Low	Mod	High
Central Weber Sewer Treatment Facility	High	Low	High	Low	Low	High	Low	Low	Low	Low	High
Ogden Water Treatment Facility	High	Unk	High	Low	Low	Low	Low	Mod	Low	High	High

Table D-8. Water and Wastewater Treatment Facility Vulnerability, Weber County

APPENDIX E. PARTICIPATING ORGANIZATIONS

Weber County Mitigation Plan Working Group and Additional Participants in the Planning Process

Purpose of the Mitigation Planning Working Group

- Assist in identification of hazards unique to the jurisdiction
- Assist in review and or conduct a vulnerability analysis and an identification of risks
- Assist in formulation of County-wide, Unincorporated County, and or Local mitigation goals and development of mitigation actions complementary to those goals.
- Ensure the opportunity for participation in the planning process by all community stakeholders (examples of participation may include relevant involvement in any planning process including LEPCs, County Emergency Management Meetings, Stormwater Management Meetings, other meetings directly in support of the planning process, contributing research, data, or other information, commenting on drafts of the plan, etc.).

***Meetings:**

1. September 30, 2014 Mitigation Meeting with Weber County Jurisdictions
    1. April 10, 2015 - Plan Kick-off Meeting
    2. Date of
    3. May 12, 2015 - Weber County Emergency Managers Meeting
    4. May 19, 2015 – Weber County Emergency Managers Meeting
    5. May 2007 - Revision of Weber County Risk Assessment
    6. May 24, 2007 - Weber County Risk Assessment
    7. August 21, 2007 - WFRC Mitigation Strategies Development Workshop (Weber County)
    8. September 18, 2007 Weber County Mitigation Strategies Review
    9. Weber Storm water Management Committee, Quarterly- Report, review, and comment on ongoing mitigation activities and future projects

Participants

Organization/Community	Participants Name	Title/Responsibility	*Attendance	Contribution	Review Draft Plan
Weber County Sheriff	Lance Peterson	Emergency Services, Director		EM Planning, Hazard Identification	X
Weber County Sheriff	Eli Johnson	Emergency Services		EM Planning, Hazard Identification	X
Weber County Engineering	Mike Meyerhoffer Rachel Pfister Dana Shuler	County Engineer		GIS, Storm water, Floodplain Mgt., Land Use Development	X
Harrisville City		Public Works		EM Planning, Storm water	X
Harrisville City		Public Works		EM Planning, Storm water	
Pineview Water		Water Manager		Water Planning &Management	
Pineview Water	Terel Grimely	Water Manager		Water Planning	

				&Management	
Central Weber Sewer		Manager	2,5,6	Water-Sewer Planning and Management	X
Bona Vista Water		Manager	2,5,6	Water Planning & Management	
Pleasant View City		Public Works	2,3,5,6	EM Planning, Stormwater,	
Pleasant View City		Public Works	2,3,5,6	EM Planning, Stormwater, Infrastructure	
Pleasant View City		Emergency Manager	2,3,4,5	EM Planning	X
Washington Terrace		Public Works	2,3,4,5,6	EM Planning, Stormwater, Infrastructure	
Washington Terrace		Emergency Manager	2,3,4,5	EM Planning, Development	X
McKay-Dee Hospital		Emergency Response	2,3,4,5	Health Response and Recovery	
Weber-Morgan Health Dept.		Emergency Response	2,3,4,5	Health Response and Recovery	
Weber Fire District		Emergency Management	2,3,4,5	EM Planning, Response, Mitigation	X
North Ogden City		Fire Chief	2,3,4	EM Planning	X
Ogden City		Risk Manager	2,3,4	EM Planning	X
Plain City		City Council	3,4,5	EM Planning	X
Marriott Slaterville		Emergency Manager	2,3,4,5	EM Planning	X
West Haven		Emergency Manager	2,3,4,5	EM Planning	X
Roy		Deputy Chief, Fire	2,3,4,5	EM Planning & Response	X
Riverdale		Fire Chief	2,3,4,5	EM Planning and Response	X
South Ogden		City Council	2,3,4,5	EM Planning	X
Uintah		Weber County EM	1,2,3,4,5,6	EM Planning, Hazard Identification	X
Farr West		Emergency Mgr.	2,3,4,5	EM Planning	X
Hooper		Emergency Manager	2,3,4,5	EM Planning	X
Huntsville		Weber County EM	1,2,3,4,5,6	EM Planning, Hazard Identification	X

Following are the attendance rosters of names and organizations that participated in the development process of this plan.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX F. FEMA LOCAL MITIGATION PLANNING TOOLS

APPENDIX G. LOCAL LAND USE PLANS

APPENDIX H. GLOSSARY OF TERMS

Abutment (dam) – the valley side against which a dam is constructed.

Acre-foot of water – approximately 326,000 gallons of water, or approximately a football field covered by one foot of water.

Active Faults – An active fault is defined as a fault displaying evidence of displacement along one or more of its traces during Holocene time (about the last 11,000 years).

Aftershocks – earthquakes during the seconds, hours, days to months following a larger earthquake (main shock) in the same general region.

Alluvial fan – a cone-shaped deposit of stream sediments, generally deposited at the base of a mountain where a stream encounters flatter terrain.

Amplitude (seismic waves) - the maximum height of a wave crest or depth of a trough. Amount the ground moves as a seismic wave passes, as measured from a seismogram.

ATV – All Terrain Vehicle

Avalanche path – the area in which a snow avalanche runs; generally divided into starting zone, track, and runout zone.

Basin and Range physiographic province – consists of north-south-trending mountain ranges separated by valleys, bounded by the Rocky Mountains and the Colorado Plateau to the east and the Sierra-Cascade Mountains to the west (includes western Utah).

Bearing capacity – the load per unit area, which the ground can safely support without excessive yield.

Bedrock – solid in-place rock, sometimes exposed and sometimes concealed beneath the soil.

Block faulting – see **normal fault**

Collapsible soil (hydrocompaction) – loose, dry, low-density soil that decreases in volume or collapses when saturated for the first time following deposition.

Critical Areas – Environmentally sensitive areas which include wetlands fish and wildlife habitat conservation areas; geologically hazardous areas; areas with a critical recharging effect on aquifers used for potable water; and frequently flooded areas. Critical areas have measurable characteristics which, when combined, create a value for or potential risk to public health, safety and welfare.

Critical/Essential Facilities – Structures meeting one or more of the following criteria:

- Fire stations, police stations, storage facilities for vehicles/equipment needed after a hazard event, and emergency operation centers.
- Hospitals, nursing homes, and housing which is likely to contain occupants who may not be sufficiently mobile to avoid injury or death as a result of a hazardous event
- Public and private utility facilities, which are vital to maintaining or restoring normal services to, damaged areas after a hazardous event.
- Structures or facilities that produce, store, or use highly flammable, explosive, volatile, toxic and/or water reactive materials

Debris flow – involves the relatively rapid, viscous flow of surficial material that is predominantly coarse grained.

Debris slide – involves predominantly coarse-grained material moving mainly along a planar surface.

Drought (Agricultural) – lack of water for crop production in a given area

Drought (Hydrologic) – lack of water in the entire water supply for a given area.

Drought (Meteorological) – lack of precipitation compared to an area's normal

Drought (Socioeconomic) – lack of water sufficient to support an area's population

Earth flow – Involves fine-grained material that slumps away from the top or upper part of a slope, leaving a scarp, and flows down to form a bulging toe.

Earthquake – a sudden motion or trembling in the earth as fracture and movement of rocks along a fault release stored elastic energy.

Earthquake fault zone – earthquake fault zones are regulatory zones around active faults. The zones are used to prohibit the location of critical facilities and structures designed for human occupancy from being built astride an active fault. Earthquake Fault Zones are plotted on topographic maps at a scale of 1-inch equals 2,000 feet. The zones vary in width, but average about one-quarter mile wide.

Earthquake-induced seiche – Earthquake generated water waves causing inundation around shores or lakes and reservoirs.

Epicenter – the point on the earth's surface directly above the focus of an earthquake.

Epoch – geologic time unit lasting more than an age but shorter than a period (Epoch 2008).

Erosion – the removal of earth or rock material by many types of processes, for example, water, wind, or ice action.

Expansive soil and rock – soil and rock which contain clay minerals that expand and contract with changes in moisture content.

Fault – a break in the earth along which movement occurs.

Fault segment – section of a fault that behaves independently from adjacent sections.

Fault zone – an area containing numerous faults.

Federal Emergency Management Agency (FEMA) – authorized under Section 404 of the Stanford Act. Provides funding for hazard mitigation projects that are cost-effective and comply with existing post-disaster mitigation programs and activities. These projects cannot be funded through other programs to be eligible.

Fill – material used to raise the surface of the land generally in a low area.

Fire-resistant vegetation – plants that do not readily ignite and burn when subjected to fire because of inherent physiological characteristics of the species such as moisture content, fuel loading, and fuel arrangement.

Floodplain – an area adjoining a body of water or natural stream that has been or may be covered by floodwater.

Floodplain (100-year/500-year) – Floodplains that have the potential to flood once every 100 or 500 years or that has a 1% (100-year) or 0.2% (500-year) chance of flooding equal to or in excess of that in any given year.

Floodway – An area of land immediately adjacent to a stream or river channel that, in times of flooding, becomes an enlarged stream or river channel and carries the floodwater with the highest velocity.

Fluvial – concerning or pertaining to rivers or streams.

Focus – the point of origin of an earthquake within the earth, and the origin of the earthquake's seismic waves.

Formation (geologic) – a mappable rock unit consisting of distinctive features/rock types separate from units above and below.

Frequency (seismic waves) – the number of complete cycles of a seismic wave passing a point during one second.

Fuel (fire) – vegetation, building material, debris, and other substances that will support combustion.

Fuel break – a change in fuel continuity, type of fuel, or degree of flammability of fuel in a strategically located strip of land to reduce or hinder the rate of fire spread.

Fuel type – a category of vegetation used to indicate the predominate cover of an area.

Glacial moraine – debris (sand to boulders) transported and deposited by glacial ice along a glacier's sides or terminus.

Graben – a block of earth down dropped between two faults.

Gradient (slope) – a measure of the slope of the land surface.
Ground failure – a general term referring to any type of ground cracking or subsidence, including landslides and liquefaction-induced cracks.

Ground shaking – the shaking or vibration of the ground during an earthquake.

Ground water – that portion of subsurface water which is in the zone of saturation.

Gypsiferous deposits – soil or rock containing gypsum, which can be subject to dissolution.

Gypsum – a mineral composed of hydrated calcium sulfate. A common mineral of evaporites.

Hazard Mitigation Plan – The Plan resulting from a systematic evaluation of the nature and extent of vulnerabilities posed by a hazard present in society that includes the strategies needed to minimize future vulnerability to hazards.

Hazard Mitigation – Any action taken to reduce or permanently eliminate the long-term risk to human life and property and the environment posed by a hazard.

HAZUS-MH – Hazards United States – Multi-hazards; Earthquake loss estimation software using GIS databases developed by FEMA.

Head (landslide) – the upper parts of the slide material along the contact between the disturbed material and the main scarp.

Holocene – geologic epoch covering the last 10,000 years (after the last Ice Age).

Igneous rocks – rocks formed by cooling and hardening of hot liquid material (magma), including rocks cooled within the earth (for example, granite) and those that cooled at the ground surface as lavas (such as basalt).

Impermeable – materials having a texture that does not permit water to move through.

Interfluve – land between two streams in the same drainage basin (Interfluve 2004)

Intermountain Seismic Belt (ISB) – zone of pronounced seismicity, up to 120 miles wide and 800 miles long, extending from Arizona through central Utah to northwestern Montana.

Lacustrine – concerning or pertaining to lakes.

Lake Bonneville – a large, ancient lake that existed 30,000 to 12,000 years ago and covered nearly 20,000 square miles in Utah, Idaho, and Nevada. The lake covered many of Utah's valleys, and was almost 1,000 feet deep in the area of the present Great Salt Lake.

Lake Bonneville sediments – sediments deposited by Lake Bonneville, found in the valleys, which range from gravels and sands to clays.

Landslide – a general term for a mass of earth or rock, which moves down slope by flowing, spreading, sliding, toppling, or falling (see slope failure).

Lateral spread – lateral down slope displacement of soil layers, generally several feet or more, above a liquefied layer.

Levee (flood) – a berm or dike used to contain or direct water, usually without an outlet or spillway.

Liquefaction – sudden large decrease in shear strength of a cohesionless soil (generally sand or silt) caused by collapse of soil structure and temporary increase in pore-water pressure during earthquake ground shaking.

Magnitude (earthquake) – a quantity characteristic of the amplitude of the ground motion of an earthquake. The most commonly used measurement is the Richter magnitude scale; a logarithmic scale based on the motion that would be measured by a standard type of seismograph 60 miles from the earthquake's epicenter.

Metamorphic rocks – rocks formed by high temperatures and/or pressures (for example, quartzite formed from sandstone).

Mitigation – the act of reducing or preventing hazards which affect society or those things deemed important to society

Modified Mercalli Intensity (MMI) – the most commonly used intensity scale in the U.S.; it is a measure of the severity of earthquake shaking at a particular site as determined from its effect on the earth's surface, man, and man's structures.

Montmorillonite – a clay mineral characterized by expansion upon wetting and shrinking upon drying.

Natural vegetation – native plant life existing on a piece of land before any form of development.

Normal fault (block faulting) – fault caused by crustal extension in which relative movement on opposite sides is primarily vertical; for example, the Wasatch fault.

Oolite – spherical grains of carbonate sand with a brine shrimp fecal pellet nucleus.

Outlet (dam) - a conduit through which controlled releases can be made from the reservoir.

Palmer Drought Severity Index (PDSI) – developed by Wayne Palmer in the 1965; measures drought severity using temperature, precipitation and soil moisture (Utah Division of Water Resources 2007)

Peat – unconsolidated surficial deposit of partially decomposed plant remains.

Period (geologic) – a standard (world-wide) geologic time unit.

Permeability – the capacity of a porous rock or soil for transmitting a fluid.

Physiographic province – a region whose pattern of relief features or landforms differs significantly from that of adjacent regions.

Piping (problem soil and rock) – a weak incoherent layer in unconsolidated deposits that acts as a channel directing the movement of water. As the layer becomes saturated it conducts water to a free face (cliff or stream bank for example) that intersects the layer, and material exits out a "pipe" formed in the free face. Piping can occur in a dam as the result of progressive development of internal erosion by seepage.

Pore space – the open spaces in a rock or soil between solid grains. The spaces may be filled with gas (usually air) or liquid (usually water).

Porosity – the ratio of the volume of pore space in rock or soil to the volume of its mass, expressed as percentage.

Probable Maximum Flood (PMF) – a flood that would result from the most severe combination of critical meteorological and hydrologic conditions possible in a region.

Probable Maximum Precipitation (PMP) – the maximum amount and duration of precipitation that can be expected to occur on a drainage basin.

Problem soil and rock – geologic materials that are susceptible to volumetric changes, collapse, subsidence, or other engineering geologic problems.

Project Impact – An initiative of the Federal Emergency Management Agency intended to modify the way in which the United States handles natural disasters. The Goal of Project Impact from a Federal Government perspective is to reduce the personal and economic costs of hazard events by bringing together the private and public sector to better enable the citizens of a community to protect themselves from natural hazards.

Quaternary – a geologic time period covering the last 1.6 million years.

Recurrence interval – the length of time between occurrences of a particular event (an earthquake, for example).

Rock fall – abrupt free fall or down slope movement, such as rolling or sliding, of loosened blocks or boulders from an area of bedrock. The rock-fall runout zone is the area below a rock-fall source which is at risk from falling rocks.

Rock topple – forward rotation movement of a rock unit(s) about some pivot point.

Runout zone (avalanche) – where a snow avalanche slows down and comes to rest (deposition zone). For large avalanches, the runout zone can include a powder- or wind-blast zone that extends far beyond the area of snow deposition.

Sand blow (earthquake) – deposit of sandy sediment ejected as water and sand to the surface, formed when ground shaking has caused liquefaction at depth.

Scarp – a relatively steeper slope separating two more gentle slopes. Scarps can form as result of earthquake faulting.

Sediment – material that is in suspension, is being transported, or has been moved from its site of origin by water, ice, or wind, and has come to rest on the earth's surface either above or below the sea level.

Sedimentary rocks – rocks formed from loose sediment such as sand, mud, or gravel deposited by water, ice, or wind, and then hardened into rock (for example, sandstone); or formed by dissolved minerals precipitating out of solution to form rock (for example, tufa).

Seiche – a standing wave generated in a closed body of water such as a lake or reservoir. Ground shaking, tectonic tilting, sub aqueous fault rupture, or landsliding into water can all generate a seiche.

Seismic waves – vibrations in the earth produced during earthquakes.

Seismicity – seismic or earthquake activity.

Sensitive clay – clay soil that experiences a particularly large loss of strength when disturbed. Deposits of sensitive clay are subject to failure during earthquake ground shaking.

Shear strength – the internal resistance that tends to prevent adjacent parts of a solid from "shearing" or sliding past one another parallel to the plane of contact. It is measured by the maximum shear stress that can be sustained without failure.

Shear stress - a stress causing adjacent parts of a solid to slide past one another parallel to the plane of contact.

Slope failure – a general term referring to any type of natural ground movement on a sloping surface (see landslide).

Slump – a slope failure that slides along a concave rupture surface. Generally slumps do not move very far from the source area.

Snow avalanche – a rapid down slope movement of a mass of snow, ice, and debris.

Spectral Acceleration – measurement for approximate horizontal force experienced in a model earthquake. Measurements are specific to the frequency of shaking found to affect buildings during and earthquake. A 0.2-second period affects primarily one- and two-story buildings while 1.0- second period of spectral acceleration affects buildings approximately 10 stories in height.

Stafford Act – Robert T. Stafford Disaster Relief and emergency Assistance Act, PL 100-707, signed into law November 23 1988: amended the Disaster Relief Act of 1974, PL 93-288

Starting zone (avalanche) – where the unstable snow or ice breaks loose and starts to slide.

Subsidence – a settling or sinking of the earth's crust.

Sunny-day failure –

Surface fault rupture (surface faulting) – propagation of an earthquake-generated fault rupture to the ground surface, displacing the surface and forming a scarp.

Tectonic subsidence – subsidence (down dropping) and tilting of a basin on the down dropped side of a fault during an earthquake.

Toe (landslide) – the margin of disturbed material most distant from the main scarp.

Track (avalanche) – the slope or channel down which a snow avalanche moves at a fairly uniform speed.

Unconsolidated basin fill – un-cemented and non-indurated sediment, chiefly clay, silt, sand, and gravel, deposited in basins.

Urban area – a geographical area, usually of incorporated land, covered predominately by engineered structures including homes, schools, commercial buildings, service facilities, and recreational facilities.

Velocity (ground motion) – the rate of displacement of an earth particle caused by passage of a seismic wave.

Wasatch fault – a normal fault that extends over 200 miles from Malad City, Idaho to Fayette, Utah, and trends along the western front of the Wasatch Range.

Watershed – the area of land above a reference point on a stream or river, which contributes runoff to that stream.

Weathering – a group of processes (such as the chemical action of air, rain water, plants, and bacteria and the mechanical action of temperature changes) whereby rocks on exposure to the weather change in character, decay, and finally crumble into soil.

Wildfire – uncontrolled fire burning in vegetation.

Wildland area – a geographical area of unincorporated land covered predominately by natural vegetation.

Wildland Urban Interface (WUI) – Wildland vegetation and forested areas adjacent to or intermingled with residential developments.

Zone of deformation (earthquake) – the width of the area of surface faulting over which earth materials have been disturbed by fault rupture, tilting, or subsidence.

APPENDIX I. LIST OF ACRONYMS

AARC	Average Annual Rate of Change
AGRC	Automated Geographic Reference Center
APHIS	Animal and Plant Health Inspection Service
AOG	Association of Governments
BCEGS	Building Code Effectiveness Grading System
BOR	Bureau of Reclamation
cal yr B.P.	Calendar Years Before Present
CDBG	Community Development Block Grant
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CERT	Certified Emergency Response Team
CFR	Code of Federal Regulations
CFS	Cubic Feet per Second
CRS	Community Rating System
DB	Detention Basin
DFIRM	Digital Flood Insurance Rate Map
DHLS	Division of Homeland Security
DMA 2000	Disaster Mitigation Act of 2000
EAP	Emergency Action Plan
EGSLFZ	East Great Salt Lake Fault Zone
EM	Emergency Management/Manager
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FMA	Flood Mitigation Assistance
G	Gravity
GIS	Geographic Information Systems
GOPB	Governor's Office of Planning and Budget
GPS	Geographic Positioning System
GSL	Great Salt Lake
HAM	Handheld Amateur Radio
HAZMAT	Hazardous Materials
HAZUS-MH	Hazards United States – Multi-Hazards
HGMP	Hazard Mitigation Grant Program
LEPC	Local Emergency Planning Committee
LUST	Leaking Underground Storage Tank
M	Magnitude
MSL	Mean Sea Level
MOU	Memoranda Of Understanding
NCDC	National Climatic Data Center
NFIP	National Flood Insurance Program
NIMS	National Incident Management System
NWS	National Weather Service
PDM	Pre-Disaster Mitigation
PDSI	Palmer Drought Severity Index

piC/L	picoCuries per Liter
PL	Public Law
PSC	Public Safety Communications
RCRA	Resource Conservation and Recovery Act
SA	Spectral Acceleration
SBA	Small Business Administration
SHELDUS	Spatial Hazard Events and Losses Database for the United States
SLC	Salt Lake City
SPI	Standardized Precipitation Index
SR	State Route
STAPLEE	Social, Technical, Administrative, Political, Legal, Economic, Environmental
SWSI	Surface Water Supply Index
TAZ	Transportation Analysis Zone
TRAX	Transit Express
TRI	Toxic Release Inventory
UCAN	Utah Communication Agency Networks
UDAF	Utah Department of Agriculture and Food
UDOT	Utah Department of Transportation
UEDV	Utah Economic Data Viewer
UFFSL	Utah Division of Forestry, Fire, and State Lands
UGS	Utah Geological Survey
USGS	United States Geological Survey
USACE	United States Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USFS	United States Forestry Service
USU	Utah State University
UUSS	University of Utah Seismic Stations
WFRC	Wasatch Front Regional Council
WFZ	Wasatch Fault Zone
WUI	Wildland-Urban Interface

APPENDIX J. WORKS CITED

Black, Bill. 1993. *Radon Hazard Potential Map of Utah*. Map 149. Salt Lake City: Utah Geological Survey. http://geology.utah.gov/maps/geohazmap/pdf/m-149.pdf (Accessed 16 April 2008).

Brough, Clayton, Dan Brown, David James, Dan Pope and Steve Summy, eds. 2007. *Utah's Tornado's and Waterspouts – 1847 to Present*. National Weather Service – Salt Lake City Weather Forecast Office, National Weather Service, National Oceanic and Atmospheric Administration, Salt Lake City, UT. http://www.wrh.noaa.gov/slc/climate/tornado.php (Accessed 16 April 2008)

Bureau of Economic Analysis (BEA). 2007. Personal Income and Per Capita Personal Income by County for Utah 2003-2005. U.S. Department of Commerce. http://www.bea.gov/bea/regional/reis/scb.cfm (Accessed 16 April 2008).

Bureau of Economic and Business Research (BEBR). 2007. Utah Construction Information Database. http://www.bebr.utah.edu/CIDB.html (Accessed 16 April 2008).

Christenson, Gary, and Lucas Shaw. 2008. *Geographic Information Database Showing Geologic-Hazards Special-Study Areas, Wasatch Front, Utah*. Circular 106. Salt Lake City: Utah Geological Survey.

Critchfield, Howard. 1974. *General Climatology*. 3rd edition. Englewood Cliffs, NJ: Prentice Hall.

Dai, Aiguo, Kevin E. Trenberth, and Taotao Qian. 2004. A global data set of Palmer Drought Severity Index for 1870-2002: Relationship with soil moisture and effects of surface warming. *Journal of Hydrometeorology* 5:1117-1130. Dai Palmer Drought Severity Index data provided by the NOAA Earth System Research Laboratory at http://www.cdc.noaa.gov/.

Davis County. 2003. *Davis County Emergency Operations Plan*. Davis County, UT.

Dinter, D. A., and J. C. Pechmann. 2005. Segmentation and Holocene displacement history of the Great Salt Lake fault, Utah, in Proceedings Volume, *Basin and Range Province Seismic Hazards Summit II*, W.L. Lund, ed., Utah Geological Survey, Misc. Publication 05-2.

Dunn, Lawrence B., and Steven V. Vasiloff. 2001. Tornadogenesis and operational considerations of the 11 August 1999 Salt Lake City tornado as seen from two different Doppler radars. ***Weather Forecasting*16:**377–398.

Elliot, Ashley. 2007a. *The 2001 Heather Drive Landslide, Layton, Davis County, Utah*. Public Information Series 88. Salt Lake City: Utah Geological Survey. http://www.geology.utah.gov/online/pi/ pi-88.pdf (Accessed 16 April 2008).

_____. 2007b. *The 2005-06 Creekside Drive Area Landslides – Mountain Green, Morgan County, Utah*. Public Information Series 91. Salt Lake City: Utah Geological Survey. http://geology.utah.gov/online/pi/pi-91.pdf (Accessed 16 April 2008).

Environmental Protection Agency (EPA). 2006. *Excessive Heat Events Guidebook*. http://www.epa.gov/heatisland/about/pdf/EHEguide_final.pdf (Accessed 16 April 2008).

Epoch. Merriam-Webster.com. 2008. *Merriam-Webster Online Dictionary.* Merriam-Webster, Inc. http://www.merriam-webster.com/info/copyright.htm (Accessed 16 April 2008).

Federal Emergency Management Agency. 1995. *Seismic Considerations for Communities at Risk*. FEMA Publication 83. Washington, D.C.: Building Seismic Safety Council.

_____. 2002. *State and Local Mitigation Planning, How to Guide: Understanding you Risks*. FEMA 386-1. Washington, D.C.: Federal Emergency Management Agency.

_____. *2006. Multi-Jurisdictional Mitigation Planning*. FEMA 386-8. Washington, D.C.: Federal Emergency Management Agency. http://www.fema.gov/library/viewRecord.do?id=1905 (Accessed 16 April 2008).

Federal Insurance and Mitigation Administration (FIMA). 2002. Digital Flood Insurance Map Database, Salt Lake County, Utah. Washington, D.C.: Federal Emergency Management.

_____. 2005. Digital Flood Insurance Map Database, Weber County, Utah. Washington, D.C.: Federal Emergency Management.

_____. 2007. Digital Flood Insurance Map Database, Davis County, Utah (and Incorporated Areas). Washington, D.C.: Federal Emergency Management.

Forest Health Protection (FHP). 2008. Aerial Detection Survey-GIS. U.S. Department of Agriculture Forest Service. http://www.fs.fed.us/r1-r4/spf/fhp/aerial/gisdata.html (Accessed 16 April 2008).

Giraud, Richard, and Lucas Shaw. 2007. Landslide Susceptibility Map of Utah. Utah Geological Survey Map 228DM. http://geology.utah.gov/online/m/m-228.pdf (Accessed 16 April 2008).

Hazards & Vulnerability Research Institute (HVRI). 2007. The Spatial Hazard Events and Losses Database for the United States, Version 5.1. Columbia, SC: University of South Carolina. http://www.cas.sc.edu/geog/hrl/sheldus.html (Accessed 16 April 2008)

Hecker, Suzanne. 1993. *Quaternary tectonics of Utah with emphasis on earthquake-hazard characterization.* Utah Geological Survey, Bulletin 127, 257 p.

Hill, Geoffrey E. 1987. Fog Effect of the Great Salt Lake. *Journal of Applied Meteorology* 27:778-783.

Hydrometeorological Design Studies Center (HDSC). 2007. NOAA Atlas 14 Precipitation Frequency Estimates in GIS Compatible Formats. National Weather Service. http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_gis.html (Accessed 11 November 2007).

Interfluve. Dictionary.com. 2004. *The American Heritage® Dictionary of the English Language, Fourth Edition*. Houghton Mifflin Company. http://dictionary.reference.com/browse/Interfluve (Accessed: 16 April 2008).

Kaliser, B.N. 1972. *Geologic Hazards in Morgan County with Applications to Planning*. Bulletin 93. Salt Lake City: Utah Geological and Mineralogical Survey.

Lips, Elliot. Personal Communication. 1999.

Lund, William R. 2005. *Consensus Preferred Recurrence-Interval and Vertical Slip-Rate Estimates – Review of Utah Paleoseismic-Trenching Data*. Utah Geological Survey, Bulletin 134, Utah Quaternary Fault Parameters Working Group.

Matthews, K., V. DeBlander, L. Pederson, P.Mocettini and D. Halsey, eds. 2005. United States Department of Agriculture, United States Forest Service and Utah Division of Forestry, fire and State Lands. http://www.fs.fed.us/r1-r4/spf/fhp/conditions/2002-2004%20UTcondrpt.pdf (Accessed 16 April 2008).

McCalpin, J.P., and S.P. Nishenko. 1996. Holocene probability, temporal clustering, and probabilities of future large (M>7) earthquakes on the Wasatch fault zone, Utah. *Journal of Geophysical Research,* 101:6233-6253.

Morgan County. 2003. *Morgan County Emergency Operations Plan*. Morgan County, UT.

Mulvey, W.E. 1992. *Soil and Rock Causing Engineering Problems in Utah*. Utah Geological Survey Special Study 80. http://geology.utah.gov/maps/geohazmap/pdf/probsoils.pdf (Accessed 16 April 2008).

National Climatic Data Center (NCDC). 2005. Climate Atlas of the Contiguous United States. National Oceanic and Atmospheric Administration. http://cdo.ncdc.noaa.gov/cgi-bin/climaps/climaps.pl (Accessed 16 April 2008).

National Drought Mitigation Center (NDMC). 2006. What is Drought? 15 April 2008. http://drought.unl.edu/whatis/what.htm.

National Flood Insurance Program (NFIP). 1990a. Flood Insurance Rate Map, Morgan County, Utah (and Unincorporated Areas). Washington, D.C.: Federal Emergency Management Agency.

_____. 1990b. Flood Insurance Rate Map, Tooele County, Utah (and Unincorporated Areas). Washington, D.C.: Federal Emergency Management Agency.

National Seismic Hazard Mapping Program (NSHMP). 2002. 2002 NSHMP Hazard Mapping. U.S. Geological Survey, Earthquake Hazards Program. http://earthquake.usgs.gov/research/hazmaps/interactive/cmaps/custom2002_2006.php (Accessed 16 April 2008).

National Weather Service (NWS). 1999. *Thunderstorms…Tornadoes…Lightning…Natures Most Violent Storms*. National Oceanic and Atmospheric Administration Public Awareness Brochure 99050. http://www.nws.noaa.gov/om/brochures/ttl.pdf (Accessed 16 April 2008)

_____. 2001. *Winter Storms – The Deceptive Killers*. National Oceanic and Atmospheric Administration Public Awareness Brochure 200160. http://www.weather.gov/om/winterstorm/winterstorms.pdf (Accessed 16 April 2008)

_____. 2008. Utah's Most Dangerous Weather! Salt Lake City Weather Forecast Office, National Weather Service, National Oceanic and Atmospheric Administration, Salt Lake City, UT. http://www.wrh.noaa.gov/slc/climate/DangerousWeather.php (Accessed 16 April 2008)

Peterson, Kristina J. 2005. Recovery by Design: The Ongoing Challenges Presented by Katrina and Rita. *Natural Hazards Observer*, vol. 30, 2:10-11.

Salt Lake County. 2003. *Salt Lake County Emergency Operations Plan*. Salt Lake County, UT.

Solomon, Barry, Neil Storey, Ivan Wong, Walter Silva, Nick Gregor, Douglas Wright, and Greg McDonald. 2004. *Earthquake-Hazards Scenario for a M7 Earthquake on the Salt Lake City Segment of the Wasatch Fault Zone, Utah*. Special Study 111 DM. Salt Lake City: Utah Geological Survey.

Storm Prediction Center. 2007b. The Enhanced Fujita Scale (EF Scale). National Weather Service, National Oceanic and Atmospheric Administration. http://www.spc.noaa.gov/efscale/ (Accessed 16 April 2008).

_____. 2007b. Severe Weather Database Files (1950-2006). National Weather Service. http://www.spc.noaa.gov/wcm/ (Accessed 11 November 2007).

Tooele County. 2001. *Tooele County Emergency Operations Plan*. Tooele County, UT.

United States. 1970. *Clean Air Act*. 42 United States Code. s/s 7401 et seq. 1970. http://www.access.gpo.gov/uscode/title42/chapter85_.html. (Accessed 16 April 2008)

_____. 1973. *Endangered Species Act*. 16 United States Code 1531. http://www.access.gpo.gov/uscode/title16/chapter35_.html (Accessed 16 April 2008).

_____. 1977a. *Clean Water Act*. 33 USC s/s 121 et seq. 1977. Public Law 95-217. http://www.access.gpo.gov/uscode/title33/chapter26_.html (Accessed 16 April 2008).

_____. 1977b. *Floodplain Management Executive Order No. 11988*. 42 Code of Federal Regulations 26951.
http://www.fema.gov/plan/ehp/ehplaws/attachments-laws/eo11988.pdf (Accessed 15 April 2008).

_____. 2000. *National Historic Preservation Act of 1966*. Amended 2000 [with annotations]. Pub. L. 89-665; 16 United States Code 470 et seq. http://www.access.gpo.gov/uscode/title16/chapter1a_subchapterii_.html (Accessed 16 April 2008).

_____. *2000. Disaster Mitigation Act of 2000*. Public Law 106-390; 42 USC 5121 note. http://www.fema.gov/library/viewRecord.do?id=1935 (Accessed 16 April 2008)

_____. 2002. *Hazard Mitigation Planning and Hazard Mitigation Grant Program*. 44 Code of Federal Regulations. Parts 201 and 206. , Federal Register Interim Final Rule. Federal Emergency Management Agency. 26 February 2002.

United States Census Bureau (USCB). 2004. Residence County to Workplace County Flows for Utah. http://www.census.gov/population/www/cen2000/commuting.html#UT (Accessed 16 April 2008).

United States Geological Survey (USGS). 1999. Geologic Time: Major Divisions of Geologic Time. http://pubs.usgs.gov/gip/geotime/divisions.html (Accessed 16 April 2008).

_____. 2006. Utah Interactive State Basins Map. http://ut.water.usgs.gov/Basins/index.html (Accessed 16 April 2008).

University of Utah Seismograph Stations (UUSS). 2007. Utah Region Earthquake Listings, 1962-Present. http://www.quake.utah.edu/EQCENTER/LISTINGS/utahregion.htm (Accessed 16 April 2008).

Utah Avalanche Center (UAC). 2008. Frequently Asked Questions. U.S. Forestry Service. http://www.avalanche.org/~uac/ed-faq.htm (Accessed 15 April 2008).

Utah Department of Agriculture and Food (UDAF). 2007a. *2007 Insect Report*. http://ag.utah.gov/plantind/2007InsectReport.pdf (Accessed 16 April 2008).

_____. 2007c. Grasshopper/Mormon Cricket Data. Salt Lake City: UDAF.

_____. 2007b. Gypsy Moth Trap Data. Salt Lake City: UDAF.

Utah Department of Transportation (UDOT). 2006. Traffic Volume Maps - Traffic Maps for 2005. Utah Department of Transportation: Data Analysis Unit. http://www.udot.utah.gov/main/f?p=100:pg:4873862879722483966:::1:T,V:1616, (Accessed 16 April 2008).

Utah Department of Workforce Services (UDWS). 2006. Utah Economic Data Viewer – County and Statewide Information. http://jobs.utah.gov/jsp/wi/utalmis/gotoCounties.do (Accessed 16 April 2008).

_____. 2007a. Davis County Largest Employers – Annual Average 2006. Workforce Information. http://jobs.utah.gov/opencms/wi/regions/northern/davis/davisme.pdf (Accessed 16 April 2008).

_____. 2007b. Morgan County Largest Employers – Annual Average 2006. Workforce Information. http://jobs.utah.gov/opencms/wi/regions/northern/morgan/morganme.pdf (Accessed 16 April 2008).

Utah Division of Comprehensive Emergency Management (UDCEM). 1991. *Utah Natural Hazards Handbook*. Utah Natural Hazards Training Workshop, July 1991.

Utah Division of Forestry, Fire and State Lands (UDFFSL). 2003. *Forest Health in Utah*. Utah

Department of Natural Resources, June 2003. http://www.ffsl.utah.gov/foresthealth/fhgov4a.pdf (Accessed 16 April 2008).

_____. 2007. Northern Utah Regional Wildfire Protection Plan. http://www.utahfireinfo.gov/CWPP/northernutah/FINAL_Northern_UT%20RWPP.pdf (Accessed 16 April 2008)

Utah Division of Radiation Control (UDRC). 2006. Test Results by ZIP code – Long Term Results by ZIP Code. http://www.radon.utah.gov/test_results.htm (Accessed 16 April 2008).

_____. 2008a. Radon Overview. http://www.radon.utah.gov/ (Accessed 16 April 2008).

_____. 2008b. Radon Techniques for New Home Construction. http://www.radon.utah.gov/ builder.htm (Accessed 16 April 2008).

Utah Division of Water Resources. 2007. *Drought in Utah: Learning from the Past – Preparing for the Future*. Utah State Water Plan. April 2007.

_____. 2007b. Great Salt Lake Pumping Project. http://www.water.utah.gov/construction/gsl/gslpage.htm (Accessed 16 April 2008).

Utah Division of Water Rights. 2007. WRDAMS - Point Shapefile of Dam database. http://utstnrwrt6.waterrights.utah.gov/Downloads/wrdams.exe (Accessed 16 April 2008)

Utah Geological Survey (UGS). 1996. *The Wasatch Fault*. Public Information Series 40. http://geology.utah.gov/online/pdf/pi-40.pdf (Accessed 16 April 2008).

_____. 2002. Utah Quaternary Fault and Fold Map – 2002. http://geology.utah.gov/maps/geohazmap/qfaults/imagemap2/ (Accessed 16 April 2008)

_____. 2004. Massive Rock Fall Near Devil's Slide, Morgan County, March 22, 2004. http://geology.utah.gov/utahgeo/hazards/landslide/morgan032204.htm (Accessed 16 April 2008).

_____. 2008. Earthquake Ground Shaking Levels for the Wasatch Front. http://ugs.utah.gov/utahgeo/hazards/eqfault/ibcshake/index.htm (Accessed 16 April 2008).

Utah Population Estimates Committee (UPEC). 2007. Demographics – Population Estimates, The State of Utah and Counties 1940-2007. Utah Governor's Office of Planning and Budget. http://governor.utah.gov/dea/UPEC/ AllUPECData071115.xls (Accessed 16 April 2008).

_____. 2008. Demographic and Economic Projections – 2008 Baseline Projections. http://governor.utah.gov/dea/ERG/ERG2008/2008ERGProjectionsTables.xls (Accessed 16 April 2008).

Utah Transit Authority (UTA). 2007. *Comprehensive Annual Financial Report for Fiscal Year Ended December 31, 2006*. http://www.rideuta.com/files/CAFR2006.pdf (Accessed 16 April 2008).

Vaisala, Inc. 2006. 1996-2005 Flash Density Map. National Weather Service. http://www.lightningsafety.noaa.gov/pdfs/Vaisala_96-05_Flash_Map.pdf (Accessed 16 April 2008).

Wasatch Front Regional Council (WFRC). 2007. Population Estimates, July 1, 2006. http://wfrc.org/resources/sedata/Surv06.xls (Accessed 15 April 2008).

Watson, Kris. 2007. *2007 Utah Cooperative Gypsy Moth Program Report*. Salt Lake City: Utah Department of Agriculture and Food.

Weber County. 2000. *Weber County Emergency Operations Plan*. Weber County, UT.