

# Converse County, Wyoming Hazard Mitigation Plan 2018 Update



# **Converse County Hazard Mitigation Plan 2018 Update**

Developed by Converse County

with professional planning assistance from

Wood Environment & Infrastructure Solutions, Inc.  
Hazard Mitigation and Emergency Management

The logo for Wood Environment & Infrastructure Solutions, Inc. features the word "wood." in a bold, lowercase, sans-serif font. The letter "o" is notably larger than the other letters, and the period at the end is a solid black dot.

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# 1 INTRODUCTION

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## 1.1 Purpose

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Converse County including the municipalities of Douglas, Glenrock, Lost Springs, and Rolling Hills prepared this multi-jurisdictional hazard mitigation plan update to guide hazard mitigation planning and to better protect the people and property of the planning area from the effects of hazard events. This plan demonstrates the County's commitment to reducing risks from hazards, and serves as a tool to help decision makers direct mitigation activities and resources. This plan also maintains the planning area's eligibility for certain federal disaster assistance under the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Assistance (HMA) grant programs.

## 1.2 Background and Scope

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This plan builds upon years of mitigation planning and project implementation by Converse County and its communities. This Hazard Mitigation Plan underwent a comprehensive update in 2018 and replaces the 2011 Converse County Hazard Mitigation Plan.

Each year in the United States, disasters take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. These monies only partially reflect the true cost of disasters, because additional expenses to insurance companies and nongovernmental organizations are not reimbursed by tax dollars. Many disasters are predictable, and much of the damage caused by these events can be alleviated or even eliminated.

Hazard mitigation is defined by FEMA as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." The results of a three-year, congressionally-mandated independent study to assess future savings from mitigation activities provides evidence that mitigation activities are highly cost-effective. On average, each dollar spent on mitigation saves society an average of \$4 in avoided future losses in addition to saving lives and preventing injuries (National Institute of Building Science Multi-Hazard Mitigation Council 2005).

Hazard mitigation planning is the process through which hazards that threaten communities are identified, likely impacts of those hazards are determined, mitigation goals and objectives are set, and appropriate actions to lessen impacts are identified, prioritized, and implemented. This plan documents the planning region's hazard mitigation planning process, identifies relevant hazards and risks, and identifies the strategy that each participating County and jurisdiction will use to decrease vulnerability and increase resiliency and sustainability.

This plan was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 (Public Law 106-390) and the implementing regulations set forth by the Interim Final Rule published in the *Federal Register* on February 26, 2002 (44 CFR §201.6) and finalized on October 31, 2007 (hereafter, these requirements and regulations will be referred to collectively as the Disaster Mitigation Act (DMA)). While the act emphasized the need for mitigation plans and more coordinated mitigation planning and implementation efforts, the regulations established the

requirements that local hazard mitigation plans must meet for a local jurisdiction to be eligible for certain federal disaster assistance and hazard mitigation funding under the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288). Because the planning area is subject to many kinds of hazards, access to these programs is vital.

Information in this plan will be used to help guide and coordinate mitigation activities and decisions for local land use policy in the future. Proactive mitigation planning will help reduce the cost of disaster response and recovery to the community and its property owners by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruption. The planning area has been affected by hazards in the past and is thus committed to reducing future disaster impacts and maintaining eligibility for federal funding.

### **1.3 Plan Organization**

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The Converse County Hazard Mitigation Plan is organized in alignment with the DMA planning requirements and the FEMA plan review crosswalk as follows:

- Chapter 1: Introduction
- Chapter 2: Community Profile
- Chapter 3: Planning Process
- Chapter 4: Risk Assessment
- Chapter 5: Mitigation Strategy
- Chapter 6: Plan Adoption, Implementation, and Maintenance
- Appendices

# 2 COMMUNITY PROFILE

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## 2.1 Geography and Climate

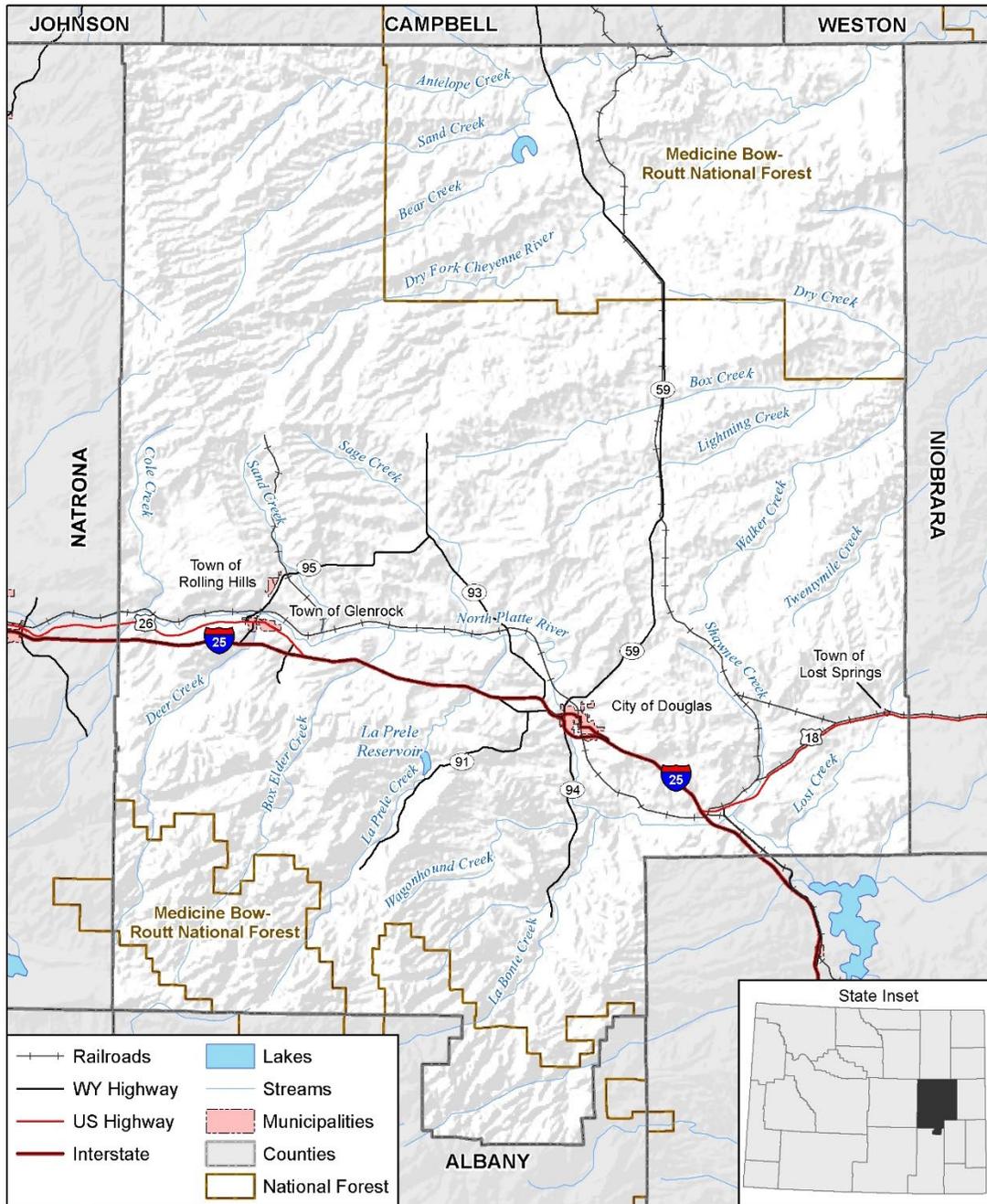
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The two dominant natural features in Converse County are the Laramie Mountain Range and North Platte River. The Laramie Mountains cut across the southwest corner of the county. The North Platte flows across the county from northwest to southeast and through the center of Douglas, the county seat.

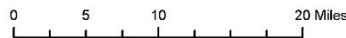
Elevations across Converse County range from just over 4,400 feet above sea level in the northeastern corner of the county to 9,165 feet at Twin Peaks in the southwestern, forested area of the county. Lands drain into both the Cheyenne and North Platte Rivers. The surface is characterized by rolling hills, canyons, and breaks in the north half of the county, and steeper, timbered mountain slopes in the southwest. Precipitation at Douglas is 12.6 inches annually, with most of the precipitation coming between April and September. Underlying the surface are oil and gas producing basins. Air and water quality in the county are generally quite good.

Interstate 25 bisects the county, running east-west to the west of Douglas, then turning north-south at Douglas. U.S. Highways 18 and 20 exit the southeast corner of the county in an easterly direction, serving Lost Springs and Shawnee. State highway 59 runs north-south connecting Douglas to Gillette in neighboring Campbell County. Highway 93/95 forms a loop from I-25 that largely parallels the North Platte and accesses Glenrock, Rolling Hills, and Orpha. The Burlington Northern and Santa Fe Railroad (BNSF) enters the county from the north and runs roughly parallel to State Highway 59. The BNSF carries coal mined in the Powder River Basin to the north, to all parts of the country. These tracks intersect with the east-west Union Pacific Railroad (UPRR) at Douglas. The UPRR closely follows the North Platte west of Douglas and State Highways 18 and 20 east of Douglas. Douglas has a general aviation airport south of town, but does not have commercial air service. Commercial air service is available in Casper, 50 miles west of Douglas.

**Figure 2.1: Converse County Base Map**



Map compiled 10/2017;  
intended for planning purposes only.  
Data Source: WY Geospatial Hub,  
WYDOT, HSIP Freedom 2015



## 2.2 History

Converse County was established in 1888 from portions of Albany and Laramie Counties. The county is named after Wyoming pioneer, Amasa R. Converse. The county is approximately

170 miles east-west and 92 miles north-south and encompasses 4,253 square miles. Converse County is located in east central Wyoming. Open range is the dominant land use with timbered mountain slopes located along the southwest boundary. Land ownership in the county is private, state, and federal. Neighboring counties include Albany, Campbell, Johnson, Natrona, Niobrara, Platte, and Weston.

## 2.3 Population

The population for the County in according to the Census in 2010 was 13,833, which is a 13% increase from the 2000 census population of 12,052. The population is 95.1 % white. Population growth in the county has been faster than the state and faster than the nation. The population density based on the 2010 census was 3.2 people per square mile. County residents live in one of the incorporated communities, Douglas, Glenrock, Lost Springs, or Rolling Hills, or one of the unincorporated communities of Bill, Esterbrook, Orpha, Orin, and Shawnee, or in unincorporated areas of the county. The highest concentration of population is in the City of Douglas, population 5,932; Douglas serves as the County seat. The town of Glenrock has a population of 2,576, Rolling Hills, 440, and Lost Springs, 4, according to the U.S. Census Bureau (Source: <http://factfinder.census.gov>).

**Table 2.1: Planning Area Population**

	2010 Census	2011 Census Estimate	2012 Census Estimate	2013 Census Estimate	2014 Census Estimate	2015 Census Estimate	2016 Census Estimate	% Change 2010-2016
<b>Converse County</b>	13,833	13,596	13,779	13,934	13,991	14,101	14,223	2.9%
<b>City of Douglas</b>	6,120	6,002	6,117	6,209	6,272	6,371	6,478	5.7%
<b>Town of Glenrock</b>	2,498	2,534	2,548	2,583	2,576	2,593	2,607	4.3%
<b>Town of Lost Springs</b>	4	5	6	6	5	5	4	0%
<b>Town of Rolling Hills</b>	440	496	581	534	522	487	383	-12.9%

Source: U.S. Census Bureau

## 2.4 Economy

In 2005, retail trade represented the largest number of firms in the county’s economic profile. This was followed by construction; other services; mining; accommodation and food services; health care and social assistance; and professional, scientific and technical services. Mining, utilities, construction, and healthcare represented the largest employers with each of these industries having at least one firm that employed 100 or more individuals. Mining is the only industry in the county that has a firm employing 250 or more people. The government share of total employment (local, state, and federal) in 2006 was 18%. Job growth over the past 36 years has outpaced both state and national rates. (Source: Socioeconomic Profile of Converse County, Headwaters Economics, February 2009)

The median family income for 2010 as estimated by Housing and Urban Development was \$66,400, slightly higher than the statewide figure of \$66,100. The unemployment rate in the county was 5.8% in 2009. The total number of housing units in the county increased from 5,669 to 6,134 for the period 2000 to 2010. (Source: Wyoming Housing Database Partnership, Final Report, August 31, 2010) The home ownership rate across the County in 2009 was 74%. (Source: <http://quickfacts.census.gov>)

## 2.5 Mitigation Capabilities

The Wyoming State Multi-Hazard Mitigation Plan summarizes existing mitigation capabilities of each county and some of their incorporated cities. The information was derived from county websites and through completed worksheets from the County Coordinators. The table below presents a summary of Converse County’s mitigation capabilities that are highlighted in the 2016 Wyoming State Mitigation Plan and in some cases updated with 2017 information. Opportunities to expand on these capabilities were discussed during the 2017-2018 update process as part of the updated mitigation strategy in Chapter 5 and implementation and incorporation through related planning efforts in Chapter 6.

**Table 2.2: Summary of Mitigation Capabilities**

Building Codes	Comprehensive Planning	Floodplain Management	GIS & Planning	Land Use Regulations	Other
County does not have building codes  City of Douglas and Town of Glenrock have building codes	2015 Converse County Land Use Plan includes the incorporated cities and towns. Includes a lot of references to preserving natural areas, wetlands etc.	RiskMAP FIRM: 11/4/09  2009 Flood Damage Ordinance	Planning and Zoning Commission	2015 Subdivision Regulations requires storm sewer improvements	Natural Resource Planning board; manages multiple uses of federal and state land  Converse Area New Development Organization = Economic Development

Source: Wyoming Multi-Hazard Mitigation Plan 2016

As part of the mitigation planning process, communities were asked to provide data on their capabilities related to hazard mitigation and emergency management. Those results are included in the table below. It should be noted that Lost Springs has a population of 4, without much in the way of official community capability.

**Table 2.3: Capability Assessment**

	Converse County	Douglas	Glenrock	Rolling Hills	Lost Springs
<b>Planning Capabilities</b>	<b>Yes/No</b>				
Comprehensive Plan	No	Yes		7/14/2009	

	Converse County	Douglas	Glenrock	Rolling Hills	Lost Springs
Capital Improvement Plan	No	7/2018		No	N/A
Local Emergency Plan	N/A	No	No	No	No
County Emergency Plan	9/1/2015	N/A	N/A	N/A	N/A
Local Recovery Plan	No	No		No	No
County Recovery Plan	No	N/A	N/A	N/A	N/A
Local Mitigation Plan	N/A	No	No	No	No
County Mitigation Plan	2011	Yes	Yes	Yes	Yes
Local Mitigation Plan (PDM)	No	No	No	No	No
County Mitigation Plan (PDM)	No	No	No	No	No
Debris Management Plan	No	No	No	No	No
Economic Development Plan	No	6/2014		No	No
Transportation Plan	No	6/2014		No	No
Land-use Plan	2015	6/2014		No	No
Flood Mitigation Assistance (FMA) Plan	2009	Yes		No	No
Watershed Plan	No	6/2004		No	No
Firewise or other fire mitigation plan	2005			No	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No	No		No	No
<b>Policies/Ordinance</b>					
Zoning Ordinance	No	Yes		Yes	
Building Code	No	Yes		No	
Floodplain Ordinance	2009	Yes	Yes	No	
Subdivision Ordinance	2015	Yes		No	
Tree Trimming Ordinance	N/A	Yes		No	No
Nuisance Ordinance	N/A	Yes		Yes	
Storm Water Ordinance	N/A	Yes		No	
Drainage Ordinance	N/A	Yes		No	
Site Plan Review Requirements	No	Yes		No	No
Historic Preservation Ordinance	No	Yes		Yes	No
Landscape Ordinance	No	Yes		No	No
<b>Program</b>					
Zoning/Land Use Restrictions	Yes	Yes	Yes	Yes	Yes
Codes Building Site/Design	No	Yes		No	
National Flood Insurance Program (NFIP)	Yes	Yes	Yes	No	No
NFIP Community Rating System (CRS) Participating Community	No	Yes Class 8	No	No	No
Hazard Awareness Program	No	No	No	No	
National Weather Service (NWS) Storm Ready	No	No	No	No	No
ISO Fire Rating	No	Yes – 5		No	
Economic Development Program	No	Yes	Yes	No	
Land Use Program	No	Yes	Yes	No	
Public Education/Awareness	No	Yes	Yes	No	
Property Acquisition	No	Yes	Yes	No	
Planning/Zoning Boards	Yes	Yes	Yes	Yes	
Stream Maintenance Program	No	Yes		No	
Tree Trimming Program	No	Yes		No	
Engineering Studies for Streams (Local/County/Regional)	No	No		No	
Mutual Aid Agreements	Yes	Yes		No	
<b>Studies/Reports/Maps</b>					
Hazard Analysis/Risk Assessment (Local)	N/A	Yes	No	Yes	No

	Converse County	Douglas	Glenrock	Rolling Hills	Lost Springs
Hazard Analysis/Risk Assessment (County)	Yes	Yes	Yes	Yes	Yes
Flood Insurance Maps	Yes	Yes			No
FEMA Flood Insurance Study (Detailed)	Yes	Yes	Yes		No
Evacuation Route Map	No	Yes		No	No
Critical Facilities Inventory	No	No		Yes	No
Vulnerable Population Inventory	No	Yes		No	No
Land Use Map	Yes	Yes	Yes	No	No
<b>Staff/Department</b>					
Building Code Official	Yes	Yes	Yes	Yes	
Building Inspector	No	Yes	Yes	No	
Mapping Specialist (GIS) Engineer	Yes	Yes		No	
Development Planner	No	Yes	Yes	Yes	
Public Works Official	Yes	Yes	Yes	No	
Emergency Management Coordinator	Yes	Yes	Yes	Yes	Yes
NFIP Floodplain Administrator	Yes	Yes	Yes	N/A	N/A
Bomb and/or Arson Squad	No	No	No	No	No
Emergency Response Team	Yes	Yes	Yes	Yes	Yes
Hazardous Materials Expert	No	No	No	No	No
Local Emergency Planning Committee	Yes	Yes	Yes	Yes	Yes
Sanitation Department	No	Yes	Yes	No	
Transportation Department	Yes	Yes		No	
Economic Development Department	No	No	Yes	No	
Housing Department	No	Yes		No	
Historic Preservation	No	Yes		Yes	
American Red Cross	Yes	No	No	No	
Salvation Army	No	No	No	No	
Environmental Organization	Yes	Yes		No	
Homeowner Associations	Yes	No		No	
Neighborhood Associations	No	No		No	
Chamber of Commerce	N/A	Yes	Yes	Yes	
Community Organizations (Lions, Kiwanis, etc.)	Yes	Yes	Yes	No	
<b>Financial Resources</b>					
Apply for Community Development Block Grants	Yes	Yes		No	
Fund projects through Capital Improvements funding	Yes	Yes		Yes	
Authority to levy taxes for specific purposes	Yes	Yes		Yes	
Fees for water, sewer, gas, or electric services	No	Yes		Yes	
Impact fees for new development	No	Yes		Yes	
Incur debt through general obligation bonds	Yes	Yes			
Incur debt through special tax bonds	Yes	Yes			
Incur debt through private activities	No	No			
Withhold spending in hazard prone areas	Yes	Yes		Yes	

# 3 PLANNING PROCESS

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**Requirements §201.6(b) and §201.6(c)(1): An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:**

- 1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;**
- 2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and**
- 3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.**

**[The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.]**

## 3.1 Background on Mitigation Planning in Converse County

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This Multi-Hazard Mitigation Plan is an update of the 2011 Plan for Converse County. The County, with Converse County Emergency Management as the lead agency, recognized the need and importance of this plan and was responsible for initiating its development. The County contracted with Wood (formerly Wood) in 2017 to facilitate and develop the plan.

The Emergency Management Coordinator led Hazard Mitigation Planning Committees (HMPCs) working in concert with the hazard mitigation planning consultant. As the planning consultant, Wood's role was to:

- Provide guidance on a planning organization for the entire planning area representative of the participants;
- Meet all of the DMA requirements as established by federal regulations, following FEMA's most recent planning guidance;
- Facilitate the entire planning process;
- Identify the data requirements that the participating counties and municipalities could provide, and conduct the research and documentation necessary to augment that data;
- Develop and help facilitate the public input process;
- Produce the draft and final plan documents; and
- Ensure acceptance of the final Plan by WOHS and FEMA Region VIII

The remainder of this chapter provides a narrative description of the steps taken to prepare the hazard mitigation plan (HMP).

## 3.2 Local Government Participation

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The Disaster Mitigation Act (DMA) planning regulations and guidance stress that each local government seeking FEMA approval of their mitigation plan must participate in the planning effort in the following ways:

- Participate in the process as part of the Hazard Mitigation Planning Committee (HMPC),
- Detail areas within the planning area where the risk differs from that facing the entire area,
- Identify specific projects to be eligible for funding, and
- Have the governing board formally adopt the plan.

For the Converse County Multi-Hazard Mitigation Plan’s HMPC, “participation” meant:

- Attending and participating in HMPC meetings;
- Providing available data requested by the HMPC coordinator/Wood;
- Providing/updating the hazard profile and vulnerability details specific to jurisdictions;
- Developing/updating the local mitigation strategy (action items and progress);
- Advertising and assisting with the public input process;
- Reviewing and commenting on plan drafts; and
- Coordinating the formal adoption of the plan by the governing boards.

In the interest of completing a robust process that would ultimately result in FEMA approval the County and participating municipalities met all of these participation requirements. In most cases one or more representatives for each agency attended the HMPC meetings and also brought together department staff to help collect data, identify mitigation actions and implementation strategies, and review and provide data on plan drafts. Appendix B provides additional information and documentation of the planning process.

## 3.3 The 10-Step Planning Process

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Wood established the planning process for the Converse County Hazard Mitigation Plan using the DMA planning requirements and FEMA’s associated guidance. This guidance is structured around a four-phase process:

- 1) Organize Resources
- 2) Assess Risks
- 3) Develop the Mitigation Plan
- 4) Implement the Plan and Monitor Progress

Into this four-phase process, Wood integrated a more detailed 10-step planning process used for FEMA’s Community Rating System (CRS) and Flood Mitigation Assistance (FMA) programs. Thus, the modified 10-step process used for this plan meets the requirements of six major programs: FEMA’s Hazard Mitigation Grant Program, Pre-Disaster Mitigation program,

Community Rating System (CRS), Flood Mitigation Assistance Program, Severe Repetitive Loss program, and new flood control projects authorized by the U.S. Army Corps of Engineers. FEMA's March 2013 *Local Mitigation Planning Handbook* recommends a nine step process within the four phase process. **Table 3.1** summarizes the four-phase DMA process, the detailed CRS planning steps and work plan used to develop the plan, the nine handbook planning tasks from FEMA's 2013 *Local Mitigation Planning Handbook*, and where the results are captured in the Plan. The sections that follow describe each planning step in more detail.

**Table 3.1. Mitigation Planning Process**

<b>FEMA 4 Phase Guidance</b>	<b>Community Rating System (CRS) Planning Steps (Activity 510) and Wood Work Plan Tasks</b>	<b>FEMA Local Mitigation Planning Handbook Tasks (44 CFR Part 201)</b>	<b>Location in Plan</b>
Phase I: Organize Resources	Task 1. Organize Resources	1: Determine the Planning Area and Resources	Chapters 1, 2 and 3
		2: Build the Planning Team 44 CFR 201.6(c)(1)	Chapter 3, Section 3.3.1
	Task 2. Involve the public	3: Create an Outreach Strategy y 44 CFR 201.6(b)(1)	Chapter 3, Section 3.3.1
	Task 3. Coordinate with Other Agencies	4: Review Community Capabilities 44 CFR 201.6(b)(2) & (3)	Chapter 3, Section 3.3.1 and Chapter 4, Section 4.4
Phase II: Assess Risks	Task 4. Assess the hazard	5: Conduct a Risk Assessment 44 CFR 201.6(c)(2)(i) 44 CFR 201.6(c)(2)(ii) & (iii)	Chapter 4, Sections 4.1-4.3
	Task 5. Assess the problem		Chapter 4, Sections 4.1-4.3
Phase III: Develop the Mitigation Strategy	Task 6. Set goals	6: Develop a Mitigation Strategy 44 CFR 201.6(c)(3)(i); 44 CFR 201.6(c)(3)(ii); and 44 CFR 201.6(c)(3)(iii)	Chapter 5, Section 5.2
	Task 7. Review possible activities		Chapter 5, Section 5.3
	Task 8. Draft an action plan		Chapter 5, Section 5.4
Phase IV: Adopt and Implement the Plan	Task 9. Adopt the plan	8: Review and Adopt the Plan	Chapter 6, Appendix C
	Task 10. Implement, evaluate, revise	7: Keep the Plan Current	Chapter 7
		9: Create a Safe and Resilient Community 44 CFR 201.6(c)(4)	Chapter 7

### 3.3.1 Phase 1: Organize Resources

#### Planning Task 1: Organize the Planning Effort

With the County’s commitment to update the Plan, Wood worked with County Emergency Management to establish the framework and organization for the process. Organizational efforts were initiated with each jurisdiction to inform and educate the plan participants of the purpose and need for the update and continued participation. During the update of this plan, the planning process was directed through a Hazard Mitigation Planning Committee comprised of Converse County and participating jurisdictions. The planning consultant held an initial conference call to

discuss the organizational aspects of the planning process with the county Emergency Management Coordinator. Using FEMA planning guidance, representatives for the county’s HMPC base membership was established, with additional invitations extended as appropriate to other federal, state, tribal, and local stakeholders and the public throughout the planning process.

Wood and the County’s Emergency Management Coordinator identified key county, municipal, and other local government and initial stakeholder representatives. An email was sent to invite them to participate as members of the HMPC and to attend a series of planning workshops. Representatives from the following County and municipal departments participated on the county or jurisdictional-level HMPC during the development of the 2018 plan update.

**Table 3.2. HMPC Members by Jurisdiction**

Jurisdictions	Position	Department
Converse County	Coordinator; Admin Assistant	Emergency Management
	Secretary	Rural Fire Department
	Sheriff; Undersheriff; Deputy	Sheriff's Office
	Coordinator	Converse County Firewise
	Public Health Response	Converse County Public Health
	PSC Manager	Joint Communications
City of Douglas	Chief; Assistant Chief; Prevention Coordinator	Fire Department
	Lieutenant	Police Department
	Supervisor	City Supervisor
	Director	Community Development
Town of Glenrock	President; Captain	Fire Department
	Director	Community Development
	Administrator	Glenrock Health Center
Town of Lost Springs	Mayor	City of Lost Springs
Town of Rolling Hills	Councilperson	Town Council
	Chief Water Operator	Water Department
Stakeholders	Position	Department
		WY Public Health Department
	State Hazard Mitigation Officer	WYOHS
	AMS; District Maintenance Engineer	WYDOT
	Disaster Program Manager	Red Cross of Casper
	Director; Ops Chief	RERT II
	Secretary	La Prele Irrigation
	Compliance	Sinclair Transportation Co.

	Supervisor	Tallgrass Energy
	Disaster POC	Natrona-Converse-Niobrara VW Extension
	Maintenance Director; Buildings and Grounds	CCSD 1 & 2
	Paramedic	Memorial Hospital of Converse County
	Communications Manager	Converse County Joint Comms Center
	Administrator; Safety Director	Mountain Lodge Douglas Care Center

When sending invitations to participate in the hazard mitigation planning process, jurisdictions were requested to send at least one participant, and then go back to their communities and work with other jurisdictional agencies as appropriate to participate in plan development. A list of all persons and agencies invited as part of the LEPC is included in the appendices. The planning process officially began with a kick-off meeting/webinar held on September 14, 2017 in combination with a meeting of the Converse County Local Emergency Planning Commission (LEPC). The meeting covered the scope of work, project schedule and an introduction to the DMA planning requirements. The meeting was also an opportunity to revisit the list of hazards analyzed in the plan. A summary of this meeting is included in Appendix A.

During the planning process, the HMPC communicated through face-to-face meetings, email, and telephone conversations. Draft documents were also shared by email. The complete draft was posted on the County website so that the HMPC members and the public could easily access and review them.

The HMPC held three primary planning meetings during the planning period (September 2017-January 2018). The first meeting focused on kicking off the process and was held remotely over Skype. The second meeting focused on discussing the draft hazard analysis and risk assessment, adding local perspective to the draft document. The third meeting focused on developing mitigation strategies. Agendas for each of the meetings are included in Appendix A.

## **Planning Task 2: Involve the Public**

The 2017-2018 planning process was an open one, with the public informed and involved early in the process. Mitigation planning was primarily accomplished at HMPC meetings, which in some cases such as the kickoff meeting included members of the public and local business and industry. Additional public involvement was accomplished through a public survey.

### ***Public Survey***

During the planning process and drafting stage, a public survey was developed as a tool to gather public input. The survey was for the public to provide feedback to the county planning teams on topics related to hazard concerns and reducing hazard impacts. The survey provided an opportunity for public input during the planning process, prior to finalization of the plan update. The survey gathered public feedback on concerns about wildfires, floods, winter storms and other hazards and solicited input on strategies to reduce their impacts. The survey was released as both an online tool

and a hardcopy form in September 2017 and closed in February 2018. The County provided links to the public survey by distributing it using social media, email, and posting the link on websites. 172 responses were received and shared with the county planning committees to inform the process.

The survey included a question on ranking hazard significance. The results generally track with the significance levels noted in Chapter 4 of this plan, with hail, winter storm, wildfire, and wind as being the four most significant. The following graph is a display of the results from Question 5. Question 5 read: *The following types of mitigation actions may be considered in this plan. Please indicate all the types of mitigation actions that you think should have the highest priority in the Multi-Hazard Mitigation Plan. These results will be considered during the planning process.* The results indicate that all categories of actions were equally popular with the public, each category receiving a 100% rating on the Priority scale. Additional results of the survey are included in Appendix A Planning Process Documentation.

**Figure 3.1. Mitigation Action Survey - Results from Question 5**



Prior to finalizing, a draft of the plan was made available to the public for review and comment. The plan was placed on the county’s web page and a press release and social media were used to announce the public comment period. A feedback form was provided to collect specific comments.

### **Planning Task 3: Coordinate with Other Departments and Agencies**

Early in the planning process, the HMPC determined that data collection, mitigation strategy development, and plan approval would be greatly enhanced by inviting state and federal agencies and organizations to participate in the process. Based on their involvement in hazard mitigation activities or their role in land stewardship in the county, representatives from state, federal, and local businesses were invited to participate on the HMPC in 2017 and are noted in **Table 3.2**.

Many of these stakeholders participated in the process by attending HMPC meetings or providing data and information that was used to update hazard profiles in the plan. Stakeholders were also given an opportunity to review and comment on the draft plan.

#### ***Other Community Planning Efforts and Hazard Mitigation Activities***

Coordination with other community planning efforts is an important aspect to mitigation planning. Hazard mitigation planning involves identifying existing policies, tools, and actions that will reduce a community’s risk and vulnerability from natural hazards. The County uses a variety of comprehensive planning mechanisms, such as development master plans and ordinances, to guide growth and development. Integrating existing planning efforts and mitigation policies and action strategies into this plan establishes a credible and comprehensive plan that ties into and supports other community programs. The development of this plan incorporated information from the following existing plans, studies, reports, and initiatives identified in the table (below). (Note - the actions in the mitigation action strategy in Chapter 5 identify the related planning mechanism, where applicable, with each detailed action description).

**Table 3.3. Key Plans, Studies and Reports**

<b>Resource</b>	<b>How Incorporated or Referenced</b>
Converse County Community Wildfire Protection Plan (CWPP)	<ul style="list-style-type: none"> <li>Incorporated into Risk and Vulnerability Assessment and Mitigation Strategy</li> </ul>
Wyoming State Hazard Mitigation Plan (2016)	<ul style="list-style-type: none"> <li>Informed data sources and information gathering and goals update</li> </ul>
Converse County Together Now and Tomorrow	<ul style="list-style-type: none"> <li>Referenced for development trends</li> </ul>
2010 City of Douglas Development Plan	<ul style="list-style-type: none"> <li>Referenced for development trends</li> </ul>
2010 Wyoming Irrigation Systems Report	<ul style="list-style-type: none"> <li>Informed dam failure analysis and risk assessment</li> </ul>
Basic Seismological Characterization for Converse County, WY (WSGS)	<ul style="list-style-type: none"> <li>Informed earthquake analysis and risk assessment</li> </ul>

Resource	How Incorporated or Referenced
Swelling Clays Map of the Conterminous United States (1989)	<ul style="list-style-type: none"> <li>Informed earthquake analysis and risk assessment</li> </ul>
FEMA Flood Insurance Study (2009)	<ul style="list-style-type: none"> <li>Informed flood analysis and risk assessment</li> </ul>
Wyoming Vehicle Miles Report (2015)	<ul style="list-style-type: none"> <li>Informed hazardous materials analysis and risk assessment</li> </ul>
2016 Wildland Fire Management Annual Operating Plan	<ul style="list-style-type: none"> <li>Informed wildfire analysis and risk assessment</li> </ul>
Mountain Community Wildfire Protection Plan (2005)	<ul style="list-style-type: none"> <li>Informed wildfire analysis and risk assessment</li> </ul>
Wyoming Wildland Urban Interface Hazard Assessment Methodology	<ul style="list-style-type: none"> <li>Informed wildfire analysis and risk assessment</li> </ul>
Socioeconomic Profile of Converse County (2009)	<ul style="list-style-type: none"> <li>Informed community profile</li> </ul>
Wyoming Housing Database Partnership Final Report (2010)	<ul style="list-style-type: none"> <li>Informed community profile</li> </ul>
	<ul style="list-style-type: none"> <li></li> </ul>

Documents were reviewed and cited, as appropriate, during the collection of data to support Planning Steps 4 and 5, which include the hazard identification, vulnerability assessment, and capability assessment.

### 2011 Mitigation Plan Inclusion in Other Planning Mechanisms

The 2011 Converse County HMP was integrated or cross referenced into some other planning mechanisms in the County. The risk assessment portion of the 2011 plan was integrated into the other planning mechanisms listed in Table 3.4. The Table lists the jurisdiction and what planning mechanism into which the 2011 HMP was integrated. In some cases, communities have deferred this step for future planning mechanisms, as discussed in the Chapter 6 Plan Adoption, Implementation and Maintenance.

**Table 3.4. 2011 Hazard Mitigation Plan Inclusion in Other Planning Mechanisms**

Jurisdiction	Planning Mechanism
Converse County	Not reported
City of Douglas	<ul style="list-style-type: none"> <li>FEMA regulations used in Unified Land Development Code</li> <li>2012 Building Code adopted</li> <li>Mitigation Plan informed Capital Improvement Plan and Infrastructure Plan</li> <li>Hazard analysis informed 2014 Douglas Master Plan</li> </ul>
Town of Glenrock	Plan was not implemented through other mechanisms
Town of Lost Springs	Not reported
Town of Rolling Hills	Not reported

### **3.3.2 Phase 2: Assess Risks**

#### **Planning Tasks 4 and 5: Identify the Hazards and Assess the Risks**

Wood led the HMPC in research efforts to identify and document all the hazards that have, or could, impact the planning area. The existing hazard mitigation plan and Wyoming State Hazard Mitigation Plan provided a basis for most of the hazard profiles. Where data permitted, Geographic Information Systems (GIS) were used to display, analyze, and quantify hazards and vulnerabilities. Sophisticated analyses for dam failure, flood, landslide and wildfire hazards were performed by Wood that included an analysis of flood risk based on the recent Digital Flood Insurance Rate Maps (DFIRMs).

Also included in the 2018 plan is a capability review and documentation of the planning area's current capabilities to mitigate risk and vulnerability from natural hazards. By collecting information about existing government programs, policies, regulations, ordinances, and emergency plans, the HMPC can assess those activities and measures already in place that contribute to mitigating some of the risks and vulnerabilities identified. The results of this review are captured in Chapter 2. A more detailed description of the risk assessment process and the results are included in Chapter 4.

### **3.3.3 Phase 3: Develop the Mitigation Plan**

#### **Planning Tasks 6 and 7: Set Goals and Review Possible Activities**

Wood facilitated discussion sessions with the HMPC that described the purpose and the process of developing planning goals, a comprehensive range of mitigation alternatives, and a method of selecting and defending recommended mitigation actions using a series of selection criteria. This process was used to update and enhance the mitigation action plan, which is the essence of the planning process and one of the most important outcomes of this effort. The Action Plan and the process used to identify and prioritize mitigation actions are described in greater detail in **Chapter 5 Mitigation Strategy**.

#### **Planning Task 8: Draft an Action Plan**

Based on input from the HMPC regarding the draft risk assessment and the goals and activities identified in Planning Steps 6 and 7, Wood produced a complete first draft of the updated Plan. This complete draft was shared for HMPC review and comment. Other agencies were invited to comment on this draft as well. HMPC and agency comments were integrated into the second draft, which was advertised and distributed to collect public input and comments. Wood integrated comments and issues from the public, as appropriate, along with additional internal review comments and produced a final draft for the Wyoming Office of Homeland Security and FEMA Region VIII to review and approve, contingent upon final re-adoption by the governing boards of each participating jurisdiction.

### **3.3.4 Phase 4: Implement the Plan and Monitor Progress**

#### **Planning Task 9: Adopt the Plan**

In order to secure buy-in and officially implement the plan, the plan was adopted by the governing boards of each participating jurisdiction. Since the adoption process follows the FEMA plan review and approval, copies of the adoption resolution will be included electronically in **Appendix D Records of Adoption**.

#### **Planning Task 10: Implement, Evaluate, and Revise the Plan**

The true worth of any mitigation plan is in the effectiveness of its implementation. Up to this point in the planning process, all of the HMPC's efforts have been directed at researching data, coordinating input from participating entities, and developing/updating appropriate mitigation actions. Each recommended action includes key descriptors, such as a lead agency and possible funding sources, to help initiate implementation. Progress on the implementation of specific actions identified in the plan is captured in a discussion and the mitigation action plan summary table in **Chapter 5 Mitigation Strategy**. An overall implementation strategy is described in **Chapter 6 Plan Adoption, Implementation and Maintenance**.

Finally, there are numerous organizations within the Converse County planning area whose goals and interests interface with hazard mitigation. Coordination with these other planning efforts, as addressed in Planning Step 3, is paramount to the ongoing success of this plan and mitigation in Converse County, and is addressed further in Chapter 6. A plan update and maintenance schedule and a strategy for continued public involvement are also included in Chapter 6.

# 4 HAZARD ANALYSIS AND RISK ASSESSMENT

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**44 CFR Requirement 201.6(c)(2): [The plan shall include] a risk assessment that provides the factual basis for activities proposed in the strategy to reduce the losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.**

As defined by the Federal Emergency Management Agency (FEMA), risk is a combination of hazard, vulnerability, and exposure. “It is the impact that a hazard would have on people, services, facilities, and structures in a community and refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage.”

The risk assessment process identifies and profiles relevant hazards and assesses the exposure of lives, property, and infrastructure to these hazards. The process allows for a better understanding of a jurisdiction’s potential risk to natural hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events.

This risk assessment builds upon the methodology described in the 2013 FEMA Local Mitigation Planning Handbook, which recommends a four-step process for conducting a risk assessment:

- 1) Describe Hazards
- 2) Identify Community Assets
- 3) Analyze Risks
- 4) Summarize Vulnerability

Data collected through this process has been incorporated into the following sections of this chapter:

**Section 4.1 Hazard Identification** identifies the hazards that threaten the planning area and describes why some hazards have been omitted from further consideration.

**Section 4.2 Hazard Profiles** discusses the threat to the planning area and describes previous occurrences of hazard events, the likelihood of future occurrences, and the County’s vulnerability to hazard events.

## 4.1 Hazard Identification

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**Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the type...of all natural hazards that can affect the jurisdiction.**

The Hazard Mitigation Planning Committee (HMPC) conducted a hazard identification study to determine the hazards that threaten the planning area.

### **4.1.1 Results and Methodology**

Using existing hazards data, plans from participating jurisdictions, and input gained through planning and public meetings, the HMPC agreed upon a list of hazards that could affect the County. Hazards data from FEMA, the Wyoming Office of Homeland Security (including the 2016 State of Wyoming Multi-Hazard Mitigation Plan), the National Oceanic and Atmospheric Administration, the Spatial Hazard Events and Losses Database for the United States (SHELDUS), and many other sources were examined to assess the significance of these hazards to the planning area. The hazards evaluated in this plan include those that have occurred historically or have the potential to cause significant human and/or monetary losses in the future.

The final list of natural hazards identified and investigated for the 2017 Converse County Multi-Hazard Mitigation Plan includes:

- Dam Failure
- Drought
- Earthquake
- Expansive Soils
- Flood
- Hazardous Materials
- High Winds and Downbursts
- Landslide/Rockfall/Debris Flow
- Severe Thunderstorms (includes Hail and Lightning)
- Tornado
- Severe Winter Weather
- Wildfire

Members of the HMPC used a hazards worksheet to rate the significance of hazards that could potentially affect the County. Significance was measured in general terms, focusing on key criteria such as the likelihood of the event, past occurrences, spatial extent, and damage and casualty potential. Table 4.1 represents the worksheet used to identify and rate the hazards, and is a composite that includes input from all the participating jurisdictions. Note that the significance of the hazard may vary from jurisdiction to jurisdiction. Jurisdictional variation is summarized in significance tables at the end of each hazard profile.

**Table 4.1: Converse County Hazard Significance Summary Table**

Hazard	Spatial Extent	Magnitude/ Severity	Probability of Future Occurrence	Overall Significance
Dam Failure	Limited	Limited	Unlikely	Low
Drought	Extensive	Limited	Likely	High
Earthquake	Significant	Critical	Occasional	High
Expansive Soils	Significant	Limited	Likely	Low
Flood/Flash Flood	Significant	Limited	Likely	Medium
Hazardous Materials	Limited	Limited	Highly Likely	Medium
Landslide/Mudslide/Rockfall	Limited	Limited	Likely	Medium
Thunderstorm (including Lightning and Hail)	Extensive	Limited	Highly Likely	Medium
Tornado/Wind	Negligible	Limited	Highly Likely	Low
Wildland Fire	Extensive	Critical	Highly Likely	High
Winter Weather	Extensive	Limited	Highly Likely	Medium
<p><b>Geographic Extent</b>  <u>Negligible:</u> Less than 10 percent of planning area or isolated single-point occurrences  <u>Limited:</u> 10 to 25 percent of the planning area or limited single-point occurrences  <u>Significant:</u> 25 to 75 percent of planning area or frequent single-point occurrences  <u>Extensive:</u> 75 to 100 percent of planning area or consistent single-point occurrences</p> <p><b>Potential Magnitude/Severity</b>  <u>Negligible:</u> Less than 10 percent of property is severely damaged, facilities and services are unavailable for less than 24 hours, injuries and illnesses are treatable with first aid or within the response capability of the jurisdiction.  <u>Limited:</u> 10 to 25 percent of property is severely damaged, facilities and services are unavailable between 1 and 7 days, injuries and illnesses require sophisticated medical support that does not strain the response capability of the jurisdiction, or results in very few permanent disabilities.  <u>Critical:</u> 25 to 50 percent of property is severely damaged, facilities and services are unavailable or severely hindered for 1 to 2 weeks, injuries and illnesses overwhelm medical support for a brief period of time, or result in many permanent disabilities and a few deaths.  <u>Catastrophic:</u> More than 50 percent of property is severely damaged, facilities and services are unavailable or hindered for more than 2 weeks, the medical response system is overwhelmed for an extended period of time or many deaths occur.</p>		<p><b>Probability of Future Occurrences</b>  <u>Unlikely:</u> Less than 1 percent probability of occurrence in the next year, or has a recurrence interval of greater than every 100 years.  <u>Occasional:</u> Between a 1 and 10 percent probability of occurrence in the next year, or has a recurrence interval of 11 to 100 years.  <u>Likely:</u> Between 10 and 90 percent probability of occurrence in the next year, or has a recurrence interval of 1 to 10 years  <u>Highly Likely:</u> Between 90 and 100 percent probability of occurrence in the next year, or has a recurrence interval of less than 1 year.</p> <p><b>Overall Significance</b>  <u>Low:</u> Two or more of the criteria fall in the lower classifications or the event has a minimal impact on the planning area. This rating is also sometimes used for hazards with a minimal or unknown record of occurrences/impacts or for hazards with minimal mitigation potential.  <u>Medium:</u> The criteria fall mostly in the middle ranges of classifications and the event's impacts on the planning area are noticeable but not devastating. This rating is also sometimes utilized for hazards with a high impact rating but an extremely low occurrence rating.  <u>High:</u> The criteria consistently fall along the high ranges of the classification and the event exerts significant and frequent impacts on the planning area. This rating is also sometimes utilized for hazards with a high psychological impact or for hazards that the jurisdiction identifies as particularly relevant.</p>		

## Hazards Considered but Not Profiled

There are several other hazards identified in the Wyoming State Hazard Mitigation Plan that could affect the county but are not profiled further for mitigation purposes due to very low probability or minimal vulnerability. These hazards include liquefaction, mine subsidence, snow avalanche, space weather, and windblown deposits. There has been little, if any, reported damage from liquefaction throughout the state, and the geologic characteristics of the County do not indicate any risk for Converse County. There is a high-level discussion of liquefaction included in Section 4.3.3 Earthquake. The Wyoming State HMP notes that liquefaction is generally isolated to the counties in the northwest corner of the state. Avalanche conditions may exist in the Laramie Range south of Douglas and Glenrock. Thousands of acres, as well as numerous well-maintained campgrounds, are managed by the U.S. Forest Service, including the land surrounding Laramie Peak (10,272 feet) in the Southern region of the County. These areas are susceptible to minor avalanche hazards, but the risk does not affect built areas. There are mines present in Glenrock that pose a threat to the community. However, because the hazard is isolated to a few specific areas and is not significant for the county at large, the issue is discussed in Section 4.3.8 Landslide/Rockfall/Debris Flow. Windblown deposits have not caused issues in the past and would likely have nuisance impacts if ancient deposits are re-mobilized. Regarding volcanism, the county and region is potentially vulnerable to an eruption of the Yellowstone Caldera due to its proximity to Yellowstone National Park. A large-scale eruption would have catastrophic global impacts. Because of the overly long expected occurrence of frequency (greater than 10,000 years) for explosive volcanism at Yellowstone, and the fact that a good response or mitigation plan is not possible for an event of this magnitude, it was not analyzed in this document.

During planning meetings, two additional hazards were discussed. Terrorism is the use of force or violence against persons or property for purposes of intimidation, coercion, or ransom. Terrorists often use threats to create fear among the public, try to convince citizens that their government is powerless to prevent terrorism, and to get immediate publicity for their causes. Converse County is not immune to the threat of terrorism, though no recorded terrorist attacks have taken place in the county or its jurisdictions. Terrorism is more of a prevention and response activity than a mitigation activity, and is not profiled further in this plan.

In August 2017, a total solar eclipse occurred over Wyoming, making many of its communities popular destinations for eclipse viewing. Converse County was included in the path of totality. The planning committee noted the logistical issues raised by the estimated 536,000 extra cars on the road, bringing more than a million people into the state. Converse County estimated that 30,000 people traveling southbound on Interstate 25 to Colorado. The State of Wyoming and Converse County had been preparing for this event, and visitors were told to ensure they had food and water, and that they had enough fuel; these warnings helped the incident run smoothly. The planning committee noted that while rare, this high volume of traffic could be repeated by two other potential scenarios, a breach in the LaPrele Dam that would affect Interstate 25, or some sort of expansive event in Casper that would push the city's 50,000 residents along the interstate for

evacuation. Because high traffic is a cascading hazard, it was not profiled separately under this plan.

#### 4.1.2 Disaster Declaration History

As part of the hazard identification process, the HMPC researched past events that triggered federal and/or state emergency or disaster declarations in the planning area. Federal and/or state disaster declarations may be granted when the severity and magnitude of an event surpasses the ability of the local government to respond and recover. Disaster assistance is supplemental and sequential. When the local government’s capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. Should the disaster be so severe that both the local and state governments’ capacities are exceeded, a federal emergency or disaster declaration may be issued allowing for the provision of federal assistance.

The federal government may issue a disaster declaration through FEMA, the U.S. Department of Agriculture (USDA), and/or the Small Business Administration (SBA). FEMA also issues emergency declarations, which are more limited in scope and without the long-term federal recovery programs of major disaster declarations. The quantity and types of damage are the determining factors.

A USDA declaration will result in the implementation of the Emergency Loan Program through the Farm Services Agency. This program enables eligible farmers and ranchers in the affected county as well as contiguous counties to apply for low interest loans. A USDA declaration will automatically follow a major disaster declaration for counties designated major disaster areas and those that are contiguous to declared counties, including those that are across state lines. As part of an agreement with the USDA, the SBA offers low interest loans for eligible businesses that suffer economic losses in declared and contiguous counties that have been declared by the USDA. These loans are referred to as Economic Injury Disaster Loans.

Table 4.2 provides information on federal emergencies and disasters declared in Wyoming between 1963 and 2017. Those that affected Converse County are indicated by an asterisk. Fire management assistance declarations that affected Converse County are also included.

**Table 4.2: Major Disaster Declarations in Wyoming: 1963 – 2017**

Event/ Hazard	Year	Declaration Type
Heavy rains, flooding	1963	Presidential – Major Disaster Declaration
Drought	1977	Presidential - Emergency Declaration
Severe storms, flooding, mudslides*	1978	Presidential – Major Disaster Declaration
Severe storms, tornadoes	1979	Presidential – Major Disaster Declaration
Severe storms, hail, flooding	1985	Presidential – Major Disaster Declaration
Methane gas seepage	1987	Presidential - Emergency Declaration
Severe winter storm	1999	Presidential – Major Disaster Declaration
Winter storm	2000	Presidential – Major Disaster Declaration

Event/ Hazard	Year	Declaration Type
Hensel Fire	2002	Fire Mgmt Assistance Declaration
Reese Mountain Fire	2002	Fire Mgmt Assistance Declaration
Commissary Ridge Fire	2002	Fire Mgmt Assistance Declaration
Tongue River Fire	2003	Fire Mgmt Assistance Declaration
Tornado	2005	Presidential – Major Disaster Declaration
Drought*	2006	USDA Declaration
Thorn Divide Fire Complex	2006	Fire Mgmt Assistance Declaration
Jackson Canyon Fire	2006	Fire Mgmt Assistance Declaration
Drought*	2007	USDA Declaration
Little Goose Fire	2007	Fire Mgmt Assistance Declaration
Drought*	2009	USDA Declaration
Severe freeze	2009	USDA Declaration
Flooding	2010	Presidential – Major Disaster Declaration
Severe Storms, Flooding, and Landslides	2011	Presidential-Major Disaster Declaration
Arapahoe Fire	2012	Fire Mgmt Assistance Declaration
Squirrel Creek Fire	2012	Fire Mgmt Assistance Declaration
Oil Creek Fire	2012	Fire Mgmt Assistance Declaration
Sheep Herder Hill Fire	2012	Fire Mgmt Assistance Declaration
Severe Storms and Flooding	2015	Presidential-Major Disaster Declaration
Station Fire	2015	Fire Mgmt Assistance Declaration
Lava Mountain Fire	2016	Fire Mgmt Assistance Declaration
Tokawana Fire	2016	Fire Mgmt Assistance Declaration
Severe Winter Storm and Straight-line Winds	2017	Presidential- Major Disaster Declaration
Flooding	2017	Presidential- Major Disaster Declaration

## 4.2 Asset Summary

### 4.2.1 Assets Exposure

As a starting point for analyzing the Planning Area’s vulnerability to identified hazards, the HMPC used a variety of data to define a baseline against which all disaster impacts could be compared. If a catastrophic disaster was to occur in the Planning Area, this section describes significant assets exposed or at risk in the Planning Area. Data used in this baseline assessment included:

- Total assets at risk;
- Critical facility inventory;
- Cultural, historical, and natural resources; and
- Population growth and land use/development trends.

## **Total Assets at Risk**

Parcel and 2017 tax year data were provided by the Converse County Assessor’s Office. This data presents an inventory of the total exposure of developed properties within the county. It is important to note that depending on the nature and type of hazard event or disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a total loss, but may see a reduction in value. Thus, the parcel analysis excludes land value.

### ***Parcel Exposure and Preparations for Analysis***

Parcel and assessor data was obtained through the county website. This information provided the basis for building exposure and property types. The focus of the analysis was on “improved” or developed parcels. These parcels were identified based on an improvement value greater than zero. Property Types were included in the assessor data and were used to identify occupancy type as shown in the following table, which includes summations of total improved value for the various property types. For the purposes of this plan ‘improved’ includes parcels that have an improvement value greater than zero. The table below shows a summary of the total improved property inventory grouped by jurisdiction. Contents values were estimated as a percentage of building value based on their property type, using FEMA/HAZUS estimated content replacement values. This includes 100% of the structure value for non-residential structures, 150% for industrial structures, and 50% for residential structures.

**Table 4.3: Converse County Total Exposure by Jurisdictions**

Jurisdiction	Property Type	Parcel Count	Improved Value	Est. Content Value	Total Exposure
Douglas	Commercial	303	\$98,535,775	\$98,535,775	\$197,071,549
	Exempt	38	\$13,925,588	\$13,925,588	\$27,851,176
	Industrial	5	\$634,267	\$951,401	\$1,585,668
	Residential	2,039	\$282,323,554	\$141,161,777	\$423,485,331
	<b>Total</b>	<b>2,385</b>	<b>\$395,419,184</b>	<b>\$254,574,540</b>	<b>\$649,993,724</b>
Glenrock	Commercial	110	\$18,425,428	\$18,425,428	\$36,850,856
	Exempt	6	\$1,824,941	\$1,824,941	\$3,649,882
	Industrial	4	\$917,073	\$1,375,610	\$2,292,683
	Residential	905	\$111,947,324	\$55,973,662	\$167,920,986
	<b>Total</b>	<b>1,025</b>	<b>\$133,114,766</b>	<b>\$77,599,641</b>	<b>\$210,714,407</b>
Lost Springs	Commercial	2	\$127,815	\$127,815	\$255,630
	Residential	2	\$6,114	\$3,057	\$9,171
	<b>Total</b>	<b>4</b>	<b>\$133,929</b>	<b>\$130,872</b>	<b>\$264,801</b>
Rolling Hills	Commercial	2	\$27,751	\$27,751	\$55,502
	Residential	155	\$27,809,122	\$13,904,561	\$41,713,683
	<b>Total</b>	<b>157</b>	<b>\$27,836,873</b>	<b>\$13,932,312</b>	<b>\$41,769,185</b>
Unincorporated	Agricultural	531	\$126,701,465	\$126,701,465	\$253,402,930
	Commercial	104	\$28,623,361	\$28,623,361	\$57,246,722
	Exempt	8	\$2,191,630	\$2,191,630	\$4,383,259
	Industrial	18	\$87,118,301	\$130,677,452	\$217,795,753
	Residential	1,533	\$263,656,134	\$131,828,067	\$395,484,202
<b>Total</b>	<b>2,194</b>	<b>\$508,290,891</b>	<b>\$420,021,974</b>	<b>\$928,312,865</b>	
<b>Grand Total</b>		<b>5,765</b>	<b>\$1,064,795,643</b>	<b>\$766,259,339</b>	<b>\$1,831,054,983</b>

Source: Wood analysis based on Assessor's Office data 2017

### Critical Facility Inventory

For the purposes of this plan, a critical facility is defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. FEMA's HAZUS-MH loss estimation software uses the following three categories of critical assets:

- *Essential facilities* are those that if damaged would have devastating impacts on disaster response and/or recovery;
- *High potential loss facilities* are those that would have a high loss or impact on the community;
- *Transportation and lifeline facilities* are a third category of critical assets, consisting of transportation systems and utilities.

Examples of each are provided in Table 4.4. Critical facilities data was provided by Converse County Planning; supplemental data from HAZUS was used to capture wastewater facilities; Homeland Security Infrastructure Program (HSIP) data was used for communications, emergency

operations centers and urgent care facilities. Each jurisdiction identified assets on a data collection guide worksheet which may capture additional facilities and additional details not within the GIS database. For a list of assets and vulnerabilities within specific jurisdictions, please refer to Appendix D.

**Table 4.4: Critical Facilities Types and Examples**

Essential Facilities	High Potential Loss Facilities	Transportation and Lifeline Facilities
Medical Facility	Assisted Living	Air Facility
Fire Department	College/University	Non-Union Communication
Hospital	Community Support	Union Communications
Law Enforcement	Day Cares	Electrical Facility
Local EOC	EPA FRS Location	
Medical Facility	EPA Regulated Facility	
Special Medical Facility	National Shelter System Facility	
Urgent Care Facility	Nursing Home	
	Power Plant	
	Public Health Department	
	School	
	Substation	
	Tier II	

**Table 4.5: Summary of Critical Facilities in Converse County by Jurisdiction**

Jurisdiction	Critical Facility Type	Facility Count
Douglas	Essential Facility	4
	High Potential Loss Facility	7
	Transportation and Lifeline Facilities	12
	<b>Total</b>	<b>23</b>
Glenrock	Essential Facility	2
	High Potential Loss Facility	4
	<b>Total</b>	<b>6</b>
Unincorporated	High Potential Loss Facility	10
	Transportation and Lifeline Facilities	131
	<b>Total</b>	<b>141</b>
<b>Grand Total</b>		<b>170</b>

Source: Converse County GIS, HSIP and HAZUS

## Cultural, Historical, and Natural Resources

Assessing the County’s vulnerability to disaster also involves inventorying the natural, historical, and cultural assets of the area. This step is important for the following reasons:

- The community may decide that these types of resources warrant more protection due to their unique and irreplaceable nature and contribution to the overall economy.
- In the event of a disaster, an accurate inventory of natural, historical and cultural resources allows for more prudent care in the disaster’s immediate aftermath when the potential for additional impacts is higher.

- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, for example, wetlands and riparian habitat which help absorb and attenuate floodwaters and thus support overall mitigation objectives.

### **Cultural and Historical Resources**

Converse County has a large stock of historically significant homes, public buildings, and landmarks. The **National Register of Historic Places** is the nation’s official list of cultural resources worthy of preservation. The National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. Properties listed include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. The National Register is administered by the U.S. Department of the Interior National Park Service.

**Table 4.6: Converse County Historical Resources**

<b>City</b>	<b>Name</b>	<b>Address</b>
Bill	Dorr Ranch	Approx. 5 mi. NE. of Woody Creek & Steinle Rds.
Douglas	Christ Episcopal Church and Rectory	4th and Center Sts.
	College Inn Bar	103 N. 2nd St.
	US Post Office--Douglas Main	129 N. Third St.
	Douglas City Hall	130 S. Third St.
	LaPrele Work Center	SW of Douglas, Medicine Bow NF
	Fremont, Elkhorn & Missouri Valley Railroad Passenger Depot	100 Walnut St.
	Braehead Ranch	69 Moss Agate Rd.
	Jenne Block	301 Center St.
	North Douglas Historic District	Roughly bounded by Second St., Clay St. Sixth St., and Center St.
	Morton Mansion	425 Center St.
	Officer's Club, Douglas Prisoner of War	115 S. Riverbend Dr.
	Hotel LaBonte	206 Walnut St.
Glenrock	Hotel Higgins	416 W. Birch
	Glenrock Buffalo Jump	Address Restricted
	Sage Creek Station (48CO104)	Address Restricted
	Commerce Block	Fourth and Birch Sts.
	Huxtable Ranch Headquarters District	1351 Box Elder Rd
Orpha	Fort Fetterman	7 mi. N of I-25 on Orpha Rd.
Unincorporated County	Antelope Creek Crossing (48CO171 and 48CO165)	Address Restricted
	Stinking Water Gulch Segment, Bozeman Trail (48CO165)	Address Restricted
	Ross Flat Segment, Bozeman Trail (48CO165)	Address Restricted

City	Name	Address
	Holdup Hollow Segment, Bozeman Trail (48CO165)	Address Restricted

Source: National Register of Historic Places, 2015

It should be noted that these lists change periodically, and they may not include those currently in the nomination process and not yet listed. Additionally, as defined by the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, if the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by NEPA. Structural mitigation projects are considered alterations for this regulation.

Many cultural and historical resources in the County are vulnerable to several hazards due to the nature of their construction. Some of these risks include earthquakes, wildfires or high winds damaging historic buildings.

### **Natural Resources**

Natural resources are important to include in benefit/cost analyses for future projects and may be used to leverage additional funding for mitigation projects that also contribute to community goals for protecting sensitive natural resources. Awareness of natural assets can lead to opportunities for meeting multiple objectives. For instance, protecting wetlands areas protects sensitive habitat as well as reducing the force of and storing floodwaters.

### **Natural and Beneficial Functions**

Floodplains can have natural and beneficial functions. Wetlands function as natural sponges that trap and slowly release surface water, rain, snowmelt, groundwater and flood waters. Trees, root mats, and other wetland vegetation also slow the speed of floodwaters and distribute them more slowly over the floodplain. This combined water storage and braking action lowers flood heights and reduces erosion. Wetlands within and downstream of urban areas are particularly valuable, counteracting the greatly increased rate and volume of surface water runoff from pavement and buildings. The holding capacity of wetlands helps control floods and prevents water logging of crops. Preserving and restoring wetlands, together with other water retention, can often provide the level of flood control otherwise provided by expensive dredge operations and levees.

### **Special Status Species**

To further understand natural resources that may be particularly vulnerable to a hazard event, as well as those that need consideration when implementing mitigation activities, it is important to identify at-risk species (i.e., endangered species) in the Planning Area. The US Fish and Wildlife Service maintains a list of threatened and endangered species in nationwide. State and federal laws protect the habitat of these species through the environmental review process. Several additional species are of special concern or candidates to make the protected list.

Table 4.7 summarizes Converse County’s special status animal species in the Fish and Wildlife Service database.

**Table 4.7: Threatened and Endangered Animals in Converse County**

Name	Scientific Name	Status
Bald eagle	Haliaeetus leucocephalus	Recovery
Ute ladies’ tresses	Spiranthes diluvialis	Threatened
Gray wolf	Canis lupis	Recovery
Preble’s meadow jumping mouse	Zapus hudsonius preblei	Threatened

Source: US Fish and Wildlife Service

### Population, Growth and Development Trends

As part of the planning process, the HMPC looked at changes in growth and development, both past and future, and examined these changes in the context of hazard-prone areas, and how the changes in growth and development affect loss estimates and vulnerability.

The US Census Bureau estimated population of Converse County for July 1, 2016 was 14,191, representing an 2.6% increase in population since 2010 (estimated at 13,827).

#### **Development Trends**

Converse County Planning and Zoning Department recently published the Converse County Together Now and Tomorrow plan to provide a unified guide for all governmental entities in Converse County regarding land use and public investment decisions to address the balance of community health, safety, welfare, and individual rights. As described in the 2010 City of Douglas Development plan, the population of Wyoming generally, is a rapidly aging one. This translates into a diminishing skilled workforce, which will require different housing options and goods and services, particularly in healthcare.

Converse County, the State of Wyoming, and the Rocky Mountain Region have been greatly influenced by energy resource exploration and development activities in the past. The economy of Converse County is tied to the availability and management of natural resources. The 2015 Converse County Land Use Plan emphasizes the relationship between population trends and the role of energy resources. The increase and intensity of the development of energy related resources has created an influx of population that does not distribute itself evenly over the County. Energy development areas, such as oil and gas fields, coal mines, or uranium mines are dispersed throughout the County but most of the workers live in or near the incorporated towns. At the same time, conservation of these resources, open spaces, and working landscapes also impacts the economy by attracting tourism, new residents, and entrepreneurs who value access to vast areas for outdoor pursuit and the quality of life associated with a clean environment and abundant wildlife.

## 4.3 Hazard Profiles

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**Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the...location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.**

The hazards identified in Section 4.1 Identifying Hazards are profiled individually in this section. Much of the profile information came from the same sources used to initially identify the hazards.

### Profile Methodology

Each hazard is profiled in a similar format that is described below:

#### Hazard Description

This subsection gives a description of the hazard and associated problems, followed by details on the hazard specific to the County.

#### Geographical Area Affected

This subsection discusses which areas of the County are most likely to be affected by a hazard event.

**Limited:** Less than 10 percent of the planning area

**Significant:** 10 to 50 percent of the planning area

**Extensive:** 50 to 100 percent of the planning area

#### Past Occurrences

This subsection contains information on historic incidents, including impacts where known. Information provided by the HMPC is included here along with information from other data sources, including the National Climatic Data Center (NCDC) and SHELDUS where available.

SHELDUS is a county-level data set for the United States that tracks 18 types of natural hazard events along with associated property and crop losses, injuries, and fatalities. In 2014 this formerly free database transitioned into a fee-based service. Due to this and the availability of similar data in NCDC databases it was not used as a resource during the 2017 plan update except for when the data was already available.

When available, tables showing county-specific data from the NCDC and SHELDUS databases may be found in each hazard profile.

## Likelihood of Occurrence

The frequency of past events is used in this section to gauge the likelihood of future occurrences. Based on historical data, the likelihood of future occurrences is categorized into one of the following classifications:

- **Highly Likely**—Near 100 percent chance of occurrence in next year, or happens every year.
- **Likely**—Between 10 and 100 percent chance of occurrence in next year, or has a recurrence interval of 10 years or less.
- **Occasional**—Between 1 and 10 percent chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
- **Unlikely**—Less than 1 percent chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

The frequency, or chance of occurrence, was calculated where possible based on existing data. Frequency was determined by dividing the number of events observed by the number of years and multiplying by 100. Stated mathematically, the methodology for calculating the probability of future occurrences is:

$$\frac{\text{\# of known events}}{\text{years of historic record}} \times 100$$

This gives the percent chance of the event happening in any given year. An example would be three droughts occurring over a 30-year period which equates to 10 percent chance of that hazard occurring any given year.

## Potential Magnitude

This subsection discusses the potential magnitude of impacts, or extent, from a hazard event. Magnitude classifications are as follows:

- **Catastrophic**—More than 50 percent of property severely damaged, and/or facilities are inoperable or closed for more than 30 days. More than 50 percent agricultural losses. Multiple fatalities and injuries. Critical indirect impacts.
- **Critical**—25 to 50 percent of property severely damaged, and/or facilities are inoperable or closed for at least 2 weeks. 10-50 percent agricultural losses. Injuries and/or illnesses result in permanent disability and some fatalities. Moderate indirect impacts.
- **Limited**—10 to 25 percent of area affected. Some injuries, complete shutdown of critical facilities for more than one week, more than 10 percent of property is severely damaged.
- **Negligible**—Less than 10 percent of area affected. Minor injuries, minimal quality-of-life impact, shutdown of critical facilities and services for 24 hours or less, less than 10 percent of property is severely damaged.

## **Vulnerability Assessment**

Vulnerability is the measurement of exposed structures, critical facilities or populations relative to the risk of the hazard. For most hazards, vulnerability is a best-estimate. Some hazards, such as flood, affect specific areas so that exposure can be quantified, and vulnerability assessments result in a more specific approximation. Other hazards, such as tornados, are random and unpredictable in location and duration that only approximate methods can be applied.

The following vulnerability assessment sections evaluate natural hazards based on the degree to which they impact people, property, critical facilities, and natural resources. Analysis is primarily driven by the availability and relevancy of GIS capabilities, combined with anecdotal information provided by HMPC members, the National Climatic Data Center storm events catalog, and other online media resources. The vulnerability assessment of some hazards is extensive and replete with quantitative analysis, while other assessments reflect a high-level interpretation of the anticipated risk.

## **Future Development**

This section describes how the hazard could impact future development.

## **Summary**

This section summarizes risk according to the area affected, likelihood, and magnitude of impacts. If the hazard has impacts on specific towns or cities in the County they are noted here, where applicable.

### **4.3.1 Dam Failure**

#### **Hazard Description**

Dams are man-made structures built for a variety of uses, including flood protection, power, agriculture, water supply, and recreation. Dams typically are constructed of earth, rock, concrete, or mine tailings. Dams and reservoirs serve a very important role for Wyoming residents and industry. While dam failures are rare, should a complete or partial failure occur it creates a significant hazard for those downstream.

Dam failure is the uncontrolled release of impounded water resulting in downstream flooding, which can affect life and property. Two factors that influence the potential severity of a full or partial dam failure are the amount of water impounded and the density, type, and value of development and infrastructure located downstream.

Dam failure occurs when the retention function of the dam is compromised, in part or in its entirety. Damage to a dam structure that may result in a failure may be caused by many sources:

- Prolonged periods of rainfall and flooding, which result in overtopping
- Earthquake

- Inadequate spillway capacity resulting in excess overtopping flows
- Internal erosion caused by embankment or foundation leakage or piping or rodent activity
- Improper design
- Age
- Improper maintenance
- Negligent operation
- Failure of upstream dams on the same waterway
- Vandalism or terrorism

A dam failure is not the only type of emergency associated with dams. Spillway discharges that are large enough to cause flooding in downstream areas or flooding upstream of dams due to backwater effects or high pool levels are both considered dam emergencies and may cause significant property damage and loss of life.<sup>1</sup>

Dam failures can be classified into four classifications: overtopping, foundation failure, structural failure, and other unforeseen failures. Overtopping failures result from the uncontrolled flow of water over, around, and adjacent to the dam. Earthen dams are most susceptible to this type of failure. Hydraulic failures account for approximately 28% of all dam failures. Foundation and structural failures are usually tied to seepage through the foundation of the main structure of the dam. Deformation of the foundation or settling of the embankment can also result in dam failure. Structural failures account for approximately 28% of all dam failures, and foundation problems account for another 25%. Earthquakes or sabotage account for 12% of all dam failures, while inadequate design and construction account for the remaining 7% of failures.

Dam failures result in a unique source of flash flooding, when a large amount of previously detained water is suddenly released into a previously dry area due to a failure in some way of the dam. Dams are classified into three classes. The State of Wyoming has adopted FEMA's risk classifications as set forth in FEMA's *Federal Guidelines for Dam Safety: Hazard Potential Classification System for Dams*. These guidelines define High Hazard (Class I) dams as those rated based on an expected loss of human life, should the dam fail, and Significant Hazard (Class II) dams as those rated based on expected significant damage, but not loss of human life. Significant damage refers to structural damage where humans live, work, or recreate; or public or private facilities exclusive of unpaved roads and picnic areas. Damage refers to making the structures inhabitable or inoperable.

## **Geographical Area Affected**

In 1981, the U.S. Army Corps of Engineers completed an inspection program for nonfederal dams under the National Dam Inspection Act (P.L. 92-367). This was a four-year work effort and included compiling an inventory of about 50,000 dams and conducting a review of each state's

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<sup>1</sup> US Army Corps of Engineers *Flood Emergency Plans: Guidelines for Corps Dams*. Hydrologic Engineering Center, (June 1980) p 4.

capabilities, practices, and regulations regarding design, construction, operation, and maintenance of dams. Part of the inspection included evaluating the dams and assigning a hazard potential based on the effects downstream should one of the dams fail. The dams were rated (1) High, (2) Significant, and (3) Low hazard. The Corps of Engineers based the hazard potential designation on such items as acre-feet capacity of the dam, distance from nearest community downstream, population density of the community, and age of the dam.

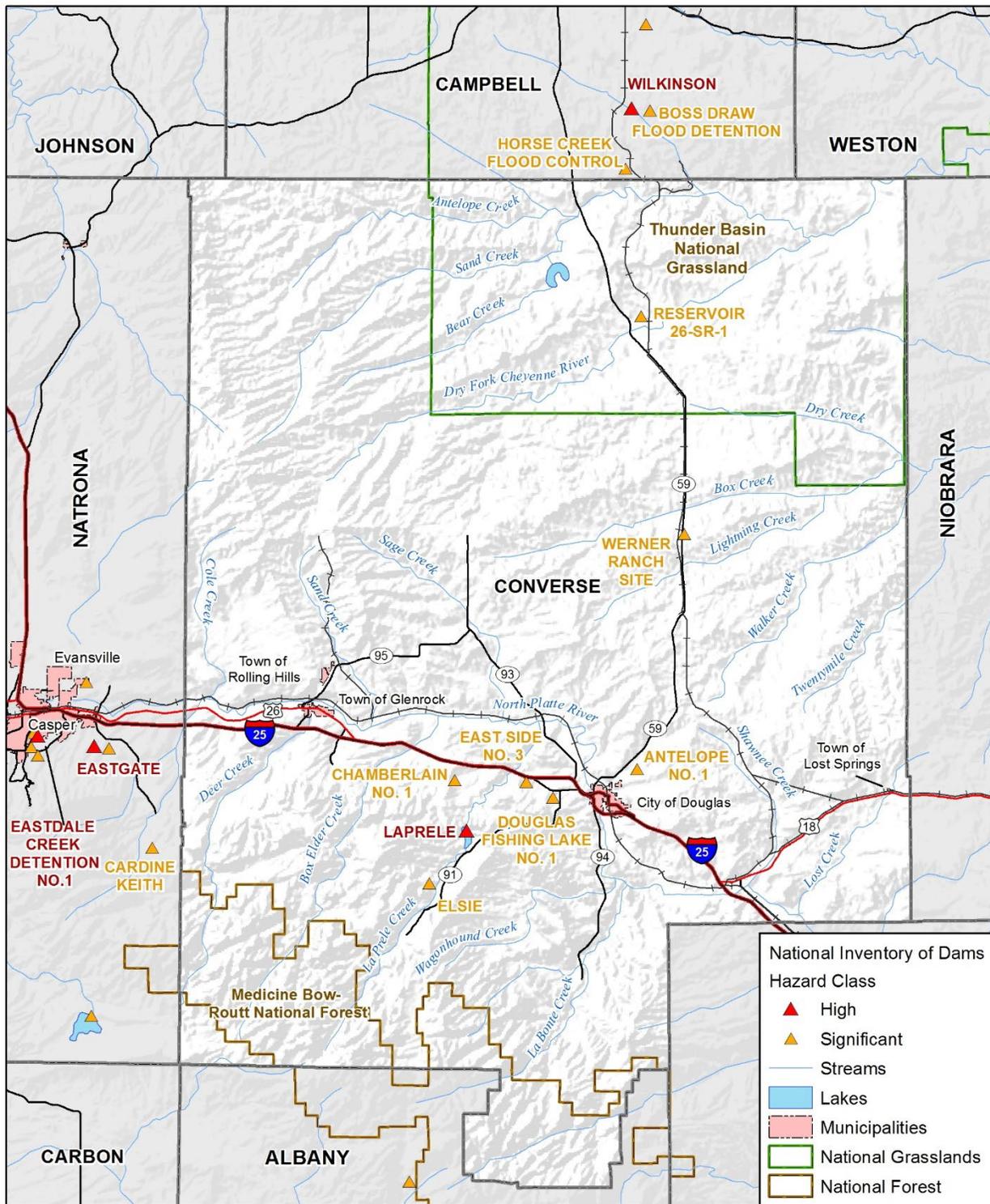
There were 1,458 dams in Wyoming that were reviewed by the Corps of Engineers. Of that number 38 were rated high hazard, 56 were rated significant hazard, and the remaining 1,364 were rated low hazard. The Wyoming State Engineers Office inspects dams over 20 feet high or with a storage capacity of 50 acre-feet or more, although smaller dams are also inspected in highly populated areas. According to the WSEO web site<sup>2</sup>, the WSEO regulates 1,515 dams. As a part of the regulatory process the WSEO inspects these dams once every five years. Of these dams, 84 are rated high hazard, 106 are rated significant hazard, and 1,325 are rated low hazard.

Figure 4-1 shows the dams affecting Converse County. Seven dams are classified as Significant Hazard (Class II) and one is classified as High hazard (Class I). Table 4.8 below provides details of the High and Significant Hazard Dams.

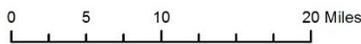
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<sup>2</sup> <http://seo.wyo.gov/home>

**Figure 4-1: Locations of High and Significant Dams Affecting Converse County**



Map compiled 4/2018;  
 intended for planning purposes only.  
 Data Source: WY Geospatial Hub,  
 WYDOT, HSIP Freedom 2015  
 National Inventory of Dams



**Table 4.8: High and Significant Hazard Dams Affecting Converse County**

Dam Name	Owner	River	Hazard Class	Nearest City	Distance to City	Maximum Capacity
Antelope No. 1	Art C. Sims	Antelope Creek N.	S	Douglas	3	202
Chamberlain No. 1	LaPrele Irrigation District	LaPrele Creek	S	Douglas	16	727
Douglas Fishing Lake No. 1	Wyoming Game and Fish Commission	Six Mile Creek	S	Douglas	4	193
East Side No. 3	LaPrele Irrigation District	Five Mile Creek	S	Douglas	6	200
Elsie	Elsie Deininger	Moss Agate Creek	S	Douglas	28	51
LaPrele	LaPrele Irrigation District	LaPrele CR, TR N Platte River	H	Douglas	14	26850
Reservoir 26-SR-1	Thunder Basin Coal Company		S	Wright		
Werner Ranch	J.P. Werner & Sons, Inc.	Werner Draw	S	Unnamed Ranch	15	113

Source: National Inventory of Dams

Of these eight dams of concern, LaPrele Dam is the only one that is classified as high hazard. LaPrele Dam is a 135-foot tall zoned concrete dam operated by LaPrele Irrigation District for irrigation. The dam is located on LaPrele Creek, roughly 14 miles southwest of Douglas near Ayres natural bridge. The dam was originally constructed in 1909 under the Carey Act, in which the federal government gave land to Western states with the intention that the land would be use for irrigation that would promote settlement. By the 1970s the dam had denigrated significantly, and was not fully functioning; only holding half of the 20,000 acre of water capacity, which was not enough to irrigate the crops of the area. The dam was then modified in 1980, which was quite the feat and lead to the American Society of Civil Engineers to award the LaPrele Irrigation District, the Panhandle Eastern Pipeline Company and the DMJM-Phillips-Reister-Haley Inc. engineering firm the “Outstanding Civil Engineering Achievement of 1979.” Today the LaPrele dam holds irrigates 14,612 acres of land, according to the 2010 Wyoming Irrigation Systems Report by the Wyoming Water Development Commission.

### Past Occurrences

There have been many dam failures in Wyoming, some of which have caused the loss of life and damage to property. According to the Wyoming State Hazard Mitigation Plan (2008) there has been one documented dam failure in Converse County. On July 22, 1983, a dam linked to the LaPrele Range Drainage Basin collapsed as a result of heavy rains. A wall of water, 10-15 feet, high inundated a nearby ranch southwest of Douglas near the LaPrele Reservoir. No damage information is available from that incident and HMPC members have confirmed that the impact of the failure was isolated to the single ranch.

## Likelihood of Future Occurrences

Based on the past occurrences a dam fails in the county on average every 36 years, which equates to an **occasional** rating. The structural integrity of dams depends on regular inspections and maintenance, which do not always happen. Additionally, many of the dam failures in Wyoming and other Rocky Mountain states occurred because of snow melt flooding that exceeded the capacity and strength of levees and dams. The County's dams will continue to be tested by snow melt, heavy rains, and other types of floods nearly every year. Thus, dam failures could possibly threaten Converse County.

## Potential Magnitude of Impacts

Potential impacts could include injury and loss of life, property damage, damage to infrastructure, drinking water contamination, loss of crops and livestock, evacuations and sheltering and associated costs, interruption of commerce and transportation, search and rescue, and clean-up costs. In addition, dam failure and associated flooding can cause damage to and loss of irrigation structures such as head gates and ditches. Loss or damage to water structures negatively impacts agricultural producers of crops and livestock, and can be costly to repair.

The severity and magnitude of a given dam failure will vary on a county basis and case-by-case basis. This information is considered sensitive and is not detailed due to Homeland Security concerns. Emergency management coordinators have access to inundation maps contained in the emergency action plans for the High Hazard dams in the State. High Hazard (Class I) dams, by definition, would merit a magnitude/severity rating of **catastrophic**, whereas Significant Hazard (Class II) dams rate as **critical** and Low Hazard dams fall into the **limited** rating. The magnitude/severity rating for the hazard in the County is considered mostly **critical**, mostly due to the number of Class I dams that could impact highly populated communities such as Douglas.

## Vulnerability Assessment

If the LaPrele Dam were to fail, the impacts would be catastrophic. Areas inundated include the Natural Bridger Park recreation area, the City of Douglas, nearby unincorporated areas, rural ranches, and I-25. The failure could result in hundreds of millions of dollars of damage in downstream communities, although the probability of such an event is low. One specific concern regarding the dam raised by the HMPC is the excessive amounts of traffic it might generate through Converse County if inundation areas had to be evacuated; the 2017 solar eclipse showed high volume traffic impacts when an incident can be planned for, and an unexpected dam failure that doesn't provide adequate warning time to evacuees on the interstate to prepare for the trip could compound the initial problem of high traffic volume.

Another concern is the aging of the dams. Of the 1,548 dams in the State inventory, 860 or 56% were constructed before 1965 and are over fifty years old. Of the 8 dams that affect Converse County, four were constructed before 1965 and are over fifty years old; however, two of these dams were modified in the last 40 years.

## Future Development

As communities or unincorporated areas grow, previously lower-classified dams may pose greater risks, which could elevate their hazard classification. Inundation maps and emergency action plans should be consulted in the planning of new development, where applicable. Growth rates in the region do not indicate that risk is increasing substantially.

## Summary

Overall, dam failure significance ranges from high to low dependent upon location in the County. The probability of such an event is low, but impacts could be significant depending upon the dam involved and where it occurred in the region.

**Table 4.9: Converse County Dam Failure Hazard Risk Summary**

	<b>Geographic Extent</b>	<b>Potential Magnitude</b>	<b>Probability of Future Occurrence</b>	<b>Overall Significance</b>
Douglas	Significant	Significant	Unlikely	Medium
Glenrock	Limited	Limited	Unlikely	Low
Rolling Hills	Limited	Limited	Unlikely	Low
Lost Springs	Limited	Limited	Unlikely	Low
Converse County	Limited	Significant	Unlikely	Medium

### 4.3.2 Drought

#### Hazard Description

Drought is described as a protracted period of deficient precipitation resulting in extensive damage to vegetation. Of all the natural weather-related disasters, drought is by far the costliest to society; it indirectly kills more people and animals than the combined effects of hurricanes, floods, tornadoes, blizzards, and wildfires. Unlike other disasters that quickly come and go, drought's long-term unrelenting destruction has been responsible in the past for mass migrations and lost civilizations. The 1980 and 1988 droughts in the US resulted in approximately 17,500 heat-related deaths and an economic cost of over \$100 billion. Drought occurs in four stages and is defined as a function of its magnitude (dryness), duration, and regional extent. Severity, the most commonly used term for measuring drought, is a combination of magnitude and duration.

The first stage of drought is known as a meteorological drought. The conditions at this stage include any precipitation shortfall of 75% of normal for three months or longer. The second stage is known as agricultural drought. Soil moisture is deficient to the point where plants are stressed and biomass (yield) is reduced. The third stage is the hydrological drought. Reduced stream flow (inflow) to reservoirs and lakes is the most obvious sign that a serious drought is in progress. The fourth stage is the socioeconomic drought. This final stage refers to the situation that occurs when physical water shortage begins to affect people.

As these stages evolve over time, the impacts to the economy, society, and environment converge into an emergency. Without reservoir water to irrigate farms, food supplies are in jeopardy. Without spring rains for the prairie grasslands, open range grazing is compromised. Without groundwater for municipalities, the hardships to communities result in increases in mental and physical stress as well as conflicts over the use of whatever limited water is available. Without water, wetlands disappear. The quality of any remaining water decreases due to its higher salinity concentration. There is also an increased risk of fires, and air quality degrades because of increased soil erosion due to strong winds and blowing dust.

### **Geographical Area Affected**

Droughts are often regional events, impacting multiple counties and states simultaneously; therefore, it is reasonable to assume that a drought will impact the entire county at the same time. According to the Wyoming State Climate Office, Wyoming is the 5<sup>th</sup> driest state in the U.S. Drought can be a normal occurrence in Wyoming due to the State's natural climate. Based on this information, the geographic extent rating for drought in Converse County is extensive.

The North Platte is the main water source, of which the State of Nebraska has significant primacy/water rights.

### **Past Occurrences**

The county has experienced several multi-year droughts over the past several decades. The most severe statewide drought in recent history started in 1999, but began in earnest in the spring of 2000 and lingered through 2004. 2005 was a wetter year, technically signifying the end of the drought period. Dry conditions returned in the following years and became especially severe between 2006 and 2007. According to the Wyoming State Climate Office, "conditions eased somewhat in mid-2008, but a near decade with warm temperatures and relatively little precipitation has left [Wyoming] very vulnerable" (<http://www.wrds.uwyo.edu/sco/drought/drought.html>). Another particularly intense but short drought occurred in 2012.

The 1999-2004 drought is considered by many to be the most severe in collective memory. According to instrument records, since 1895 there have been only seven multi-year (three years or longer) statewide droughts. Based on deficit precipitation totals (negative departures from the long-term average), they are ranked statewide.

**Table 4.10: Significant Multi-Year Wyoming Droughts of the Modern Instrumented Era**

Years	Average Annual Precipitation (inches)	Percent of 1985-2006 Average Annual Precipitation (13.04")
1952-1956	10.65	81.69%
1900-1903	10.76	82.52%
1999-2004	11.07	84.89%
1987-1990	11.12	85.28%
1958-1964	11.67	89.49%
1974-1977	11.77	90.26%
1931-1936	11.79	90.41%

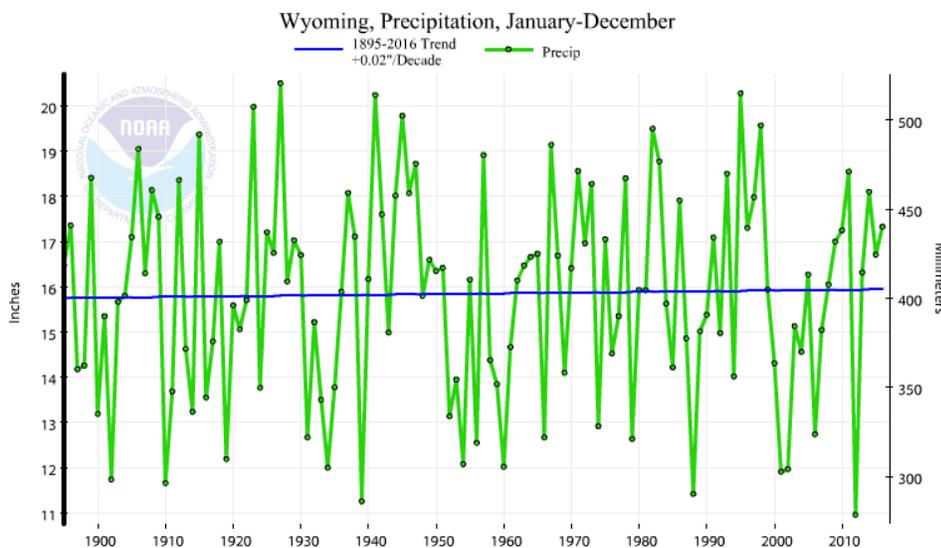
Source: Wyoming Climate Atlas

Widespread droughts in Wyoming, as determined from stream flow records, were most notable during three periods: 1929-1942, 1948-1962, and 1976-1982.

Converse County was listed in three USDA drought disaster declarations in 2006, 2007 and 2009. Converse County was included as a contiguous county for a 2016 USDA drought declaration.

Wyoming’s precipitation records from 1895-2016 reveals that, for the first half of the 20th century (except for the Dust Bowl years of the 1930s), there was generally a surplus of moisture. These trends are displayed in the following figures. During the second half of the 20<sup>th</sup> century and into the 21<sup>st</sup> century there was an increasing trend of increased periods of drought.

**Figure 4-2: Wyoming Annual Precipitation: 1895-2016**

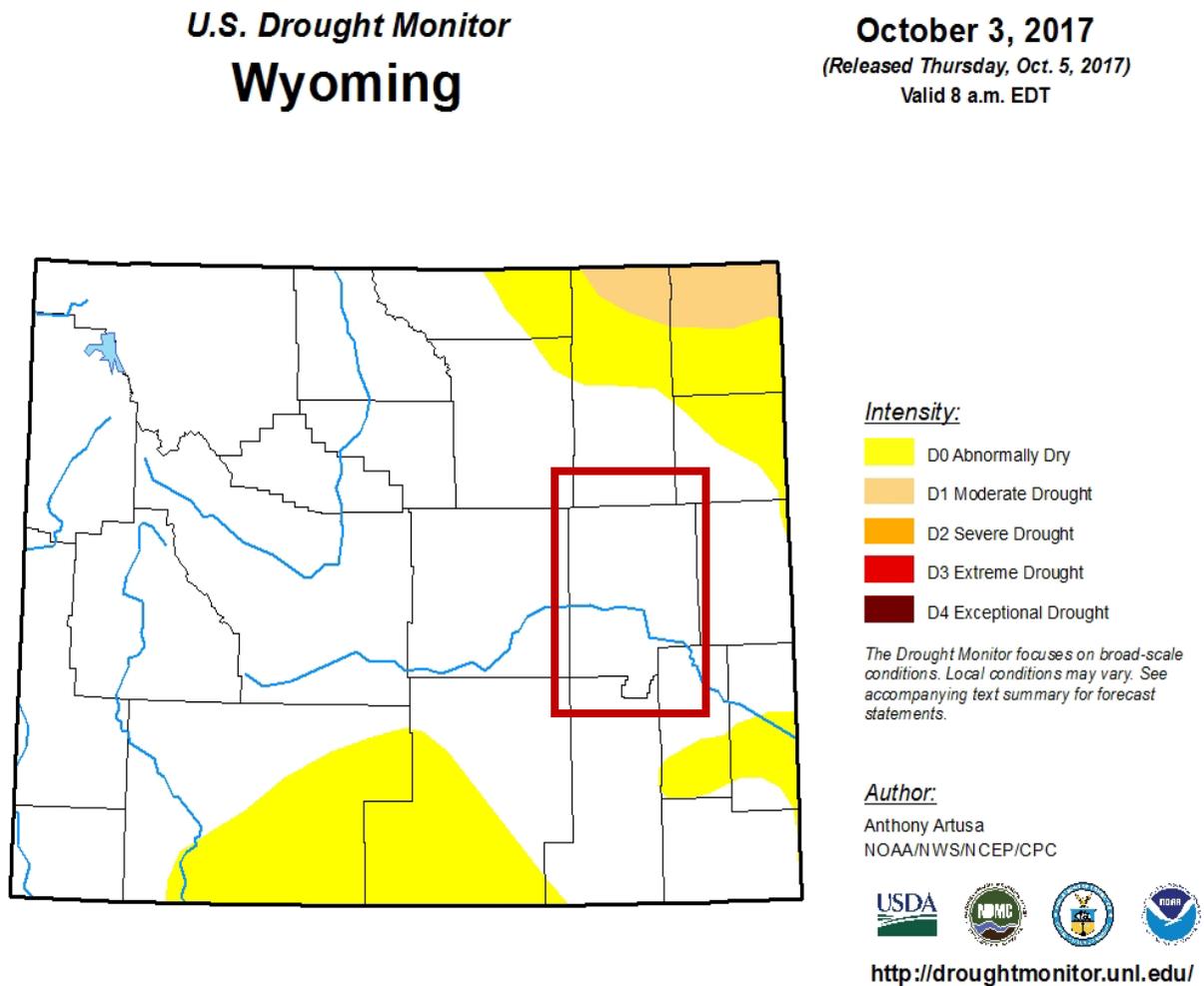


Source: <https://www.ncdc.noaa.gov/cag/global/time-series/>

The U.S. Drought Monitor provides a general summary of current drought conditions. The U.S. Department of Agriculture (USDA), the National Oceanic and Atmospheric Administration (NOAA), and the National Drought Mitigation Center (University of Nebraska-Lincoln) collaborate on this weekly product, which is released each Thursday. Multiple drought indicators, including various indices, outlooks, field reports, and news accounts are reviewed and synthesized. In addition, numerous experts from other agencies and offices across the country are consulted. The result is the consensus assessment presented on the USDM map. The image is color-coded for four levels of drought intensity. An additional category, “Abnormally Dry,” is used to show areas that might be moving into a drought, as well as those that have recently come out of one. The dominant type of drought is also indicated (i.e. agricultural and/or hydrological).

As of October 3, 2017, no drought conditions are identified in Converse County; the HMPC noted that statewide, areas of drought were receding.

**Figure 4-3: U.S. Drought Monitor**



Another useful resource to determine the impacts of drought is the Drought Impact Reporter (DIR), launched by the National Drought Mitigation Center in July 2005 as the nation’s first comprehensive database of drought impacts. The Drought Impact Reporter is an interactive web-based mapping tool designed to compile and display impact information across the United States in near real-time from a variety of sources such as media, government agencies, and the public.

Information within the Drought Impact Reporter is collected from a variety of sources including the media, government agencies and reports, and citizen observers. Each of these sources provides different types of information at different spatial and temporal scales.

A search of the database for Converse County from 2007 to 2016 (which includes the most recent severe droughts) shows a total of 177 reported impacts. The most reported impacts (53) are in the Agricultural category, followed by Plants and Wildlife (32) and Fire (32). The following table shows total impacts by category for the county.

**Table 4.11 Converse County Drought Impact Reporter Summary 2007-2016**

<b>Category</b>	<b>Total Number of Impacts Recorded</b>
Agriculture	53
Plants and Wildlife	32
Society and Public Health	8
Water Supply and Quality	21
Fire	32
Relief, Response and Restrictions	27
Tourism and Recreation	4
<b>Total</b>	<b>177</b>

Source: <http://droughtreporter.unl.edu/map/>

Drought effects associated with agriculture include damage to crop quality; income loss for farmers due to reduced crop yields; reduced productivity of cropland; reduced productivity of rangeland; forced reduction of foundation stock; and closure/limitation of public lands to grazing, among others. The Relief, Response & Recovery category refers to drought effects associated with disaster declarations, aid programs, requests for disaster declaration or aid, water restrictions, or fire restrictions. Specific recorded impacts include reports on reduced yields, fire danger, water availability and impacts to livestock and wildlife. HMPC members have noted that the most significant impacts of drought for the county are those associated with wildfire and agriculture. In the past, there have been issues with crops coming to maturity and overall agricultural production during dry years.

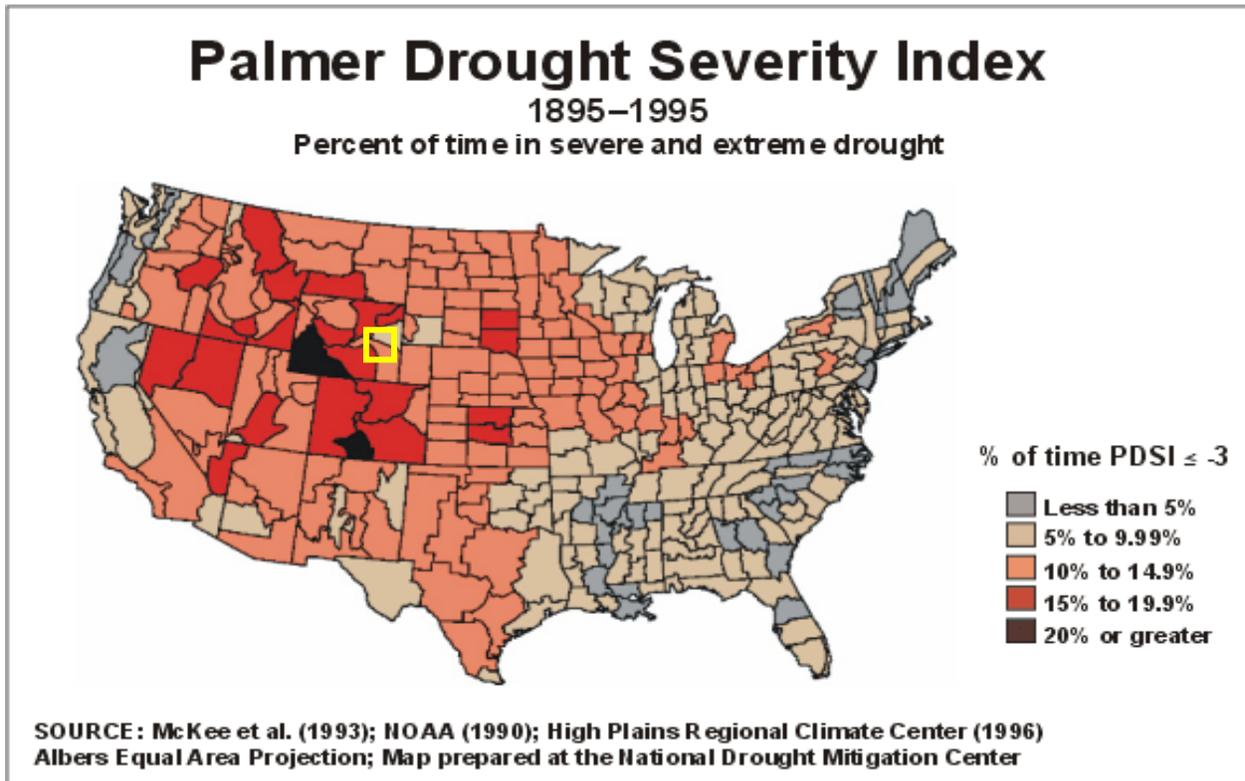
The 1999-2004 drought had significant impacts on agriculture and other industries in Converse County. The worst-case year was 2002, with a negative dollar impact of \$308,171,390 statewide. If it is assumed that the drought impact is equally distributed across the state, which it is not, the potential drought impact in Converse County for 2002 would have been approximately \$13,400,000. The total impact statewide for the 1999-2004 drought has been \$903,649,936. If it is assumed that the drought impact is equally distributed across the state, which it is not, then the potential drought impact in Converse County would be over \$39 million for the five-year period

in 2002 dollars. Using a 4% annual inflation rate, this would put the losses for Converse County for this five-year event at approximately \$56 million in 2010 dollars.

### Likelihood of Future Occurrence

The Palmer Drought Severity Index indicates that Converse County experienced severe or extreme drought conditions between 10% and 19% of the time between 1895 and 1995. This is consistent with the data in the Past Occurrences subsection which suggests that severe multi-year droughts have occurred roughly every ten years since the mid-20<sup>th</sup> century. Based on the historic record, Wyoming experienced major drought conditions for 36 years out of a 115-year period (based on the total number of years in each of the seven droughts). This yields a 31% chance that Wyoming will be in a drought in any given year. An occurrence interval of roughly once every ten years corresponds to a **likely** frequency of occurrence.

**Figure 4-4: Palmer Drought Severity Index for the Continental U.S.: 1895-1995**



Converse County indicated by yellow outline

### Potential Magnitude

To calculate a magnitude and severity rating for comparison with other hazards, and to assist in assessing the overall impact of the hazard on the planning area, information from the event of record is used. In some cases, the event of record represents an anticipated worst-case scenario, and in others, it reflects a common occurrence. Based upon information in the past occurrences

discussion the drought of 1999-2004 is as significant, if not more significant than any other droughts in the last 100 years for the entire state. Data derived from the Wyoming Climate Atlas indicates that the most significant droughts in the last century, in terms of precipitation deficit, were in 1952-1956 and 1999-2004. To determine which drought period had the most significant impact on Wyoming, crop production and livestock inventory data for the two periods were compared. 1957 and 2005 were wetter years, with annual statewide precipitation totals above the 1895-2015 average. Those two years were used as endpoints for the droughts that started in 1952 and 1999 respectively. In both cases, the years following saw a return to drier conditions. Because of this, the most recent drought impacts were also calculated for 2005 and 2006, and are included in summary tables. The following tables show peak decline (%) in production during drought compared to the 5-year pre-drought production average for various commodities.

A comparison of peak commodity production changes in the late 1940s and early 1950s, and peak commodity production changes between 1994 and 2004 indicate that drought impacts to the Wyoming agricultural community were greater in the 1999-2004 drought than in the 1952-1956 drought. Except for dry beans, all commodities in the worst years of the 1999-2004 drought showed a greater percentage decline in production than in the 1952-1956 drought. As a result, the 1999-2004 drought will be used as the drought of historic record to calculate dollar impacts.

**Table 4.12: Peak Commodity Production Changes from Pre-Drought (1947-1951) to Drought (1952-1956)**

Commodity	5-Year Pre-Drought Production Average (1947-1951)	Units	Lowest Production During Drought (1952-1956)	Year of Lowest Production (1952-1956)	Percent Change
Winter Wheat	5,072	1,000 bu.	2,346	1954	-54%
Spring Wheat	1,579	1,000 bu.	600	1954	-62%
Barley	4,414	1,000 bu.	2,700	1956	-39%
Oats	4,577	1,000 bu.	2,470	1954	-46%
Dry Beans	1,009	1,000 cwt.	589	1955	-42%
Sugarbeets	413	1,000 tons	421	1955	+2%
Corn	227	1,000 bu.	161	1953	-29%
Alfalfa Hay	490	1,000 tons	675	1954	+38%
Other Hay	674	1,000 tons	442	1954	-34%
Cattle/ Calves Inventory	1,050	1,000 head	1,096	1954	+4%

Source: Wyoming Climate Atlas

**Table 4.13: Peak Commodity Production Changes from Pre-Drought (1994-1998) to Drought (1999-2004)**

Commodity	5-Year Pre-Drought Production Average (1994-1998)	Units	Lowest Production During Drought (1999-2006)	Year of Lowest Production (1999-2006)	Percent Change
Winter Wheat	6,029	1,000 bu.	2375	2002	-61%
Spring Wheat	648	1,000 bu.	96	2002	-84%
Barley	8,383	1,000 bu.	4680	2002	-44%
Oats	1,648	1,000 bu.	600	2005	-64%
Dry Beans	691	1,000 cwt.	514	2001	-26%
Sugarbeets	1,151	1,000 tons	659	2002	-43%
Corn	6,328	1,000 bu.	4165	2002	-34%
Alfalfa Hay	1,581	1,000 tons	1150	2002	-27%
Other Hay	817	1,000 tons	450	2002	-45%
Cattle/ Calves Inventory	1,536	1,000 head	1300	2004	-16%

Source: Wyoming Climate Atlas

In the future, the state could expect similar impacts to the 1999-2004 drought (based on the event of record). Post-2006 data shows that significant losses were experienced in the agricultural industry following the 1999-2004 drought. Even when a drought technically ceases, the impacts can continue. It may take years for the Wyoming agricultural industry to fully recover from the effects of any given drought.

### Economic Impacts

Agricultural dollar impacts can also be used to show the effects of drought. Data was obtained from the U.S. Department of Agriculture (USDA) Quick Stats database (<https://quickstats.nass.usda.gov>).

The data below represent changes in production value for crops and changes in inventory value for cattle and calves. As such, the data should be considered impact value versus loss value. For example, with cattle and calves (Table 4.9 through Table 4.17) inventory, the inventory has decreased during the drought. Therefore, the value of inventory on hand has decreased. The inventory decreased, however, because of the sale of the cattle and calves. The sales resulted in an increase in cash receipts to the farming and ranching community. The net result, however, is a decrease in inventory value, which is a negative drought impact.

**Table 4.14: 1999 Production and Inventory Value Impact**

Commodity	5-Year Pre-Drought Production Average (1994-1998)	Units	1999 Production	Value (USD)	Production and Inventory Value Impact (USD)
Winter Wheat	6,029	1,000 bu.	6,105	\$2.12/bu	+ 161,120
Spring Wheat	648	1,000 bu.	264	\$2.54/bu	- 976,376
Barley	8,383	1,000 bu.	7,310	\$3.03/bu	- 3,251,190
Oats	1,648	1,000 bu.	1,539	\$1.45/bu	- 158,050
Dry Bean	691	1,000 cwt.	788	\$16.00/cwt	+ 1,555,200
Sugar Beet	1,150	1,000 tons	1,205	\$39.00/ton	+ 2,145,000
Corn	6,328	1,000 bu.	6,136	\$1.94/bu	- 372,480
Alfalfa Hay	1,581	1,000 tons	1,782	\$67.00/ton	+ 13,467,000
Other Hay	817	1,000 tons	1,008	\$60.00/ton	+ 11,436,000
Cattle/Calves Inventory	1,536	1,000 head	1,580	\$770.00/head	+ 33,880,000
TOTAL					+\$57,886,224

**Table 4.15: 2000 Production and Inventory Value Impact**

Commodity	5-Year Pre-Drought Production Average (1994-1998)	Units	2000 Production	Value (USD)	Production and Inventory Value Impact (USD)
Winter Wheat	6,029	1,000 bu.	4,080	\$2.70/bu	- 5,262,300
Spring Wheat	648	1,000 bu.	232	\$2.70/bu	- 1,124,280
Barley	8,383	1,000 bu.	7,885	\$3.08/bu	- 1,533,840
Oats	1,648	1,000 bu.	1,156	\$1.55/bu	- 252,650
Dry Bean	691	1,000 cwt.	762	\$16.80/cwt	+ 1,196,160
Sugar Beet	1,150	1,000 tons	1,556	\$32.50/ton	+ 195,000
Corn	6,328	1,000 bu.	7,656	\$2.02/bu	+ 2,682,560
Alfalfa Hay	1,581	1,000 tons	1,449	\$85.00/ton	- 11,220,000
Other Hay	817	1,000 tons	650	\$80.00/ton	- 13,392,000
Cattle/Calves Inventory	1,536	1,000 head	1,550	\$780.00/head	+\$10,920,000
TOTAL					-\$17,791,350

**Table 4.16: 2001 Production and Inventory Value Impact**

Commodity	5-Year Pre-Drought Production Average (1994-1998)	Units	2001 Production	Value (USD)	Production and Inventory Value Impact (USD)
Winter Wheat	6,029	1,000 bu.	2,880	\$2.70/bu	- 8,502,300
Spring Wheat	648	1,000 bu.	168	\$2.90/bu	- 1,393,160
Barley	8383	1,000 bu.	6,970	\$3.32/bu	- 4,691,160
Oats	1,648	1,000 bu.	1,344	\$1.65/bu	- 501,600
Dry Bean	691	1,000 cwt.	514	\$23.00/cwt	- 4,066,400
Sugar Beet	1,150	1,000 tons	794	\$39.70/ton	- 14,133,200
Corn	6,328	1,000 bu.	6,375	\$2.30/bu	+ 108,100
Alfalfa Hay	1,581	1,000 tons	1,276	\$110.00/ton	- 33,550,000
Other Hay	817	1,000 tons	605	\$105.00/ton	- 22,302,000
Cattle/Calves Inventory	1,536	1,000 head	1,470	\$780.00/head	- 51,480,000
TOTAL					-\$140,511,720

**Table 4.17: 2002 Production and Inventory Value Impact**

Commodity	5-Year Pre-Drought Production Average (1994-1998)	Units	2002 Production	Value (USD)	Production and Inventory Value Impact (USD)
Winter Wheat	6,029	1,000 bu.	2,375	\$3.70/bu	- \$ 13,519,800
Spring Wheat	648	1,000 bu.	96	\$3.90/bu	- \$ 2,154,360
Barley	8,383	1,000 bu.	4,680	\$3.23/bu	- \$ 11,960,690
Oats	1,648	1,000 bu.	750	\$2.20/bu	- \$ 1,975,600
Dry Bean	691	1,000 cwt.	624	\$18.30/cwt	- \$ 1,222,440
Sugar Beet	1,150	1,000 tons	659	\$42.30/ton	- \$ 20,769,300
Corn	6,328	1,000 bu.	4,165	\$2.60/bu	- \$ 5,623,800
Alfalfa Hay	1,581	1,000 tons	1,150	\$111.00/ton	- \$ 47,841,000
Other Hay	817	1,000 tons	450	\$106.00/ton	- \$ 38,944,400
Cattle/Calves Inventory	1,536	1,000 head	1,320	\$760.00/head	- \$164,160,000
TOTAL					-\$308,171,390

**Table 4.18: 2003 Production and Inventory Value Impact**

Commodity	5-Year Pre-Drought Production Average (1994-1998)	Units	2003 Production	Value (USD)	Production and Inventory Value Impact (USD)
Winter Wheat	6,029	1,000 bu.	3,915	\$3.40/bu	-\$7,187,600
Spring Wheat	648	1,000 bu.	180	\$3.15/bu	-\$1,474,200
Barley	8,383	1,000 bu.	6,975	\$3.46/bu	-\$4,871,680
Oats	1,648	1,000 bu.	1,104	\$1.80/bu	-\$979,200
Dry Bean	691	1,000 cwt.	645	\$17.40/cwt	-\$800,400
Sugar Beet	1,150	1,000 tons	752	\$41.20/ton	-\$16,397,600
Corn	6,328	1,000 bu.	6,450	\$2.50/bu	\$305,000
Alfalfa Hay	1,581	1,000 tons	1,625	\$80.00/ton	\$3,520,000
Other Hay	817	1,000 tons	770	\$73.00/ton	-\$3,431,000
Cattle/Calves Inventory	1,536	1,000 head	1,350	\$890.00/head	-\$165,540,000
TOTAL					-\$196,856,680

**Table 4.19: 2004 Production and Inventory Value Impact**

Commodity	5-Year Pre-Drought Production Average (1994-1998)	Units	2004 Production	Value (USD)	Production and Inventory Value Impact (USD)
Winter Wheat	6,029	1,000 bu.	3,510	\$3.20/bu	-\$8,060,800
Spring Wheat	648	1,000 bu.	240	\$3.25/bu	-\$1,326,000
Barley	8,383	1,000 bu.	7,050	\$3.41/bu	-\$4,545,530
Oats	1,648	1,000 bu.	795	\$1.55/bu	-\$1,322,150
Dry Bean	691	1,000 cwt.	541	\$25.90/cwt	-\$3,885,000
Sugar Beet	1,150	1,000 tons	812	\$41.70/ton	-\$14,094,600
Corn	6,328	1,000 bu.	6,550	\$2.48/bu	\$550,560
Alfalfa Hay	1,581	1,000 tons	1,305	\$74.50/ton	-\$20,562,000
Other Hay	817	1,000 tons	756	\$69.50/ton	-\$4,239,500
Cattle/Calves Inventory	1,536	1,000 head	1,300	\$1,020.00/head	-\$240,720,000
TOTAL					-\$298,205,020

**Table 4.20: 2005 Production and Inventory Value Impact**

Commodity	5-Year Pre-Drought Production Average (1994-1998)	Units	2005 Production	Value (USD)	Production and Inventory Value Impact (USD)
Winter Wheat	6,029	1,000 bu.	4,350	\$3.50/bu	-\$5,876,500
Spring Wheat	648	1,000 bu.	315	\$3.19/bu	-\$1,062,270
Barley	8,383	1,000 bu.	5,580	\$3.28/bu	-\$9,193,840
Oats	1,648	1,000 bu.	600	\$1.60/bu	-\$1,676,800
Dry Bean	691	1,000 cwt.	776	\$18.70/cwt	\$1,589,500
Sugar Beet	1,150	1,000 tons	801	\$42.80/ton	-\$14,937,200
Corn	6,328	1,000 bu.	6,860	\$2.45/bu	\$1,303,400
Alfalfa Hay	1,581	1,000 tons	1,560	\$75.00/ton	-\$1,575,000
Other Hay	817	1,000 tons	756	\$72.00/ton	-\$4,392,000
Cattle/Calves Inventory	1,536	1,000 head	1,400	\$1,140.00/head	-\$155,040,000
TOTAL					-\$190,860,710

**Table 4.21: 2006 Production and Inventory Value Impact**

Commodity	5-Year Pre-Drought Production Average (1994-1998)	Units	2006 Production	Value (USD)	Production and Inventory Value Impact (USD)
Winter Wheat	6,029	1,000 bu.	36,45	\$4.58/bu	-\$10,918,720
Spring Wheat	648	1,000 bu.	234	\$3.80/bu	-\$1,573,200
Barley	8,383	1,000 bu.	4,845	\$3.32/bu	-\$11,746,160
Oats	1,648	1,000 bu.	684	\$2.15/bu	-\$2,072,600
Dry Bean	691	1,000 cwt.	590	\$22.00/cwt	-\$2,222,000
Sugar Beet	1,150	1,000 tons	798	\$46.80/ton	-\$16,473,600
Corn	6,328	1,000 bu.	5,805	\$2.64/bu	-\$1,380,720
Alfalfa Hay	1,581	1,000 tons	1,400	\$101.00/ton	-\$18,281,000
Other Hay	817	1,000 tons	715	\$103.00/ton	-\$10,506,000
Cattle/Calves Inventory	1,536	1,000 head	1,400	\$1,010.00/head	-\$137,360,000
TOTAL					-\$212,534,000

**Table 4.22: Production and Inventory Value Impact for Worst Year of Drought**

Commodity	5-Year Pre-Drought Production Average (1994-1998)	Units	Worst Yearly Production of Drought	Year	Value (USD)	Production and Inventory Value Impact (USD)
Winter Wheat	6,029	1,000 bu.	2,375	2002	\$3.70/bu	-\$13,519,800
Spring Wheat	648	1,000 bu.	96	2002	\$3.90/bu	-\$2,152,800
Barley	8,383	1,000 bu.	4,505	2007	\$3.62/bu	-\$14,038,360
Oats	1,648	1,000 bu.	376	2007	\$2.82/bu	-\$3,587,040
Dry Bean	691	1,000 cwt.	514	2001	\$23.00/cwt	-\$4,071,000
Sugar Beet	1,150	1,000 tons	658	2007	\$40.20/ton	-\$19,778,400
Corn	6,328	1,000 bu.	4,165	2002	\$2.60/bu	-\$5,623,800
Alfalfa Hay	1,581	1,000 tons	1,150	2002	\$111.00/ton	-\$47,841,000
Other Hay	817	1,000 tons	450	2002	\$106.00/ton	-\$38,902,000
Cattle/Calves Inventory	1,536	1,000 head	1,300	2004	\$1,020/head	-\$240,720,000
TOTAL						-\$390,234,200

**Table 4.23 Converse County Economic Impact from Drought**

	Size (Sq Mi)	Ratio	Negative Dollar Impact (2002)	Total Drought impact 1999-2004
Wyoming	97,818		\$308,171,390	\$903,649,936
Converse	4,265	4.4%	\$13,559,541	\$39,760,597

Additionally, drought can exacerbate the risk of wildfires; increase the cost of municipal water usage; and deplete water resources used for recreation, affecting the local economy.

### Vulnerability Assessment

The vulnerability of the people, buildings, and economy of Converse County to drought is very difficult to quantify. Typically, people and structures are not directly vulnerable to drought, though secondary or indirect impacts may eventually increase vulnerability ratings. However, some areas are more vulnerable overall than others and, therefore, benefit from adequate mitigation planning and implementation. For Converse County, the agricultural sector is the most vulnerable to drought and will benefit the most from mitigation efforts. Economic resources tied to agricultural production are extremely vulnerable to drought. Outdoor recreation, which is important to Converse County’s economy, is also vulnerable to drought. Fishing, hunting, snowmobiling and skiing are some of the activities that could be affected by drought. The geographic extent of the hazard is considered extensive. The probability of future occurrences is considered **likely**, and the

potential magnitude/severity is **critical**. In addition, the HMPC considers the hazard to have an overall impact rating of **high** for the County.

### Future Development

Future development in Converse County is not anticipated to change vulnerability to drought significantly.

### Summary

Drought is considered a high significance hazard for Converse County due to the potential for extensive economic and environmental impacts. Drought can be widespread and pervasive for several years.

**Table 4.24: Drought Hazard Risk Summary**

	Geographic Extent	Potential Magnitude	Probability of Future Occurrence	Overall Significance
Douglas	Extensive	Critical	Likely	High
Glenrock	Extensive	Critical	Likely	High
Rolling Hills	Extensive	Critical	Likely	High
Lost Springs	Extensive	Critical	Likely	High
Converse County	Extensive	Critical	Likely	High

### 4.3.3 Earthquake

#### Hazard Description

An earthquake is generally defined as a sudden motion or trembling in the Earth caused by the abrupt release of strain accumulated within or along the edge of the earth’s tectonic plates. The most common types of earthquakes are caused by movements along faults and by volcanic forces, although they can also result from explosions, cavern collapse, and other minor causes not related to slowly accumulated strains.

The amount of energy released during an earthquake is usually expressed as a Moment magnitude (which succeeds the Richter magnitude) and is measured directly from the earthquake as recorded on seismographs. Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface as felt by humans or resulting damage to structures and defined in the Modified Mercalli scale (see Table 4.25). Seismic shaking is typically the greatest cause of losses to structures during earthquakes.

**Table 4.25: Modified Mercalli Intensity (MMI) Scale**

<b>MMI</b>	<b>Felt Intensity</b>	<b>Acceleration (%g) (PGA)</b>
I	Not felt except by a very few people under special conditions. Detected mostly by instruments.	<0.17
II	Felt by a few people, especially those on upper floors of buildings. Suspended objects may swing.	0.17 – 1.4
III	Felt noticeably indoors. Standing automobiles may rock slightly.	0.17 – 1.4
IV	Felt by many people indoors, by a few outdoors. At night, some people are awakened. Dishes, windows, and doors rattle.	1.4 – 3.9
V	Felt by nearly everyone. Many people are awakened. Some dishes and windows are broken. Unstable objects are overturned.	3.9 – 9.2
VI	Felt by everyone. Many people become frightened and run outdoors. Some heavy furniture is moved. Some plaster falls.	9.2 – 18
VII	Most people are alarmed and run outside. Damage is negligible in buildings of good construction, considerable in buildings of poor construction.	18 – 34
VIII	Damage is slight in specially designed structures, considerable in ordinary buildings, great in poorly built structures. Heavy furniture is overturned.	34 – 65
IX	Damage is considerable in specially designed buildings. Buildings shift from their foundations and partly collapse. Underground pipes are broken.	65 – 124
X	Some well-built wooden structures are destroyed. Most masonry structures are destroyed. The ground is badly cracked. Considerable landslides occur on steep slopes.	>124
XI	Few, if any, masonry structures remain standing. Rails are bent. Broad fissures appear in the ground.	>124
XII	Virtually total destruction. Waves are seen on the ground surface. Objects are thrown in the air.	>124

Source: USGS. <http://earthquake.usgs.gov/learn/topics/mercalli.php>; Modified Mercalli Intensity and peak ground acceleration (PGA) (Wald, et al 1999).

Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, communication, and transportation lines. Other damaging effects of earthquakes include surface rupture, fissuring, ground settlement, and permanent horizontal and vertical shifting of the ground. Secondary impacts can include landslides, seiches, liquefaction, fires, and dam failure. The combination of widespread primary and secondary effects from large earthquakes make this hazard potentially devastating.

Part of what makes earthquakes so destructive is that they generally occur without warning. The main shock of an earthquake can usually be measured in seconds, and rarely lasts for more than a minute. Aftershocks can occur within the days, weeks, and even months following a major earthquake.

By studying the geologic characteristics of faults, geoscientists can often determine when the fault last moved and estimate the magnitude of the earthquake that produced the last movement. Because the occurrence of earthquakes is relatively infrequent in Converse County and the historical earthquake record is short, accurate estimations of magnitude, timing, or location of future dangerous earthquakes in the County are difficult to estimate.

## **Liquefaction**

During an earthquake, near surface (within 30 feet), relatively young (less than 10,000 years old), water-saturated sands and silts may act as a viscous fluid. This event is known as liquefaction (quicksand is a result of liquefaction). Liquefaction occurs when water-saturated materials are exposed to seismic waves. These seismic waves may compact the material (i.e. silts and sands), increasing the interior pore water pressure within the material mass.

When the pore pressure rises to about the pressure of the weight of the overlying materials, liquefaction occurs. If the liquefaction occurs near the surface, the soil bearing strength for buildings, roads, and other structures may be lost. Buildings can tip on their side, or in some cases sink. Roads can shift and become unstable to drive on. If the liquefied zone is buried beneath more competent material, cracks may form in the overlying material, and the water and sand from the liquefied zone can eject through the cracks as slurry.

## **Geographical Area Affected**

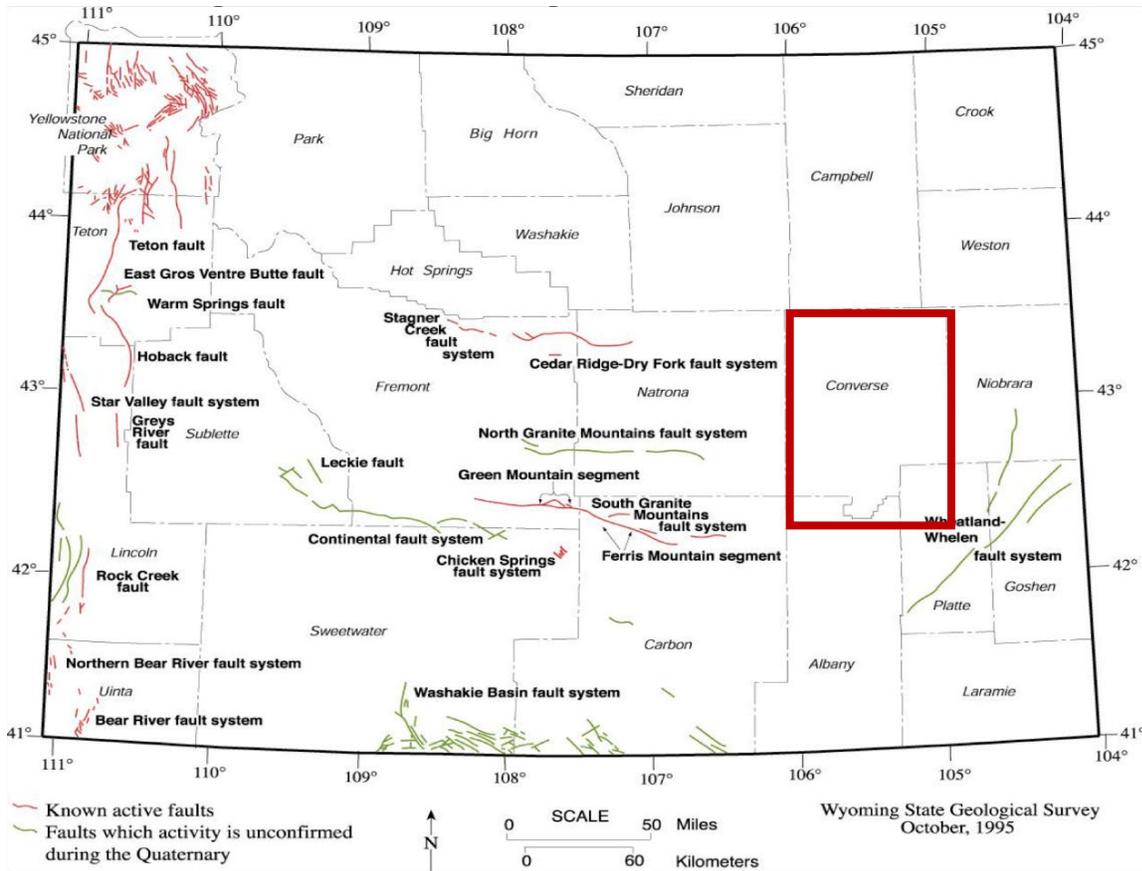
Most Wyoming earthquakes outside of Yellowstone National Park occur as a result of movement on faults. If the fault has moved within the Quaternary geological period, or last 1.6 million years, the fault is considered to be active. Active faults can be exposed at the surface or deeply buried with no significant surface expression. Historically, no earthquakes in Wyoming have been associated with exposed active faults. The exposed active faults, however, have the potential to generate the largest earthquakes. As a result, it is necessary to understand both exposed and buried active faults to generate a realistic seismological characterization of the state.

There are approximately 80 Quaternary faults mapped in Wyoming, with 26 considered active (Source: [www.wsgs.wyo.gov](http://www.wsgs.wyo.gov)). In central Wyoming, the Stagner Creek fault system and the South Granite Mountain fault system are both considered potentially active and capable of generating magnitude 6.5 to 6.75 earthquakes.

There are no known active fault systems located within the boundaries of Converse County. However, there are a few significant faults in the surrounding counties. A fault system called the Cedar Ridge/Dry Fork fault system is present in the northwestern corner of Natrona County. The 35-mile long Cedar Ridge fault comprises the western portion of the fault system, and the 15-mile long Dry Fork fault makes up the eastern portion.

There is also no compelling reason to believe that the Cedar Ridge fault system is active. Based upon its fault rupture length of 35 miles, however, if the fault did activate it could potentially generate a maximum magnitude 7.1 earthquake (Wong et al., 2001). Although there is no compelling reason to believe that the Dry Fork fault system is active, if it did activate as an isolated system, it could potentially generate a magnitude 6.7 earthquake. This is based upon a postulated fault rupture length of 15 miles (Wong et al., 2001).

**Figure 4-5: Exposed Known or Suspected Active Faults in Wyoming**



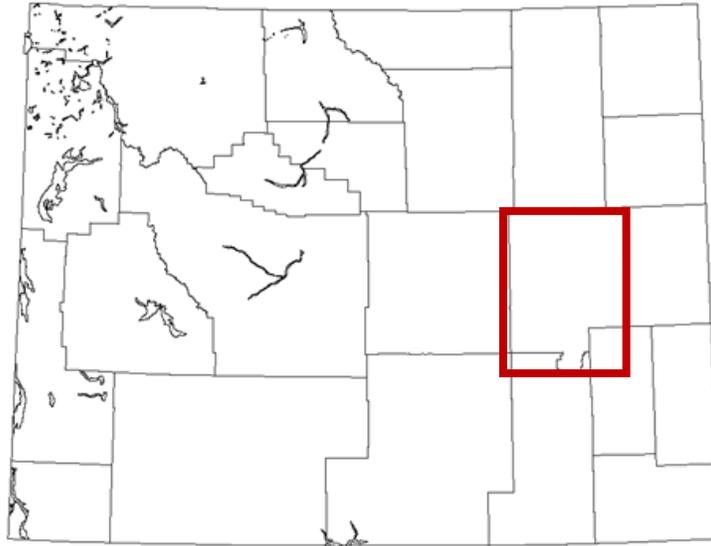
Source: Wyoming Geological Survey

The Wyoming Multi-Hazard Mitigation plan estimates that an earthquake of 6.5 magnitude is possible anywhere in the state.

Figure 4-6 shows areas in Wyoming that could experience liquefaction during an intense earthquake. Areas shown have sands and coarse silts that are less than 10,000 years in age and are within 30 feet of the surface. None of these areas are identified in Converse County.

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**Figure 4-6: Wyoming Liquefaction Coverage**



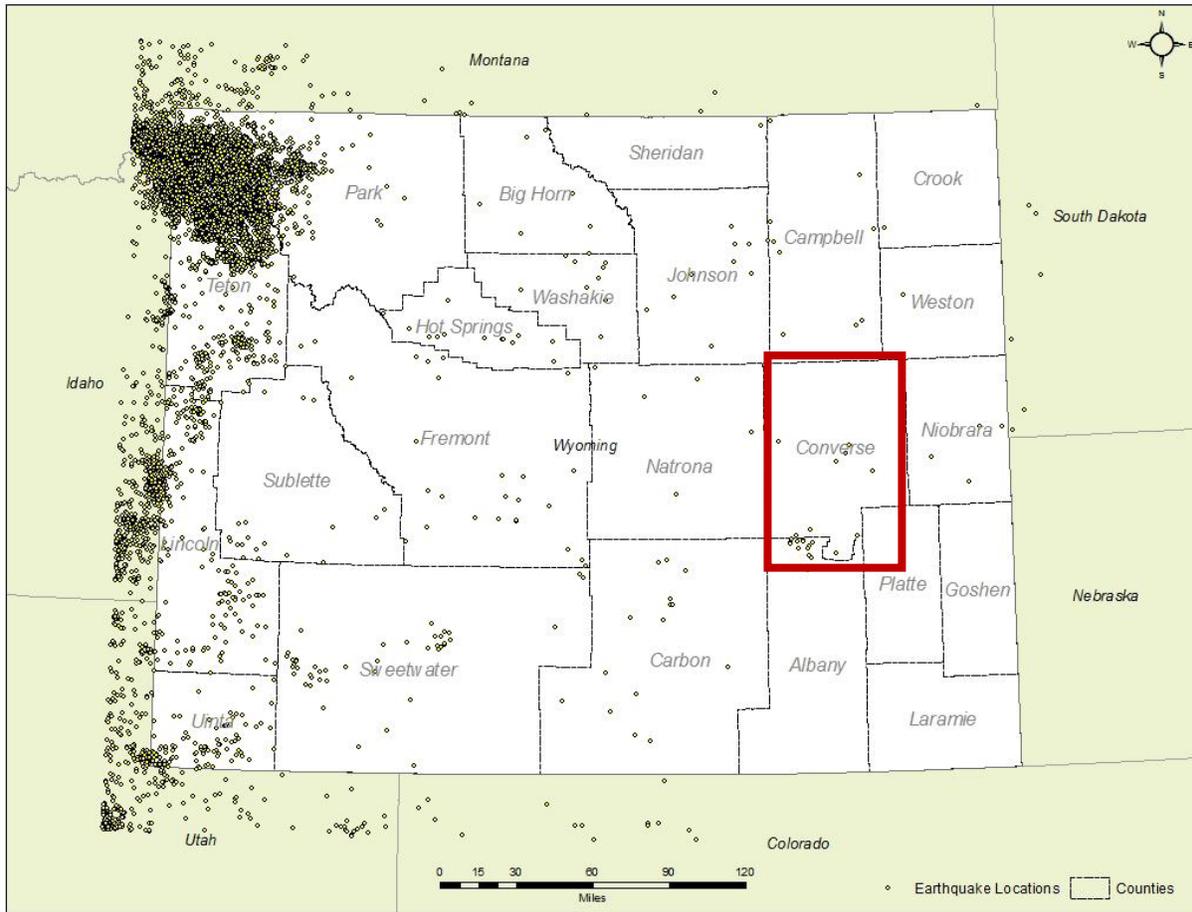
Converse County outlined in red  
Source: Wyoming Geological Survey

### **Past Occurrences**

Prior to the 1950s, most earthquakes were detected and located by personal reports. After the Hebgen Lake earthquake in 1959 near Yellowstone Park, monitoring in Wyoming started to improve and earthquakes were more commonly located by seismometers.

Since 1871, the state has logged some 47,000 earthquakes, with most of the events taking place in the western third of the state (see Figure 4-7). Of these historic earthquakes, most occurrences in Converse County were concentrated in the southern portion of the county, around the Albany County border.

**Figure 4-7: Wyoming Historic Earthquake Occurrences Statewide Since 1963- 2010**



Source: Wyoming Geological Survey - Wyoming Earthquake Hazard and Risk Analysis: HAZUS-MH Loss Estimations for 16 Earthquake Scenarios Report

Historically, earthquakes have occurred in every county in Wyoming. The first was reported in Yellowstone National Park in 1871. Even if the epicenter of an earthquake is not located within Converse County, the effects of the earthquake may still be felt in the County. According to the Wyoming State Geological Survey, there are no known active or suspected active faults in Converse County. However, there have been multiple earthquakes with magnitudes greater than 3.0 recorded in or near Converse County. The most recent event was a 3.8 earthquake on August 29, 2004 with the epicenter approximately 11 miles northwest of Douglas. There was no reported damage, but the earthquake was felt throughout the city and even on nearby highways. Members from the HMPC commented on this event, remarking that this quake occurred in the middle of vacant land and there was no damage reported because there weren't any structures or infrastructure near the epicenter.

Table 4.26 presents a more comprehensive list of Converse County's Earthquake history. The data is derived from the Wyoming State Geological Survey report titled "Basic Seismological

Characterization for Converse County, Wyoming” in September of 2002. The document includes a history of magnitude 3.0 or greater earthquakes recorded in Converse County. Many of the earthquakes noted above have originated in the Laramie mountain range in southern Converse County and northern Albany County.

**Table 4.26: Historic Earthquake Occurrences in Converse County**

Date	Location	Magnitude/Intensity	Comments
April 14, 1947	LaPrele Creek, southwest of Douglas	Intensity V	The earthquake was felt by everyone in a ranch house and by a few outdoors. Windows were rattled, chairs were moved, and buildings shook
April 21, 1952	7 miles north-northeast of Esterbrook	Intensity IV	Felt by several people in the area and was reportedly felt 40 miles to the southwest of Esterbrook
September 2, 1952	7 miles north-northeast of Esterbrook	N/A	Small magnitude event; no damage reported
January 5, 1957	7 miles north-northeast of Esterbrook	Intensity III	No damage reported
March 31, 1964	7 miles north-northeast of Esterbrook	Intensity IV	No damage reported
November 15, 1983	15 miles northeast of Casper in western Converse County	Magnitude 3.0, Intensity III	No damage reported
October 18, 1984	4 miles west of Toltec in northern Albany County. 21 miles south of Esterbrook	Magnitude 5.5	Felt in Wyoming, South Dakota, Nebraska, Colorado, Utah, Montana, and Kansas. It cracked buildings and shook items from shelves in grocery stores in Douglas.
December 5, 1984	Laramie Range in southern Converse County	Magnitude 2.9	No damage reported
June 30, 1993	15 miles north of Douglas	Magnitude 3.0	No damage reported
July 23, 1993	Southern Converse County; 13 miles north-northwest of Tolec in northern Albany County	Magnitude 3.7, Intensity IV	The event was felt as far away as Laramie
December 13, 1993	8 miles east of Toltec	Magnitude 3.5	No damage reported
October 19, 1996	15 miles northeast of Casper in western Converse County	Magnitude 4.2	No damage reported

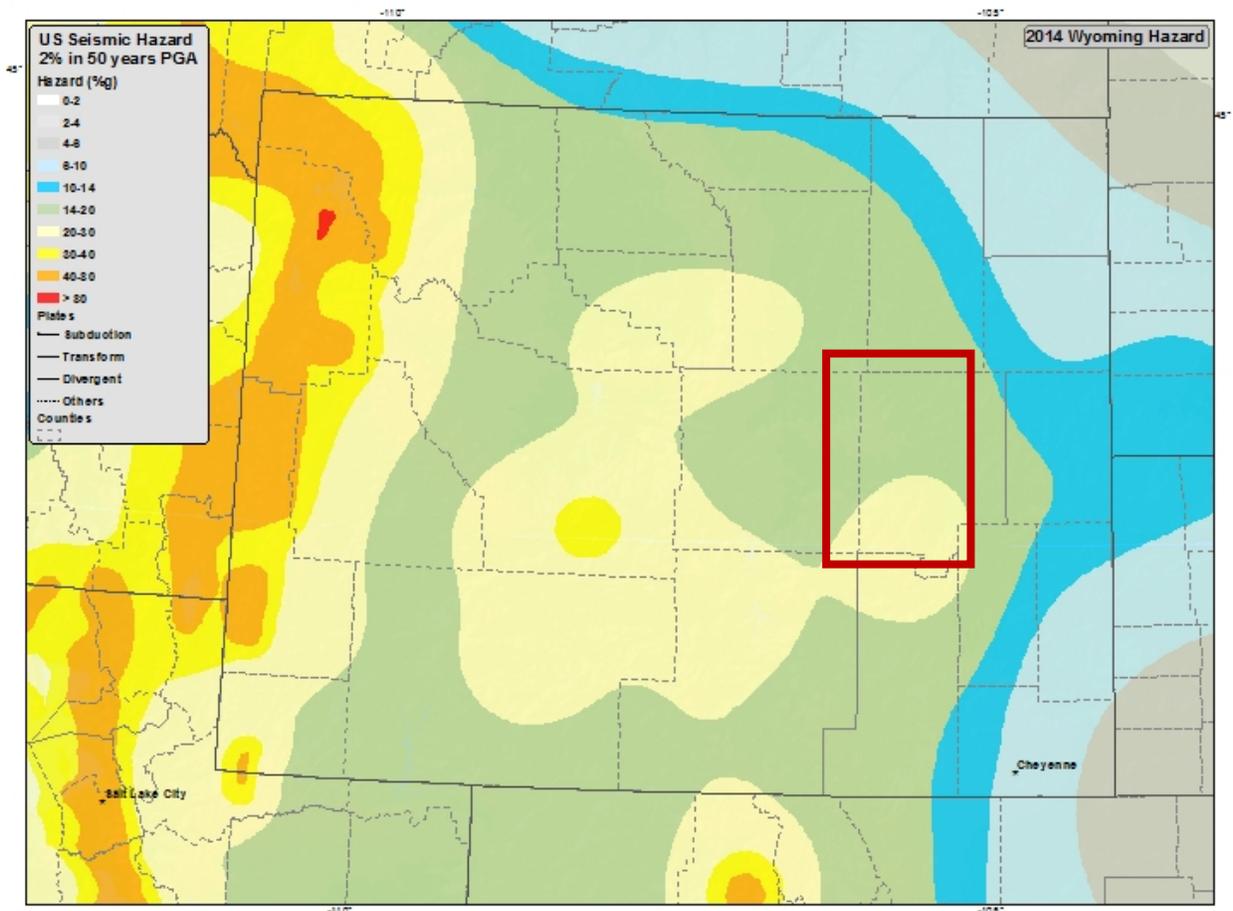
Source: Wyoming State Geological Survey

### Frequency/Likelihood of Future Occurrence

Based on past occurrences the region is likely to experience one magnitude 2.5 or greater earthquake approximately every ten to fifteen years; based on past occurrences, the earthquakes are likely to cause little to no damage. To determine the likelihood of damaging earthquakes the

U.S. Geological Survey (USGS) publishes probabilistic acceleration maps for 500-, 1000-, and 2,500-year time frames. The maps show what accelerations may be met or exceeded in those time frames by expressing the probability that the accelerations will be met or exceeded in a shorter time frame. For example, a 10% probability that acceleration may be met or exceeded in 50 years is roughly equivalent to a 100% probability of exceedance in 500 years. The 2,500-year (2% probability of exceedance in 50 years) map is shown in the figure below. The International Building Code uses a 2,500-year map as the basis for building design. The maps reflect current perceptions on seismicity in Wyoming based on available science. In many areas of Wyoming, ground accelerations shown on the USGS maps can be increased further due to local soil conditions. For example, if fairly soft, saturated sediments are present at the surface, and seismic waves are passed through them, surface ground accelerations will usually be greater than would be experienced if only bedrock was present. In this case, the ground accelerations shown on the USGS maps would underestimate the local hazard, as they are based upon accelerations that would be expected if firm soil or rock were present at the surface.

**Figure 4-8: 2500-year probabilistic acceleration map (2% probability of exceedance in 50 years) – Converse County Highlighted by Red Rectangle**



As the historic record is limited, it is nearly impossible to determine when a 2,500-year event last occurred in the county. Because of the uncertainty involved, and based upon the fact that the new International Building Code utilizes 2,500-year events for building design, it is suggested that the 2,500-year probabilistic maps be used for regional and county analyses. This conservative approach is in the interest of public safety.

### **Potential Magnitude**

Limited damages have been documented in the County from historic earthquakes. Because of the limited historic record, however, it is possible to underestimate the seismic hazard in the County if historic earthquakes are used as the sole basis for analysis. Earthquake and ground motion probability maps give a more reasonable estimate of damage potential in areas with or without exposed active faults at the surface. USGS earthquake probability maps that are used in support of the modern building codes suggest a scenario that would result in moderate damage to buildings and their contents, with damage increasing from the northwest to the east.

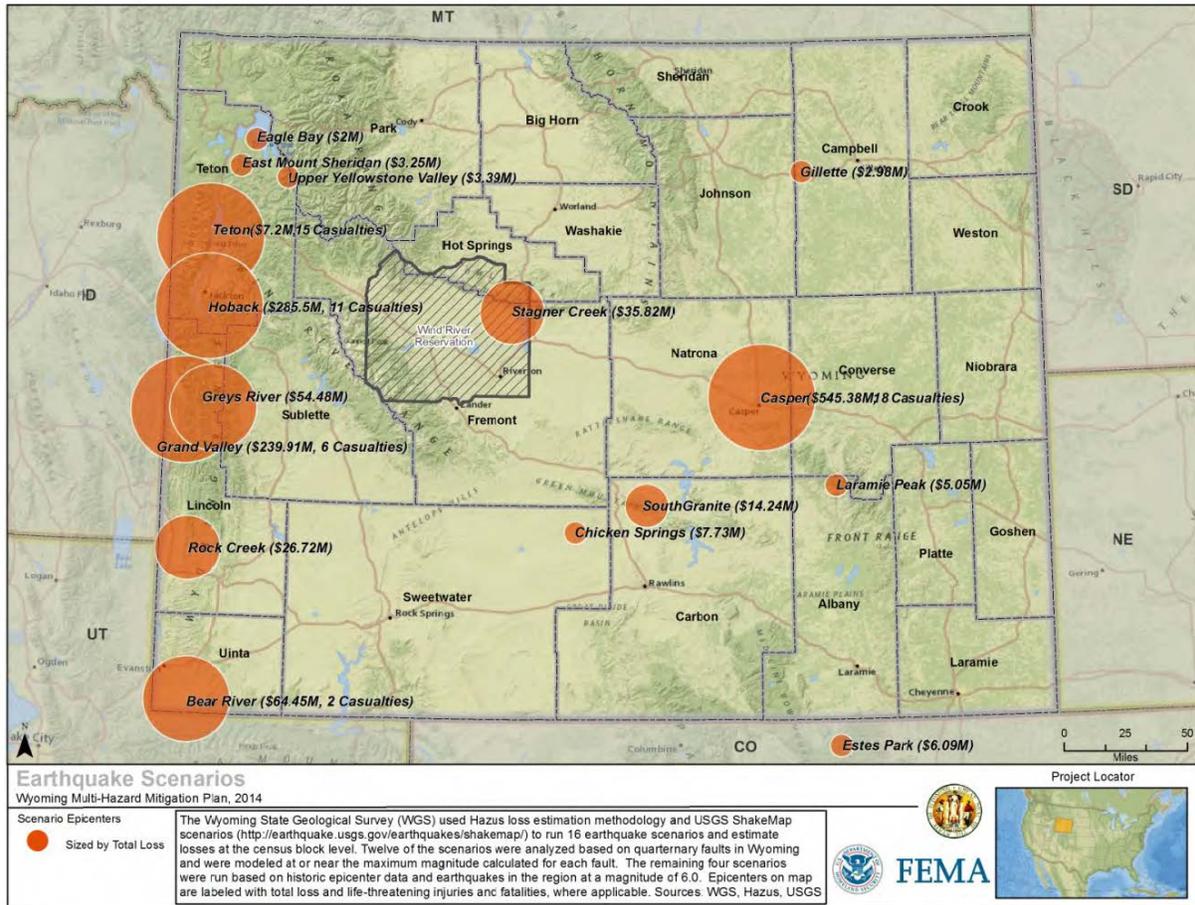
### **Vulnerability Assessment**

HAZUS (Hazards U.S.) is a nationally standardized, GIS-based, risk assessment and loss estimation computer program that was originally designed in 1997 to provide the user with an estimate of the type, extent, and cost of damages and losses that may occur during and following an earthquake. It was developed for the FEMA by the National Institute of Building Sciences (NIBS). There have been many versions of HAZUS generated by FEMA, with HAZUS-MH (HAZUS - Multi-Hazard) being the most recent release.

The study included information regarding the likelihood of damage to local and regional infrastructure, including fire stations, police stations, sheriffs' departments, schools, and hospitals. The scenarios reflect anticipated functionality of each infrastructure system immediately following the scenario earthquake, on day seven following the earthquake and one month after the earthquake. Additional information provided includes anticipated households displaced or seeking temporary shelter, electrical outages anticipated, number of households without potable water, debris generated by the scenario and economic losses resulting from three categories: buildings, transportation and utilities.

The following figure shows epicenter locations of the scenarios, sized by total loss. Epicenters on map are labeled with total loss and if applicable, life-threatening injuries and fatalities.

**Figure 4-9: HAZUS-MH Earthquake Scenarios for Wyoming, 2011**



Source: Wyoming Multi-Hazard Mitigation Plan, 2014

**Probabilistic Scenario**

A 2,500-year probabilistic HAZUS earthquake scenario was performed as part of this mitigation plan development and the results can be referenced below in. This scenario considers worst-case ground shaking from a variety of seismic sources. The following table lists total loss, loss ratio (total loss/total building inventory value), and ranges of casualties within severity levels. HAZUS provides casualty estimates for 2 a.m., 2 p.m., and 5 p.m. to represent periods of the day that different sectors of the community are at their peak occupancy loads. The casualty ranges represent the lowest to highest casualties within these times of day. Casualty severity levels are described as follows:

- Level 1: Injuries will require medical attention but hospitalization is not needed
- Level 2: Injuries will require hospitalization but are not considered life-threatening

- Level 3: Injuries will require hospitalization and can become life-threatening if not promptly treated
- Level 4: Victims are killed by the earthquake

**Table 4.27: HAZUS-MH Earthquake Loss Estimation 2,500-Year Scenario Results**

Type of Impact	Impacts to County
Total Buildings Damaged	Slight: 1,268 Moderate: 725 Extensive: 156 Complete: 12
Building and Income Related Losses	\$70.98M 60% of damage related to residential structures 19% of loss due to business interruption
Total Economic Losses (includes building, income and lifeline losses)	\$89.71M
Casualties (based on 2 a.m. time of occurrence)	Without requiring hospitalization: 8 Requiring hospitalization: 1 Life threatening: 0 Fatalities: 0
Casualties (based on 2 p.m. time of occurrence)	Without requiring hospitalization: 14 Requiring hospitalization: 2 Life threatening: 0 Fatalities: 1
Casualties (based on 5 p.m. time of occurrence)	Without requiring hospitalization: 10 Requiring hospitalization: 2 Life threatening: 0 Fatalities: 0
Damage to Transportation and Utility Systems and Essential Facilities	Some damage to utility pipeline systems, 1 Hospital, 14 Schools, 4 Police Stations, and 3 Fire Stations all damaged with >50% functionality on day 1
Displaced Households	30
Shelter Requirements	17

Source: Hazus-MH 4.0

The total damage figure by itself does not reflect the percentage of building damage, since small damage to many valuable buildings may result in a higher total damage figure than may be found in a county with fewer, less expensive buildings, with a higher percentage of damage.

### ***Liquefaction Vulnerability***

There have been little, if any, reported damages from liquefaction in Wyoming. Given that ground motions associated with Intensity VIII or larger are usually needed to trigger liquefaction, and that only small areas of the region would experience that level of shaking during the 2% event (2% probability of exceedance in 50 years), liquefaction would be a rare occurrence in the County. The 2016 Wyoming State Hazard Mitigation Plan notes that Converse County has \$0 in exposure to liquefaction.

## Future Development

Future development in the county is not anticipated to significantly affect vulnerability to earthquakes, but will result in a slight increase in exposure of the population and building stock

## Summary

Converse County is at moderate risk due to the closer proximity of potentially active faults within and near the County and the history of having experienced one of the strongest earthquakes in central Wyoming. It is estimated that if a worst-case event occurred in Converse County, \$268 million in combined capital stock and income losses could occur. Though the probability is low, WSGS studies indicate the possibility of a 6.5 magnitude could occur anywhere in the state.

**Table 4.28: Earthquake Hazard Risk Summary**

	<b>Geographic Extent</b>	<b>Potential Magnitude</b>	<b>Probability of Future Occurrence</b>	<b>Overall Significance</b>
Douglas	Significant	Critical	Occasional	Medium
Glenrock	Significant	Critical	Occasional	Medium
Rolling Hills	Significant	Critical	Occasional	Medium
Lost Springs	Significant	Critical	Occasional	Medium
Converse County	Significant	Critical	Occasional	Medium

### 4.3.4 Expansive Soils

#### Hazard Description

Soils and swelling bedrock contain clay which causes the material to increase in volume when exposed to moisture and shrink as it dries. They are also commonly known as expansive, shrinking and swelling, bentonitic, heaving, or unstable soils and bedrock. In general, the term refers to both soil and bedrock contents although the occurrence of the two materials may occur concurrently or separately. The difference between the materials is that swelling soil contains clay, while swelling bedrock contains claystone.<sup>3</sup>

The clay materials in swelling soils are capable of absorbing great quantities of water and expanding 10 percent or more as the clay becomes wet. The force of expansion is capable of exerting pressures of 15,000 pounds per square foot or greater on foundations, slabs, and other confining structures.<sup>4</sup> The amount of swelling (or potential volume of expansion) is linked to five main factors: the type of mineral content, the concentration of swelling clay, the density of the materials, moisture changes in the environment, and the restraining pressure exerted by materials

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<sup>3</sup> Colorado Geological Survey Department of Natural Resources, *A Guide to Swelling Soils for Colorado Homebuyers and Homeowners*. (Denver, Colorado.) 1997. p 15-16.

<sup>4</sup> *Ibid.*, p 17.

on top of the swelling soil. Each of these factors impact how much swelling an area will experience, but may be modified, for better or worse, by development actions in the area.

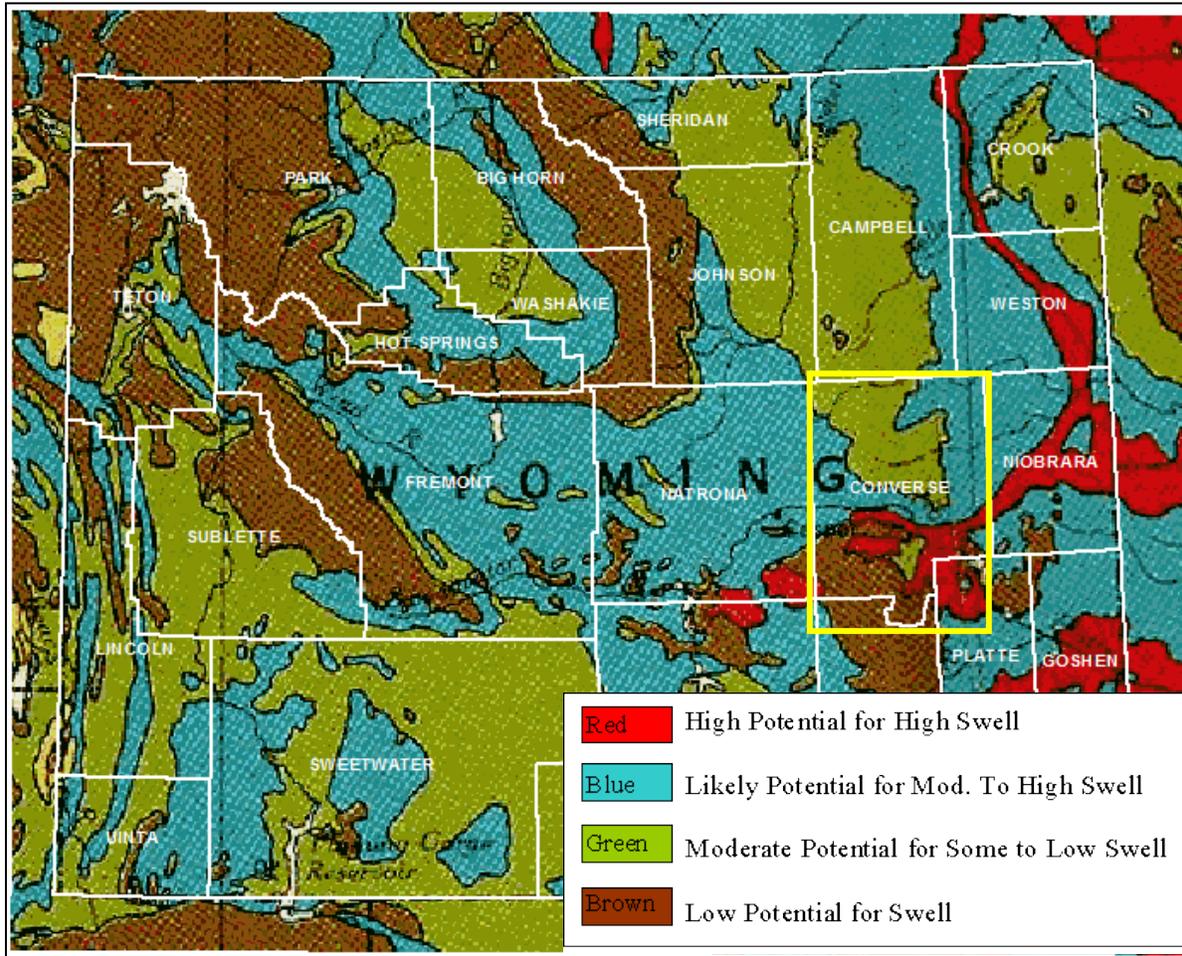
- **Low**—this soils class includes sands and silts with relatively low amounts of clay minerals. Sandy clays may also have low expansion potential, if the clay is kaolinite. Kaolinite is a common clay mineral.
- **Moderate**—this class includes silty clay and clay textured soils, if the clay is kaolinite, and includes heavy silts, light sandy clays, and silty clays with mixed clay minerals.
- **High**—this class includes clays and clay with mixed montmorillonite, a clay mineral which expands and contracts more than kaolinite.

### **Geographical Area Affected**

Expansive soils are known to be present in Converse County. The figures below illustrate possible expansive soils locations in Wyoming. Figure 4-10 is based on select geologic formations from the Love and Christiansen 1985 Geologic Map of Wyoming. Most of land coverage in the county falls under the category of moderate potential for swelling, with a significant portion of land (primarily in the southern area) considered to be low potential for swelling. Areas of concern are located in the central/south-eastern County where a belt of high potential soil flows through the County from the north-east.

Figure 4-11 is based on data from the Wyoming State Geological Survey which displays much of Converse County at risk to expansive soils. Those formations selected have characteristics that could lead to expansive soils where they outcrop. Deposits of calcium montmorillonite can also contribute to swelling problems, but these areas have not been completely mapped. Based on the figures below, expansive soils are estimated to affect a **limited** portion of the planning area.

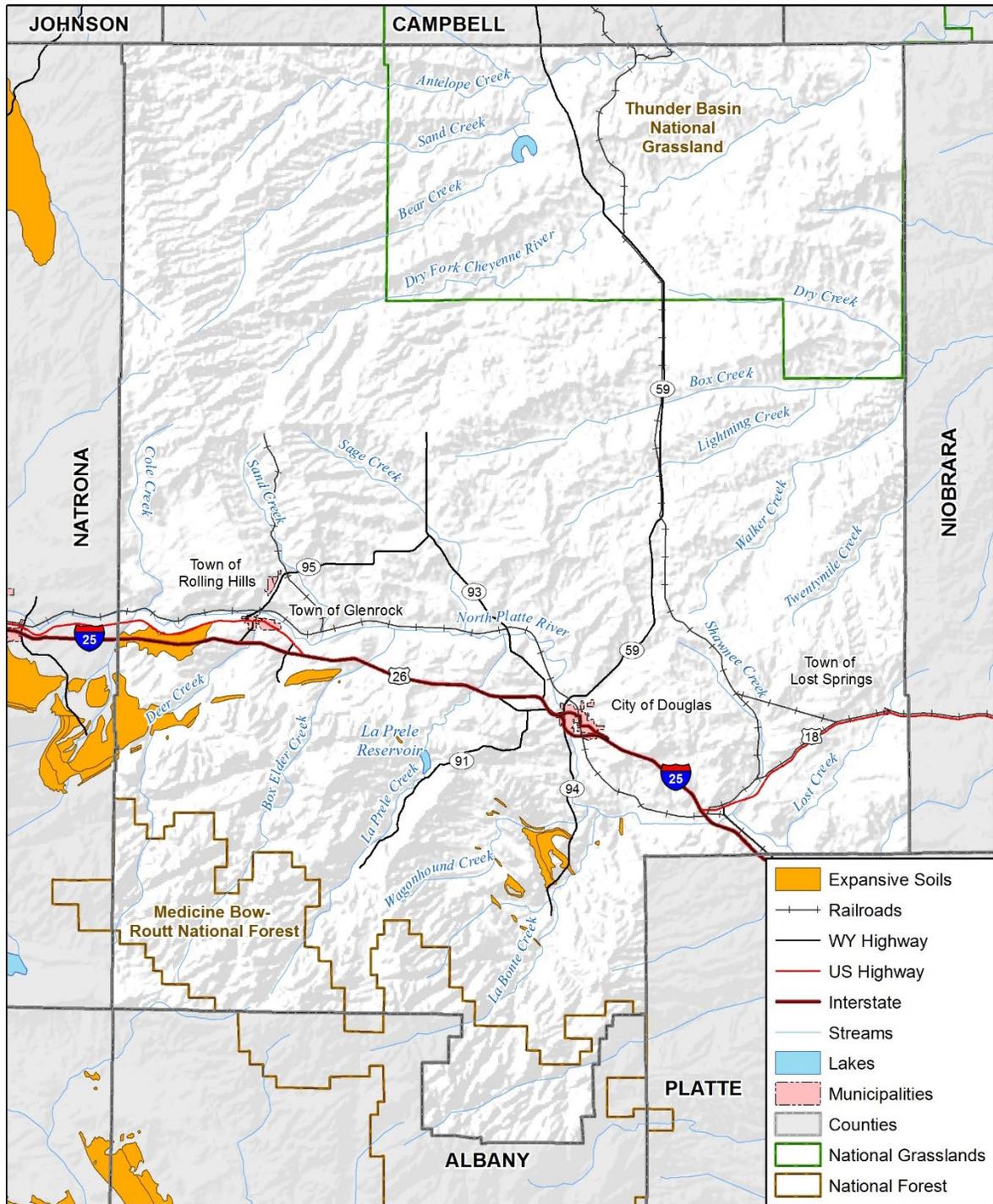
**Figure 4-10: Expansive Soil Potential in Wyoming**



Source: The map above is based upon “Swelling Clays Map of the Conterminous United States” by W. Olive, A. Chleborad, C. Frahme, J. Shlocker, R. Schneider and R. Schuster. It was published in 1989 as Map I-1940 in the USGS Miscellaneous Investigations Series. Land areas were assigned to map soil categories based upon the type of bedrock that exists beneath them as shown on a geologic map. In most areas, where soils are produced “in situ”, this method of assignment was reasonable. However, some areas are underlain by soils which have been transported by wind, water or ice. The map soil categories would not apply for these locations.

Figure 4-11: Expansive Soil Potential in Wyoming

## Converse County Expansive Soils



Map compiled 4/2018;  
intended for planning purposes only.  
Data Source: WY Geospatial Hub,  
WYDOT, HSIP Freedom 2015,  
Wyoming State Geological Survey

0 5 10 20 Miles



## Past Occurrences

Very little data exists on expansive soil problems and damages in Wyoming. Studies on the issue have not been performed and no database exists to catalog occurrences. The 2016 State of Wyoming Multi-Hazard Mitigation Plan does not list specific events in Converse County.

## Likelihood of Occurrence

Expansive soils will be a **likely** problem for the Converse County.

## Potential Magnitude

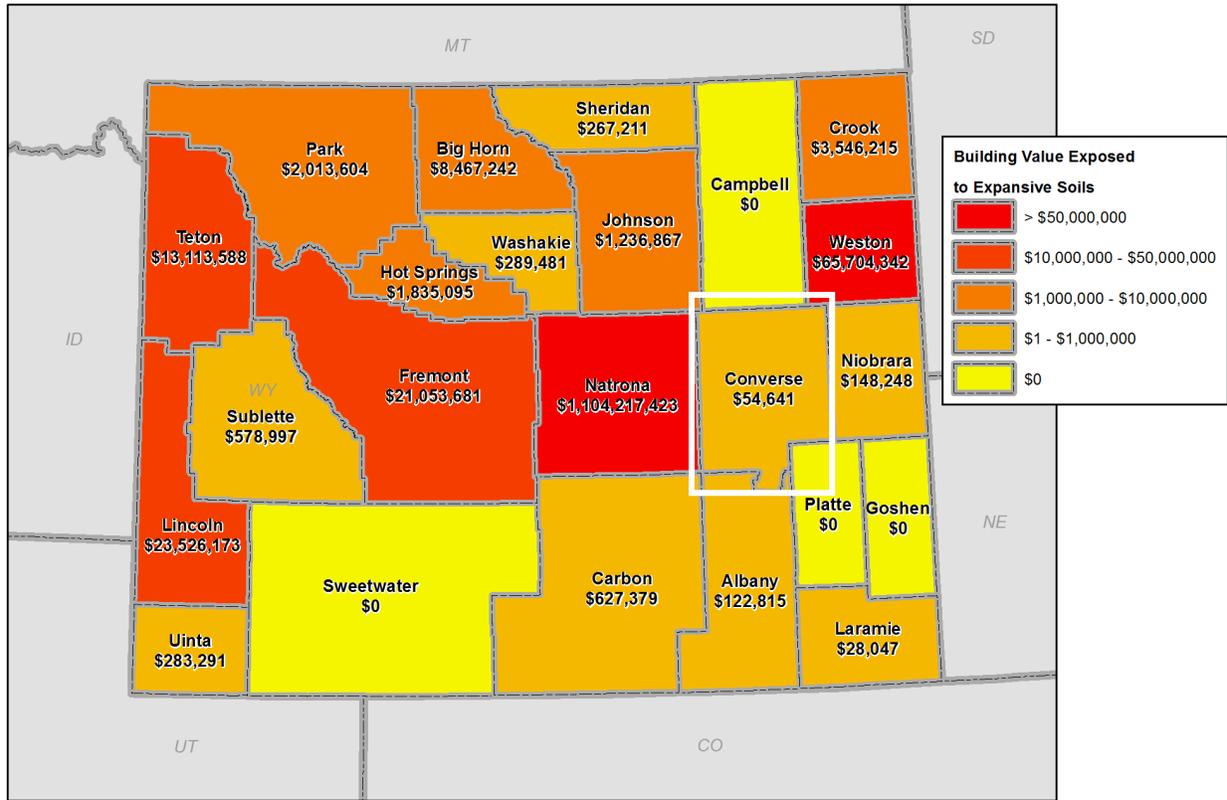
The potential magnitude of expansive soils events and damages is estimated to be **significant** in Converse County. No impacts related to expansive soils have been reported thus far. Because damages from expansive soils tend to happen over an extended period, it is difficult to estimate the potential severity of a problem. Many deposits of expansive soils do not inflict damage over large areas. Instead, these deposits can often create localized damage to individual structures and supply lines, such as roads, railways, bridges and power lines.

## Vulnerability Assessment

According to the Wyoming State Multi-Hazard Mitigation Plan there are two measurements used for calculating future impacts: historic dollar damages and building exposure values. There are not enough current data to accurately estimate historic damages.

The Wyoming State Geological Survey (WSGS) calculated the building exposure values for buildings that may occur within the areas of expansive soils. All expansive soils mapped have been digitized and the expansive soil layer was then digitally crossed with the Census block building values. In the event of an expansive soil boundary dissecting a census block, the proportional value of the buildings in the census block will be assigned to the expansive soil. IN a case where a census block is within an expansive soil, the combined values of all the buildings in the census block are assigned. The values derived by county are shown in the map below. These damage estimates assume an instantaneous event, which would damage all the property of suspected expansive areas at one time. This scenario is extremely unlikely, meaning that the exposed damage estimates most likely are vastly overstated. It is far more likely that damage from these soils will be individual events, which will cause damage to a small number of buildings or road segments over time. Converse County has a moderately low value of exposed buildings, ranking 20<sup>th</sup> out of 23 Wyoming counties; four counties statewide have zero building exposure.

**Figure 4-12: Wyoming Exposure to Shrinking/Swelling Soils by County**



Source: State of Wyoming Multi-Hazard Mitigation Plan  
 White box denotes Converse County boundary

**Summary**

Overall, expansive soils are a medium significance hazard for the County.

**Table 4.29: Expansive Soil Hazard Risk Summary**

	Geographic Extent	Potential Magnitude	Probability of Future Occurrence	Overall Significance
Douglas	Limited	Limited	Likely	Low
Glenrock	Limited	Limited	Likely	Low
Rolling Hills	Limited	Limited	Likely	Low
Lost Springs	Limited	Limited	Likely	Low
Converse County	Limited	Limited	Likely	Low

### 4.3.5 Flood

#### Hazard Description

Floods can and have caused significant damage in Converse County. They have caused millions of dollars in damage in just a few hours or days. A flood, as defined by the National Flood Insurance Program, is a general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties from: overflow of waters; unusual and rapid accumulation or runoff of surface waters from any source; or, a mudflow. Floods can be slow or fast rising, but generally develop over a period of many hours or days. Causes of flooding relevant to the County include:

- Rain in a general storm system
- Rain in a localized intense thunderstorm
- Melting snow
- Rain or melting snow
- Urban stormwater drainage
- Ice Jams
- Dam failure
- Levee Failure
- Rain on fire damaged watersheds

The area adjacent to a river channel is its floodplain. In its common usage, “floodplain” most often refers to that area that is inundated by the 100-year flood, the flood that has a 1 percent chance in any given year of being equaled or exceeded. The 100-year flood is the national standard to which communities regulate their floodplains through the National Flood Insurance Program.

Converse County is susceptible to multiple types of floods including riverine flooding, flash floods, slow rise floods, ice jams and possibly dam or levee failure.

Riverine flooding is defined as when a watercourse exceeds its “bank-full” capacity and is usually the most common type of flood event. Riverine flooding generally occurs because of prolonged rainfall, or rainfall that is combined with soils already saturated from previous rain events. Slow rise floods associated with snowmelt and sustained precipitation usually are preceded with adequate warning, though the event can last several days.

Floods can also occur with little or no warning and can reach full peak in only a few minutes. Such floods are called flash floods. A flash flood usually results from intense storms dropping large amounts of rain within a brief period. Flash floods, by their nature, occur very suddenly but usually dissipate within hours. Even flash floods are usually preceded with warning from the National Weather Service in terms of flash flood advisories, watches, and warnings.

Floods can occur for reasons other than precipitation or rapidly melting snow. They can also occur because of ice jams, which have occurred in Washakie and Big Horn Counties. An ice jam is a

stationary accumulation of ice that restricts flow. Ice jams can cause considerable increases in upstream water levels, while at the same time downstream water levels may drop. Types of ice jams include freeze up jams, breakup jams, or combinations of both. These types of floods can be slow or fast rising, but generally develop over a period of many hours or days.

Levee failure can also cause a flash flood and is a risk in the planning area. A levee is an earthen embankment constructed along the banks of rivers, canals and coastlines to protect adjacent lands from flooding by reinforcing the banks. By confining the flow, levees can also increase the speed of the water. Levees can be natural or man-made. A natural levee is formed when sediment settles on the river bank, raising the level of the land around the river. To construct a man-made levee, workers pile dirt or concrete along the river banks, creating an embankment. This embankment is flat at the top, and slopes at an angle down to the water. For added strength, sandbags are sometimes placed over dirt embankments. Natural disasters such as Hurricane Katrina demonstrate that, although levees can provide strong flood protection, they are not failsafe. Levees can *reduce* the risk to individuals and structures behind them; but they do not eliminate risk entirely. Levees are designed to protect against a specific flood level; severe weather could create a higher flood level that the levee cannot withstand. Levees can fail by either overtopping or breaching. Overtopping occurs when floodwaters exceed the height of a levee and flow over its crown. As the water passes over the top, it may erode the levee, worsening the flooding and potentially causing an opening, or breach, in the levee. A levee breach occurs when part of a levee gives way, creating an opening through which floodwaters may pass. A breach may occur gradually or suddenly. The most dangerous breaches happen quickly during periods of high water. The resulting torrent can quickly swamp a large area behind the failed levee with little or no warning. Unfortunately, in the rare occurrence when a levee system fails or is overtopped, severe flooding can occur due to increased elevation differences associated with levees and the increased water velocity that is created. It is also important to remember that no levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure. In 2011, Emergency Management Coordinator Lt. Stewart Anderson reported “crews had constructed a levee of sorts” on the North Platte River in preparation for flooding.

The potential for flooding can also change and increase through various land use changes and changes to land surface. A change in the built environment can create localized flooding problems inside and outside of natural floodplains by altering or confining watersheds or natural drainage channels. These changes are commonly created by human activities. Flooding in the communities in the County could be exacerbated by inadequate drainage and channel systems that would not stand up to the 1% annual chance flood. Inadequate culverts and drainage systems can cause flooded roads and flood adjacent properties.

Increased flooding can also be created by other events such as wildfires. Wildfires create hydrophobic soils, a hardening or “glazing” of the earth’s surface that prevents rainfall from being absorbed into the ground, thereby increasing runoff; erosion, and downstream sedimentation of channels.

## Geographical Area Affected

All areas within the planning area have the potential for flooding. The extent of the flooding varies based on the location in the county. The North Platte River is the main source of flooding in Converse County, although many of its tributaries have the potential to flood as well. Converse County is located downstream of several reservoirs that dam the North Platte River, notably Seminoe and Pathfinder Reservoirs. According to a 2009 FEMA Flood Insurance Study, the primary cause of flooding in the North Platte River near Douglas is runoff from the drainage area below the reservoirs, particularly from drainages entering the North Platte from the south.

The North Platte River basin is located in the southeast corner of the state. The river flows north into Wyoming from Colorado. The Sweetwater River, one of the North Platte's major tributaries, flows in from the west. The North Platte River Basin covers roughly 22,000 square miles in Wyoming, about one quarter of the state. The headwaters flow from the mountains surrounding North Park, Colorado, as well as the Medicine Bow and Sierra Madre and other, minor ranges of southeast Wyoming.

Most of Converse County is situated within five watersheds: The Antelope in the northwest corner, the Dry Fork Cheyenne in the north-central region, the Lightning in the northeast, the Middle North Platte-Casper in the central/south east (including Rolling Hills and Glenrock), and the Glendo Reservoir Watershed in the central/south west (encompassing Douglas and Lost Springs) (EPA, 2011). The County has a relatively low population density (2.8 persons per square mile), which makes the danger to human health and life from flooding in the County quite low. The towns of Douglas and Glenrock, which lie along the North Platte River and its tributaries, account for most of the documented flood risk in the County.

Figure 4-12 shows the Converse County flood hazards, followed by Figure 4-14 through Figure 4-18, showing flood hazards by jurisdiction.

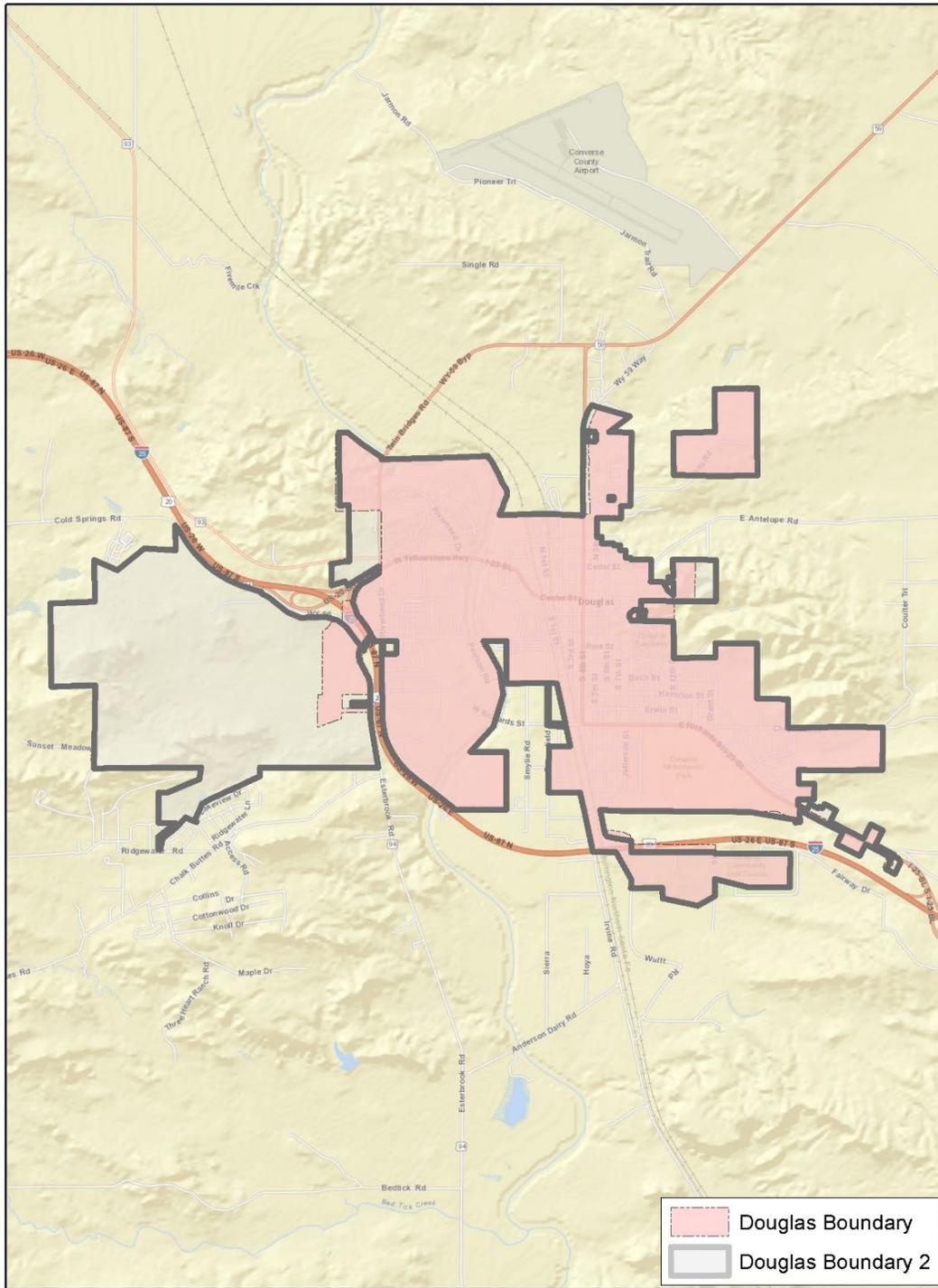
GIS analysis is based on the statewide layers for communities in Wyoming, and covers both the 1% and 0.2% annual Chance Flood Hazard zones. Moderate flood hazard areas, labeled Zone B or Zone X (shaded) are also shown on the FIRM, and are the areas between the limits of the base flood and the 0.2-percent-annual-chance (or 500-year) flood. The areas of minimal flood hazard, which are the areas outside the SFHA and higher than the elevation of the 0.2-percent-annual-chance flood, are labeled Zone C or Zone X (unshaded).

The maps were generated primarily using FEMA NFIP data. However, FEMA flood data is not completely comprehensive, especially in the unincorporated areas of Converse County. Therefore, a HAZUS 1% annual chance flood model was used to determine the potential extent of flooding otherwise not depicted. When relevant, the maps differentiate the sources of the flood layer information.

An HMPC member from the City of Douglas supplied an additional GIS layer that suggests a variance in city boundary. The primary difference in extent is seen in the western area of the jurisdiction, as evident by the Douglas Boundary 2 in the figure below. Though this discrepancy

is visually significant, the added area from the layer is either green space or other undeveloped land, and therefore it does not change parcel numbers or building count exposure results.

**Figure 4-13: City of Douglas Boundary Variance**

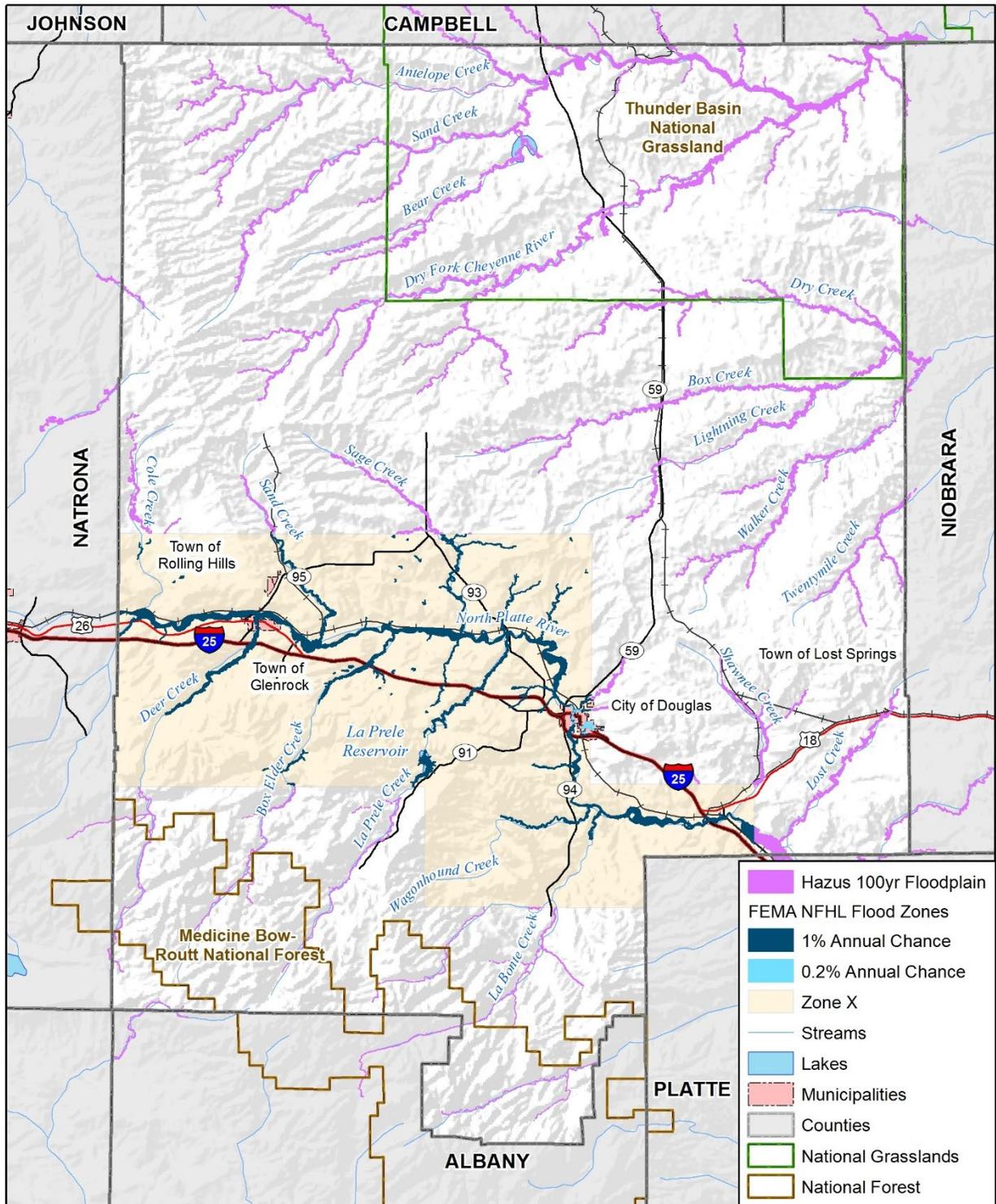


Map compiled 11/2017,  
intended for planning purposes only.  
Data Source: WY Geospatial Hub,  
WYDOT, HSIP Freedom 2015,  
City of Douglas

0 0.25 0.5 1 Miles



**Figure 4-14: Converse County FEMA and HAZUS Flood Hazards**

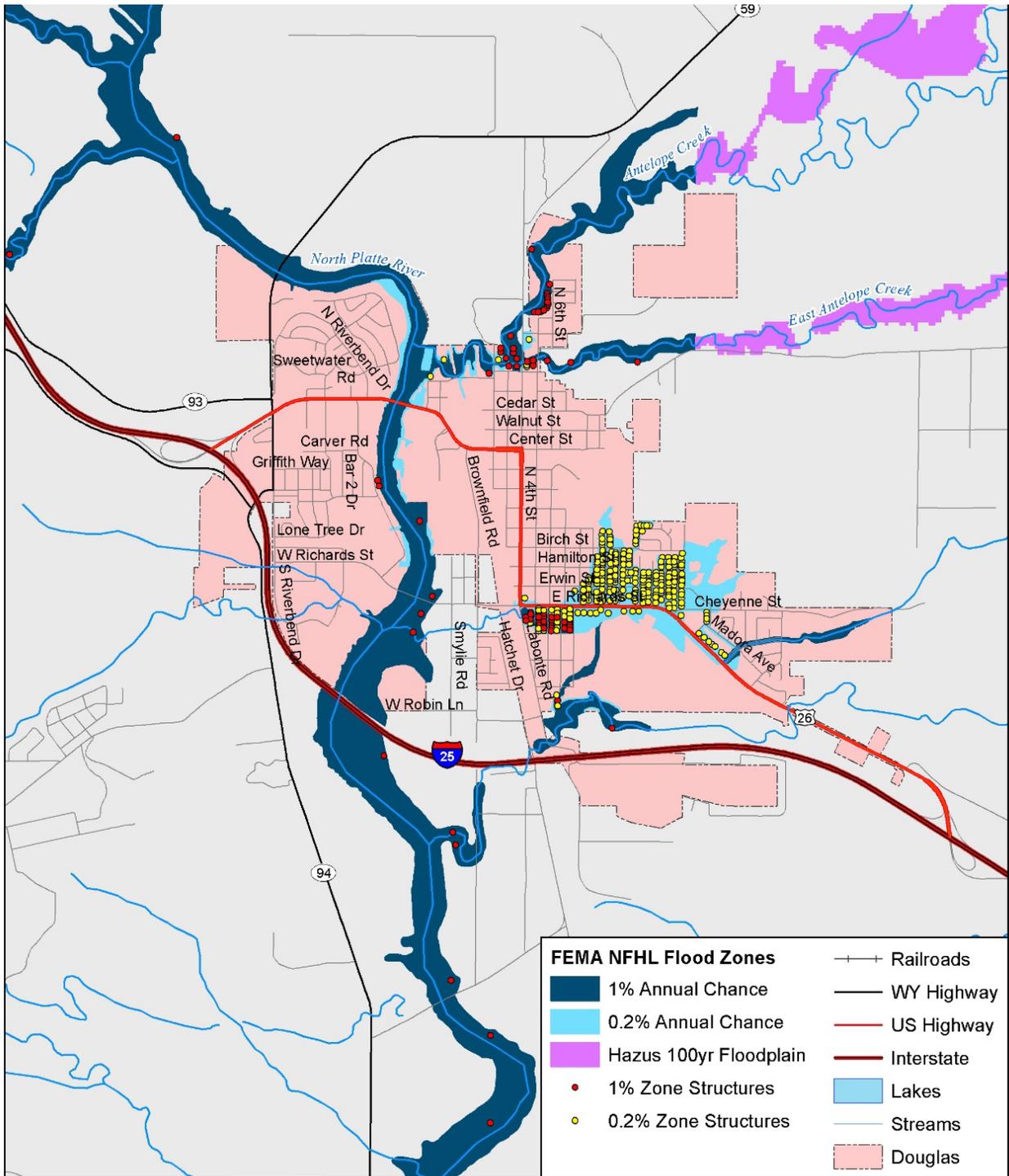


Map compiled 4/2018;  
intended for planning purposes only.  
Data Source: WY Geospatial Hub,  
WYDOT, HSIP Freedom 2015,  
FEMA NFHL 11/04/2009, HAZUS-MH MR2

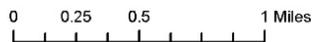
0 5 10 20 Miles



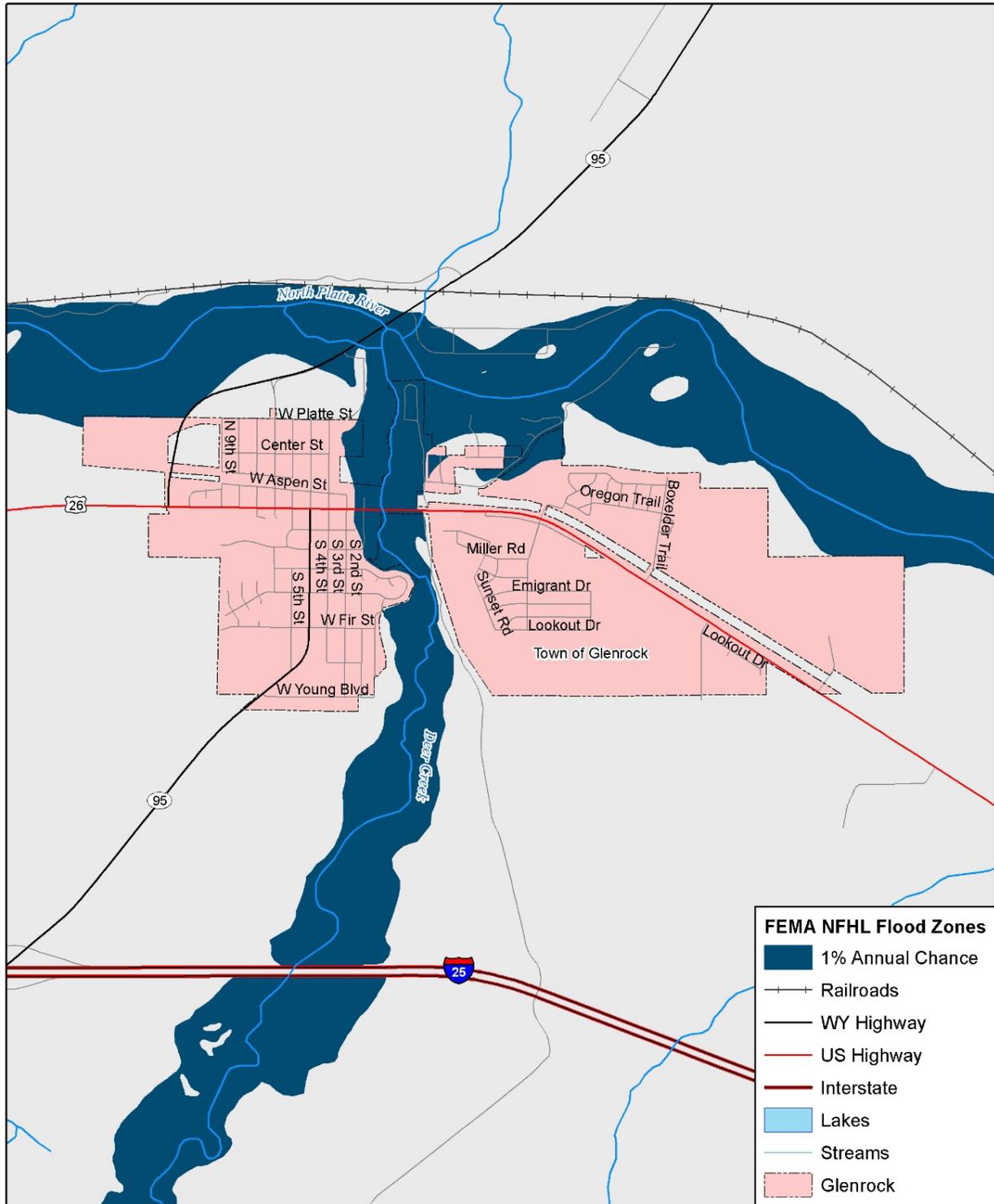
Figure 4-15: Douglas 1% and 0.2% Annual Chance Flood Hazards



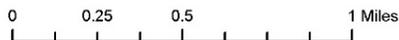
Map compiled 10/2017;  
intended for planning purposes only.  
Data Source: WY Geospatial Hub,  
WYDOT, HSIP Freedom 2015,  
FEMA NFHL 11/04/2009, HAZUS-MH MR2



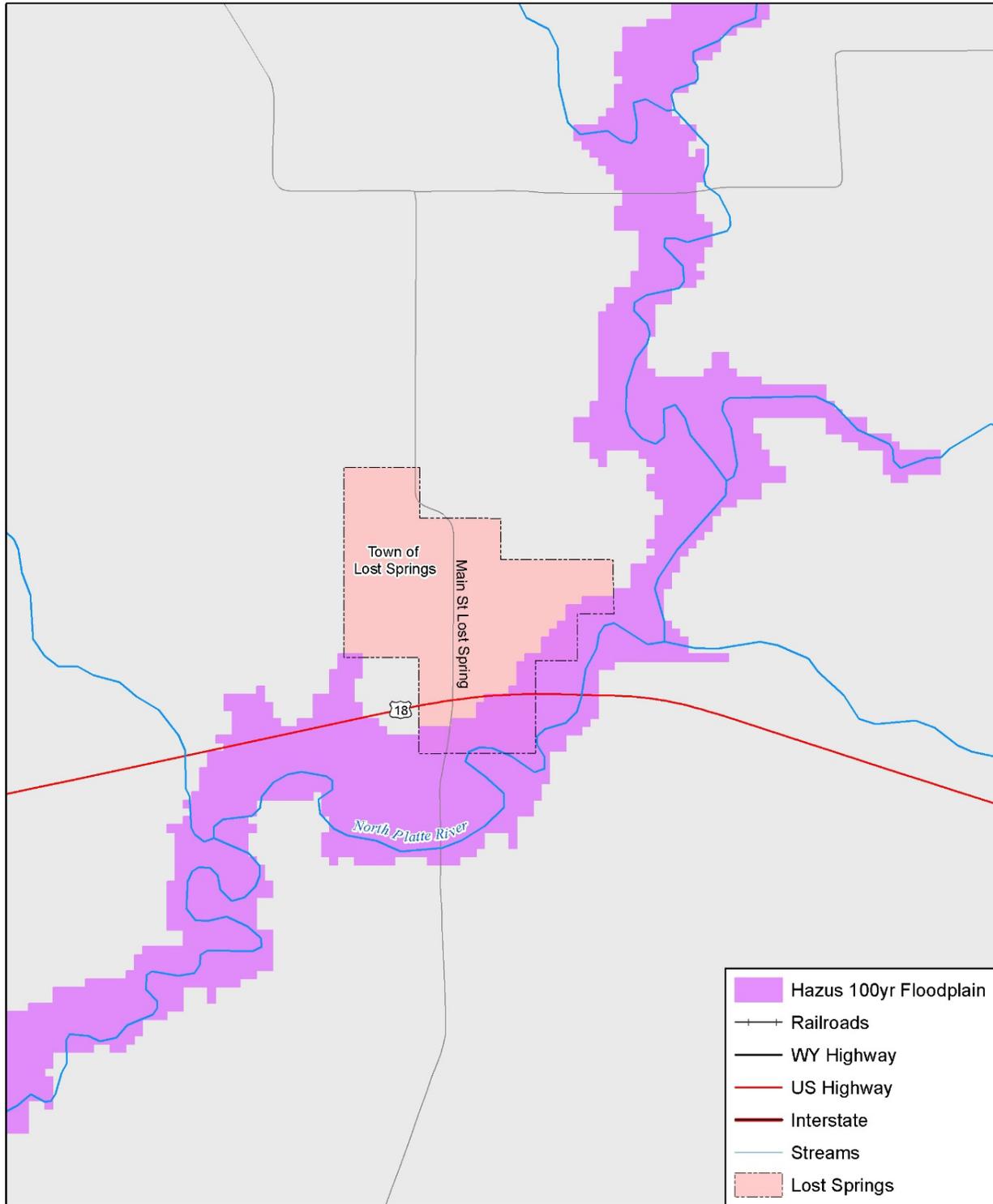
**Figure 4-16: Glenrock 1% Annual Chance Flood Hazards**



Map compiled 10/2017;  
intended for planning purposes only.  
Data Source: WY Geospatial Hub,  
WYDOT, HSIP Freedom 2015,  
FEMA NFHL 11/04/2009



**Figure 4-17: Lost Springs HAZUS 1% Annual Chance Flood Hazards**

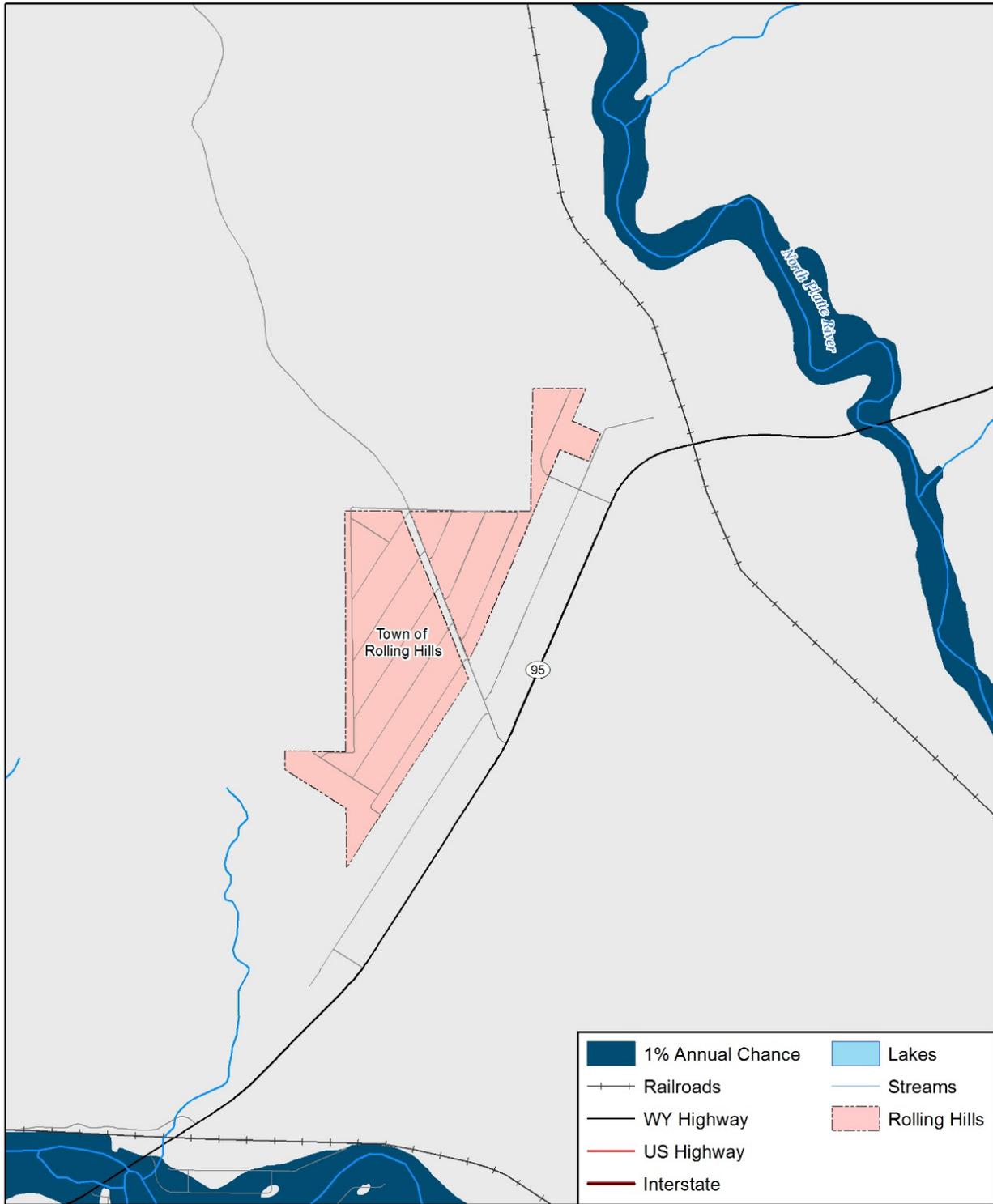


Map compiled 10/2017;  
intended for planning purposes only.  
Data Source: WY Geospatial Hub,  
WYDOT, HSIP Freedom 2015,  
FEMA NFHL 11/04/2009, HAZUS-MH MR2

0 0.125 0.25 0.5 Miles



**Figure 4-18: Rolling Hills 1% Annual Chance Flood Hazards**



Map compiled 10/2017;  
intended for planning purposes only.  
Data Source: WY Geospatial Hub,  
WYDOT, HSIP Freedom 2015,  
FEMA NFHL 11/04/2009

0 0.25 0.5 1 Miles



## Past Occurrences

A brief history of significant floods is presented below. NCDC data is available for floods and flash flooding in Converse County. The table below outlines occurrences and associated damages.

**Table 4.30: Flood Occurrences in Converse County, 1965-2017**

Date	Type of Event	Damages	Comments
May 14, 1965	Flood	\$175,000 of damages (\$50K in Glenrock and \$125K in the County)	16,000 cfs eight miles downstream of Glenrock and 23,800 cfs at Orin. This flood considered a 50-year (2% chance) event.
June 16, 1965	Flash Flood	\$2,250	A flash flood near Bill killed one coal miner on Antelope Creek.
June 12, 1970	Flood	\$1 million	Northeast residential area flooded, municipal park severely damaged, trailer court, croplands, bridges, fences, and farm buildings damaged
May, 1978	Flood	\$15.5 million.	Severe thunderstorm produced 4.5 inches of rain overnight. Major impacts to infrastructure (roads, bridges, powerlines). Severe damage to homes, property, crops, and livestock.
July 22, 1983	Flood	-	Runoff collapsed a dam. See Section 4.3.5 Flood History for more information.
August 1, 1984	Flood	\$2,250	A thunderstorm dumped two inches of rain in 30 minutes. Rain flooded basements of several houses, a car, and several businesses.
May, 1991	Flash Flood		A storm produced 4.5 to 11 inches of rain in 48 hours. Erosion and major damage to irrigation pumps and canals, fences, and fields. Estimated to be a 100-year event.
July 1, 1998	Flash Flood	\$2,000	A storm produced 6 inches of rainfall 50 miles northwest of Douglas. Water covered many rural roads in the area.
July, 2008	Flash Flood	-	LaPrele Creek flooding as flow of water increased from 2,000 cfs to 12,000 cfs in a few hours. Sandbagging occurred at three homes in the Orin area.
June, 2010	Flood	-	Rapid snowmelt prompted sandbagging efforts in Douglas around structures in low-lying areas.
August 9, 2013	Flash Flood	-	Slow moving thunderstorms across Converse County produced rainfall estimates of one to three inches in a two-hour period. The heavy rainfall resulted in flash flooding. Water and debris were flowing across Highway 59 north of Bill.
May 7, 2016	Flash Flood	-	Rain on snowmelt produced flash flooding in southwest Converse County. Flash flooding was reported on Esterbrook and Cold Springs Road. Two to three feet of water was reported at the Deer Creek RV park. Natural Bridge Park was closed due to rising flood waters. Flooding was reported along the Deer Creek, Boxelder, and LaPrele drainages.

Source: National Center for Climatic Data

## Likelihood of Occurrence

The available flood history indicates that damaging floods occur infrequently in Converse County. Documented flood history for Converse County extends back to 1937 as described previously. This record shows about 12 floods or high-flow events in the last 52 years, which translates to one event every four years or so, or about a 25% chance any given year. Note that not all of these floods caused damage to property. Most of these floods have taken place in the summer months of June, July, and August. This corresponds to a **Likely** occurrence rating, meaning that a flood has a 10-100 percent chance of occurrence in the next year somewhere in the County.

## Potential Magnitude

Magnitude and severity can be described or evaluated in terms of a combination of the various levels of impact that a community sustains from a hazard event. Specific examples of negative impacts from flooding on the County span a comprehensive range and are summarized as follows:

- Floods cause damage to private property that often creates financial hardship for individuals and families;
- Floods cause damage to public infrastructure resulting in increased public expenditures and demand for tax dollars;
- Floods cause loss of personal income for agricultural producers that experience flood damages;
- Floods cause loss of income to businesses relying on recreational uses of regional waterways;
- Floods cause emotional distress on individuals and families; and
- Floods can cause injury and death.

Floods present a risk to life and property, including buildings, their contents, and their use. Floods can affect crops and livestock. Floods can also affect lifeline utilities (e.g., water, sewerage, and power), transportation, jobs, tourism, the environment, and the local and regional economies. The impact of a flood event can vary based on geographic location to waterways, soil content and ground cover, and construction. The extent of the damage of flooding ranges from very narrow to widespread based on the type of flooding and other circumstances such as previous rainfall, rate of precipitation accumulation, and the time of year.

The magnitude and severity of the flood hazard is usually determined by not only the extent of impact it has on the overall geographic area, but also by identifying the most catastrophic event in the previous flood history. Sometimes it is referred to as the “event of record.” The flood of record is almost always correlated to a peak discharge at a gage, but that event may not have caused the worst historic flood impact in terms of property damage, loss of life, etc.

One method of examining the magnitude and severity of flooding in the planning area is to examine the damage losses and payments from the National Flood Insurance Program. This information is not comprehensive, because it only reflects the communities which participate in the NFIP, but it is a useful overview of flood damages in the planning area. The information below represents the

composite of unincorporated and community-specific policies, claims and payments. There were no repetitive losses or substantial damage claims reported.

**Table 4.31: Converse County NFIP Statistics**

Jurisdiction	Policies	Coverage	# of Claims	Paid Losses
Douglas	7	\$2,189,000	2	\$0
Glenrock	5	\$862,700	4	\$7,350
County	15	\$4,423,100	1	\$2,032
<b>Total</b>	<b>27</b>	<b>\$7,474,800</b>	<b>7</b>	<b>\$9,382</b>

Source: FEMA Policy and Claim Statistics <http://www.fema.gov/policy-claim-statistics-flood-insurance>

Converse County, Douglas, and Glenrock all participate in the NFIP. Converse has participated since 1988, Douglas since 1978, and Glenrock since 1985. As of August 2017, there were 27 flood insurance policies in Converse County with an insured value of \$7,474,800. Douglas has the most insurance policies (primarily single-family), but Glenrock is the only jurisdiction where NFIP insurance claims have been made for flood damages. In recent years, there have been no substantial damage claims (claims in excess of 50% of the structure value).

The potential magnitude for a flood event in the planning area is generally **limited**. An event of limited magnitude would result in some injuries, a complete shutdown of critical facilities for over a week, and damages to more than 10% of the planning area. This is consistent with the flood event history in the County. The flood history indicates that damaging floods have occurred consistently in the County. Fortunately, there has been no loss of life or any significant injury caused by floods in the county.

### Vulnerability Assessment

The vulnerability assessment of flood risk in Converse County is highly comprehensive. Supported by extensive geospatial analysis, the following section describes the potential impacts of flood for the County’s people, properties, critical facilities, and natural resources.

Vulnerable populations in the County include residents living in known flooding areas or near areas vulnerable to flash floods. Certain populations are particularly vulnerable. This may include the elderly and very young; those living in long-term care facilities; mobile homes; hospitals; low-income housing areas; temporary shelters; people who do not speak English well; tourists and visitors; and those with developmental, physical, or sensory disabilities. These populations may be more vulnerable to flooding due to limitations of movement, fiscal income, challenges in receiving and understanding warnings, or unfamiliarity with surroundings.

As part of this plan’s preparation, an estimate of the population exposed to flooding was created using a GIS overlay of existing DFIRMs on potentially flooded parcels. The flood-impacted population for each jurisdiction in the county was then calculated by taking the number of Residential parcel units in the 1% annual chance and 0.2% annual chance floodplains and multiplying that number by the average household size based on the Census Bureau’s estimate for the county. GIS analysis was used to estimate Converse County’s potential property and economic

losses. The parcel layer was used as the basis for the inventory of developed parcels. Parcel boundaries with assessor attributes merged into the layer were converted into centroids to represent building locations. For the purposes of this analysis, the flood zone that intersected the parcel centroids were assigned the flood zone for the entire parcel. In some cases, there are parcels in multiple flood zones, such as Zone A and X500. Another assumption with this model is that every parcel with an improvement value greater than zero was assumed to be developed in some way. Only improved parcels, and the value of those improvements, were analyzed and aggregated by jurisdiction, property type and flood zone. The summarized results for the planning area are shown below

Table 4.32 through Table 4.34 show the count and improved value of parcels in the planning area, broken out by each jurisdiction, that fall in a floodplain, by FEMA DFIRM 1% annual chance flood and 0.2% annual chance flood and Hazus 1% annual chance. The tables also show loss estimate values which are calculated based upon the improved value and estimated contents value. The estimated contents value for a Residential Property is 50% of the improved value (150% for Industrial and 100% all other non-residential properties); the total exposure is the sum of the improved and estimated contents values; the loss estimate is 25% of the total value based on FEMA’s depth-damage loss curves. For example, a two-foot flood generally results in about 25% damage to the structure (which translates to 25% of the structure’s replacement value).

Based on this analysis, the planning area has significant assets at risk to the 100-year and greater floods. There are 239 structures within the FEMA and Hazus 100-year floodplain (1% annual chance) for a total improved value of \$47M. There are 274 structures within the 500-year floodplain (0.2% annual chance) for a total value of \$42M. Overall, Converse County potentially faces almost \$19 million in losses from flooding.

**Table 4.32: Converse County FEMA/Hazus 1% Annual Chance Flood Hazards**

Jurisdiction	Property Type	Parcel Count	Improved Value	Est. Content Value	Total Exposure	Potential Loss	Population
Unincorporated	Agricultural	46	\$13,907,736	\$13,907,736	\$27,815,472	\$6,953,868	0
	Commercial	4	\$4,945,256	\$2,472,628	\$7,417,884	\$1,854,471	0
	Residential	106	\$20,515,693	\$10,257,846	\$30,773,539	\$7,693,385	269
	<b>Total</b>	<b>156</b>	<b>\$39,368,685</b>	<b>\$26,638,210</b>	<b>\$66,006,895</b>	<b>\$16,501,724</b>	<b>269</b>

Source: FEMA NFHL, HAZUS-MH MR2, Wood analysis based on Assessor’s Office data 2017

**Table 4.33: Douglas FEMA 1% Annual Chance Flood Hazards**

Jurisdiction	Property Type	Parcel Count	Improved Value	Est. Content Value	Total Exposure	Potential Loss	Population
Douglas	Commercial	5	\$1,020,034	\$1,020,034	\$2,040,068	\$510,017	0
	Residential	51	\$4,552,469	\$2,276,234	\$6,828,703	\$1,707,176	130
	<b>Total</b>	<b>56</b>	<b>\$5,572,503</b>	<b>\$3,296,268</b>	<b>\$8,868,771</b>	<b>\$2,217,193</b>	<b>130</b>

Source: FEMA NFHL, Wood analysis based on Assessor’s Office data 2017

**Table 4.34: Glenrock 1% FEMA Annual Chance Flood Hazards**

Jurisdiction	Property Type	Parcel Count	Improved Value	Est. Content Value	Total Exposure	Potential Loss	Population
Glenrock	Commercial	2	\$177,586	\$177,586	\$355,172	\$88,793	0
	Residential	25	\$1,863,055	\$931,527	\$2,794,582	\$698,646	64
	<b>Total</b>	<b>27</b>	<b>\$2,040,641</b>	<b>\$1,109,113</b>	<b>\$3,149,754</b>	<b>\$787,439</b>	<b>64</b>

Source: FEMA NFHL, Wood analysis based on Assessor's Office data 2017

As demonstrated in Table 4.36 and Table 4.37, there are \$17.9 million in damages resulting from the 0.2% annual chance flood. The City of Douglas and the Unincorporated County are the only areas with 0.2% annual chance flood areas, with a total of 274 buildings impacted.

**Table 4.35: Douglas 0.2% Annual Chance Flood Hazards**

Jurisdiction	Property Type	Parcel Count	Improved Value	Est. Content Value	Total Exposure	Potential Loss	Population
Douglas	Commercial	50	\$11,902,160	\$11,902,160	\$23,804,320	\$5,951,080	0
	Exempt	5	\$1,013,168	\$1,013,168	\$2,026,336	\$506,584	0
	Industrial	1	\$68,156	\$102,234	\$170,390	\$42,598	0
	Residential	217	\$30,222,018	\$15,111,009	\$45,333,027	\$11,333,257	551
	<b>Total</b>	<b>273</b>	<b>\$43,205,502</b>	<b>\$28,128,571</b>	<b>\$71,334,073</b>	<b>\$17,833,518</b>	<b>551</b>

Source: FEMA NFHL, Wood analysis based on Assessor's Office data 2017

**Table 4.36: Converse County 0.2% Annual Chance Flood Hazards**

Jurisdiction	Property Type	Parcel Count	Improved Value	Est. Content Value	Total Exposure	Potential Loss	Population
Unincorporated	Commercial	1	\$59,828	\$59,828	\$119,656	\$29,914	0
	<b>Total</b>	<b>1</b>	<b>\$59,828</b>	<b>\$59,828</b>	<b>\$119,656</b>	<b>\$29,914</b>	<b>0</b>

Source: FEMA NFHL, Wood analysis based on Assessor's Office data 2017

GIS analysis of flood hazards in Converse County indicates that there are 41 critical facilities and/or community assets that are potentially exposed to 1% and 0.2% annual chance flood hazards. There are 40 facilities in the 100-year floodplain and 1 in the 500-year. Beyond the unincorporated county, Douglas is the only jurisdiction in the county with critical facilities (3) located within the floodplain. The tables below summarize the facilities that are potentially at risk.

**Table 4.37: Critical Facilities within FEMA/Hazus 1% Annual Chance Flood Hazards**

Jurisdiction	Critical Facility Type	Facility Count
Douglas (FEMA)	Transportation and Lifeline Facilities	3
Unincorporated (FEMA)	High Potential Loss Facility	1
	Transportation and Lifeline Facilities	25
Unincorporated (Hazus)	Transportation and Lifeline Facilities	11
<b>Total</b>		<b>40</b>

Source: Converse County GIS, HSIP, FEMA, HAZUS

**Table 4.38: Critical Facilities within 0.2% Chance FEMA Flood Zone**

Jurisdiction	Critical Facility Type	Facility Count
Douglas	High Potential Loss Facility	1
<b>Total</b>		<b>1</b>

Source: Converse County GIS, HSIP, FEMA, HAZUS

Natural resources are generally resistant to flooding except where natural landscapes and soil compositions have been altered for human development or after periods of previous disasters such as drought and fire. Wetlands, for example, exist because of natural flooding incidents. Areas that are no longer wetlands may suffer from oversaturation of water, as will areas that are particularly impacted by drought. Areas recently suffering from wildfire damage may erode because of flooding, which can permanently alter an ecological system.

Tourism and outdoor recreation is an important part of the County’s economy. If part of the planning area were damaged by flooding, tourism and outdoor recreation could potentially suffer.

### Future Development

For NFIP participating communities, floodplain management practices implemented through local floodplain management ordinances should mitigate the flood risk to new development in floodplains.

### Summary

Overall, flooding presents a **medium risk** for Converse County. Flooding has damaged homes, infrastructure (roads and bridges), and caused agricultural losses in the planning area in the past. Flood risk varies by jurisdiction.

**Table 4.39: Flood Hazard Risk Summary**

	Geographic Extent	Potential Magnitude	Probability of Future Occurrence	Overall Significance
Douglas	Significant	Critical	Likely	Medium
Glenrock	Limited	Limited	Likely	Medium
Rolling Hills	Limited	Limited	Likely	Medium

Lost Springs	Limited	Limited	Likely	Medium
Converse County	Significant	Critical	Likely	Medium

### 4.3.6 Hazardous Materials

#### Hazard Description

Generally, a hazardous material is a substance or combination of substances which, because of quantity, concentration, or physical, chemical, or infectious characteristics, may either (1) cause or significantly contribute to, an increase in mortality or an increase in serious, irreversible, or incapacitating reversible, illness; or (2) pose a substantial present or potential hazard to human health or environment when improperly treated, stored, transported, disposed of, or otherwise managed. Hazardous material incidents can occur while a hazardous substance is stored at a fixed facility, or while the substance is being transported.

The U.S. Department of Transportation, U.S. Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA) all have responsibilities regarding hazardous materials and waste.

The U.S. Department of Transportation has identified the following classes of hazardous materials:

- Explosives
- Compressed gases: flammable, non-flammable compressed, poisonous
- Flammable liquids: flammable (flashpoint below 141 degrees Fahrenheit) combustible (flashpoint from 141 - 200 degrees)
- Flammable solids: spontaneously combustible, dangerous when wet
- Oxidizers and organic peroxides
- Toxic materials: poisonous material, infectious agents
- Radioactive material
- Corrosive material: destruction of human skin, corrodes steel

#### Geographical Areas Affected

Hazmat incidents can occur at a fixed facility or during transportation. Hazardous materials facilities are identified and mapped by the counties they reside in, along with the types of materials stored there. Some facilities contain extremely hazardous substances; these facilities are required to generate Risk Management Plans (RMPs), and resubmit these plans every five years.

Hazardous materials routes are also present in the County. Interstate 25 goes directly through the county and the Glenrock metropolitan area. Major rail lines run through the county as well, and can convey hazardous materials. Generally, any infrastructure or populations located within a half mile of a hazardous materials route or fixed facility can be considered at elevated risk for impacts from a hazmat incident.

A 2017 commodity flow study conducted by the University of Wyoming Department of Civil and Architectural Engineering examined HAZMAT traffic from four different study locations. Using data from the 2015 Wyoming Vehicle Miles Report a monthly average daily traffic (MADT) was calculated for each of the study locations. HAZMAT truck percentages are based on the percentage of HAZMAT trucks counted during field data collection. Using the estimated number of HAZMAT trucks per day, the study went on to calculate the potential range of hazardous materials transported by different truck body configurations (straight truck, truck-trailer, and multi-trailer).

Total min amount = MADT × % of trucks × % of HAZMAT trucks × body config. × min capacity  
 Total max amount = MADT × % of trucks × % of HAZMAT trucks × body config. × max capacity

The study was conducted in Natrona County, and data was collected from four different locations along I-25 and Highway 220. Three out of four sites are not relevant to Converse County; however, one of the observation points was located along I-25, east of Casper. Though the assessment is focused in Natrona County, it can be presumed that the results can be extrapolated because the transport of hazardous materials is in close proximity to the survey point and the flow of materials will likely pass along I-25 through western Converse County. Table 4.40 displays the minimum and maximum amount of hazardous materials transported along this route.

**Table 4.40 HAZMAT Traffic Assessment in Converse County**

Study Location	Monthly Average Daily Traffic	% of Truck	% of HAZMAT Trucks	Monthly Average Number of HAZMAT trucks per day	Total Amount (US gallons/day) Min/Max
I-25 East of Casper MP 182.06	8,188	17.9%	12.7%	186	1,131,353/2,061,772

The estimated minimum/maximum amounts of the transported HAZMATs was 1,131,353/2,061,772 US gallons/day for I-25 south of Casper. It should be noted that these numbers were estimated without taking seasonal variation into account due to lack of seasonal factors for HAZMAT transportation in Wyoming.

Data analysis showed that the most common HAZMAT class being transported is class 3, which is flammable liquids. Accordingly, it would indicate that the most likely HAZMAT incident could happen would involve a class 3 HAZMAT of flammable liquids. Flammable liquids (Class 3) HAZMAT has the highest percentage among the transported HAZMAT classes. It represents 78.5% from the survey location, averaged for both directions.

According to data from the Environmental Protection Agency posted by the Right to Know Network ([www.rtknet.org](http://www.rtknet.org)), there are six RMP 73 facilities in the Douglas area and two in Glenrock. There have been four 5-year accidents, three of which were associated with the Douglas Gas Plant. These accidents caused one injury and no reported property damage. No additional information about toxic or flammable chemicals in processes was provided.

The State of Wyoming had 63 RMP facilities as of October 24, 2009. ([www.rtknet.org](http://www.rtknet.org)). The amount of property damage from 5-year accidents across the state at that time was \$73,598,500.

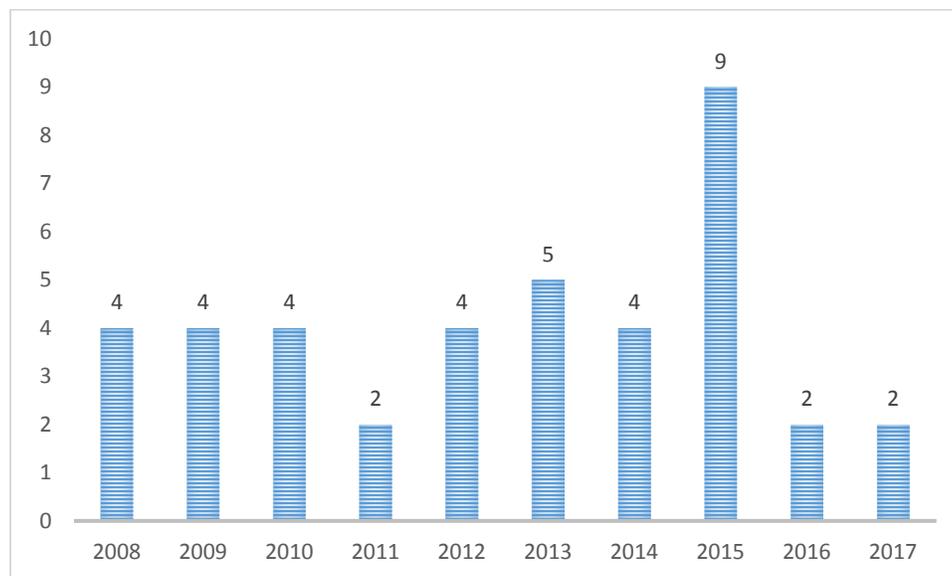
As a rough measure, this figure divides out to \$1,168,222 per facility. Converse County has seven RMP facilities so applying this per facility figure to the seven facilities in Converse County would produce a damage estimate of \$9,345,777 in property damage over a five-year period. Of course, the facilities in the county may not have this level or spills or releases but just one very serious event could cost in the millions of dollars when clean-up, property and resource damage, and interruption of production and commerce are factored in.

## Past Occurrences

There are a variety of mechanisms to get an idea of the number and types of historical hazardous materials spills in Converse County. One such repository is the catalog of hazardous materials spill and accident reports at the National Response Center (NRC) as part of the Right to Know Network (RTK NET). The figure below shows a ten-year record for reported incidents in Converse County.

Converse County has seen a relatively stable rate of occurrence of hazardous material incidents. There have been 40 hazardous materials incidents recorded between 2008 and 2017. Between 2007 and 2017, the average number of events per year was four. The following figure shows trends in hazardous material spill occurrences by year. 2015 recorded the highest number of incidents (15), while there were only two accidents noted for 2017, 2016 and 2011.

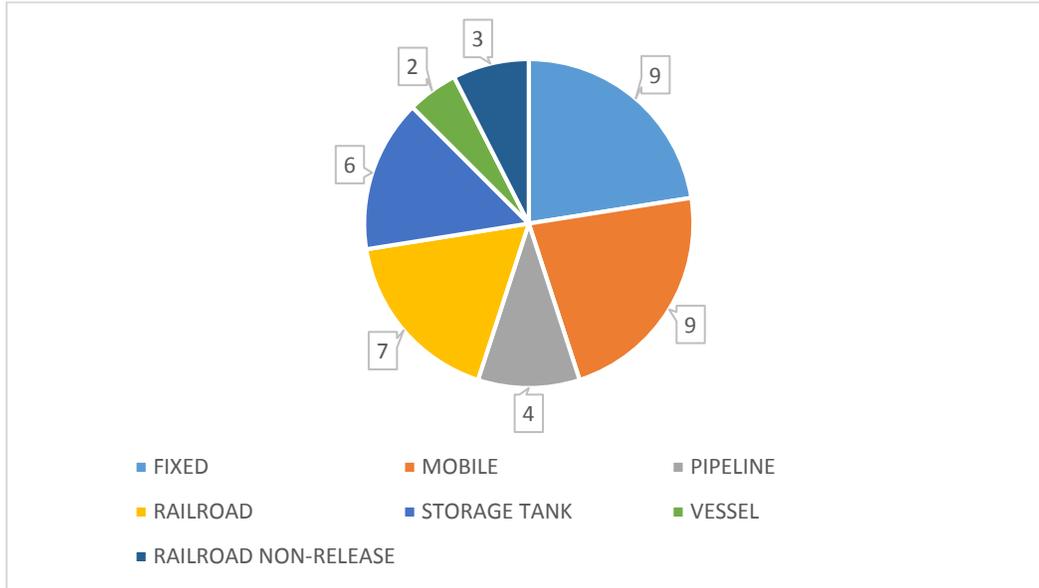
**Figure 4-19: Hazardous Materials Spills/Accidents Reported to the NRC 2008-2017**



Source: National Response Center

According to the NRC site, the incident types with the highest rates of reports were fixed-site incidents (9) and mobile incidents (9); together, incidents of these types made up 45% of total incidents reported.

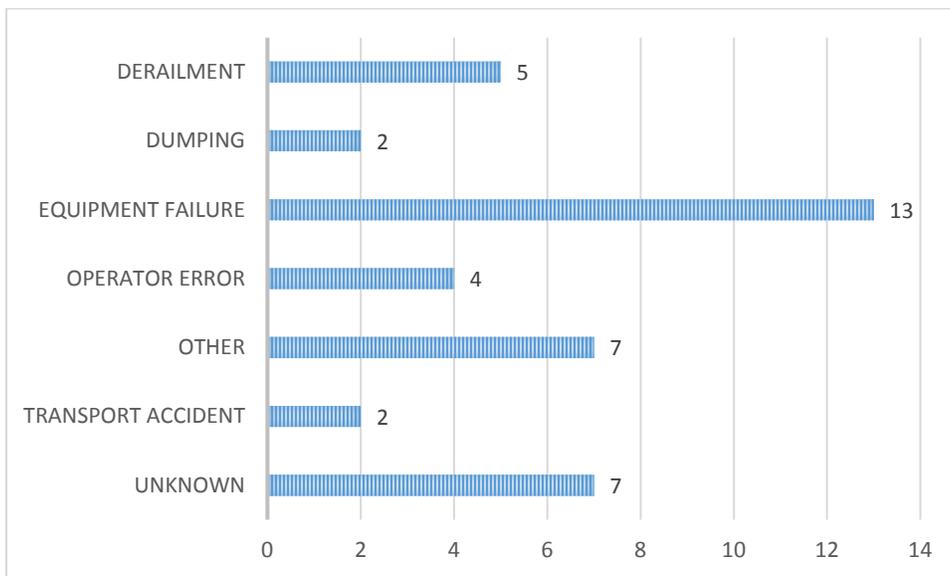
**Figure 4-20: Hazardous Materials Spills/Accidents by Type 2008-2017**



Source: National Response Center

Equipment failure was by far the most prevalent cause for hazardous materials spills and accidents in Converse County. Operator error, derailment, transport accident, and dumping were also responsible for spills reported in the County. The figure below shows incidents by cause in the County between 2008 and 2017.

**Figure 4-21: Hazardous Materials Spills/Accidents by Cause 2008-2017**



Source: National Response Center

According to the data, the City of Douglas experienced the highest number of incidents with 20, followed by Bill and Glenrock, both with 5. McKinley/Ammon, Rolling Hills, and Shawnee also experienced hazardous materials incidents, but at a much lower rate. These numbers are detailed in Table 4.41 below.

**Table 4.41: Hazardous Materials Incidents by Community 2008-2017**

Nearest City	Incidents
Bill	5
Douglas	20
Glenrock	5
Mckinley/Ammon	1
Rolling Hills	1
Shawnee	4
Unidentified	4
Total	40

Source: National Response Center

In addition to local first responders, eight Regional Emergency Response Teams across the State of Wyoming respond to a variety of incidents, including those incidents involving hazardous materials. Converse County is serviced by the Region 2 RERT, located in Casper. The following table shows records of Region 2 RERT mission assignments pertaining to hazardous materials releases, according the 2016 Wyoming State Hazard Mitigation Plan. It should be noted that this data is *regional*, not county-specific.

**Table 4.42: Region 2 RERT Mission Assignments – Hazardous Materials: 2004-2015**

Type	Number
Fixed Facility	5
Truck/Highway	16
Rail	-
Pipeline	-
Aircraft	2
Orphan Drum	1
Total	24

Source: 2016 Wyoming State Hazard Mitigation Plan

### Likelihood of Future Occurrence

According to National Response Center data, Converse County experiences multiple hazardous materials incidents each year; there is a 100% chance that the County will experience a hazardous materials incident in any given year.

### Potential Magnitude

Impacts that could occur from hazardous waste spills or releases include:

- Injury
- Loss of life (human, livestock, fish and wildlife)
- Evacuations

- Property damage
- Air pollution
- Surface or ground water pollution/contamination
- Interruption of commerce and transportation

Numerous factors go into the ultimate impacts of a hazardous materials release, including method of release, the type of material, location of release, weather conditions, and time of day. This makes it difficult to nail down precise impacts. Hazardous materials found in the County will have at least one of the impacts listed above, and probably more.

Historical data doesn't provide much to go on, as NRC data doesn't record any fatalities, injuries or economic impacts from hazardous materials incidents in the last ten years.

### Vulnerability Assessment

Converse County and many of the municipalities have energy pipelines, Interstate and state highways, and railroad tracks which carry many types of hazardous materials. A variety of hazardous materials originating in the County or elsewhere are transported along these routes, and could be vulnerable to accidental spills. Consequences can vary depending on whether the spill affects a populated area vs an unpopulated but environmentally sensitive area.

Because of the volatility of some hazardous materials and the increased risk they pose to the facility and the surrounding area, the 1990 Clean Air Act requires facilities that use extremely hazardous substances to develop a Risk Management Plan (RMP). These plans help local fire, police and emergency response personnel prepare for and respond to chemical emergencies. There are eight RMP facilities located in Converse County, as noted in the following table.

**Table 4.43: RMP Facilities in Converse County**

Community	Number of Facilities
Douglas	6
Glenrock	2
Rolling Hills	0
Lost Springs	0
<b>Total</b>	<b>8</b>

Source: <http://www.rtknet.org>

Potential losses can vary greatly for hazardous material incidents. For even a small incident, there are cleanup and disposal costs. In a larger scale incident, cleanup can be extensive and protracted. There can be deaths or injuries requiring doctor's visits and hospitalization, disabling chronic injuries, soil and water contamination can occur, necessitating costly remediation. Evacuations can disrupt home and business activities. Large-scale incidents can easily reach \$1 million or more in direct damages.

## Future Development

Fixed facilities with hazardous materials are identified and mapped. Transportation routes are also identified. Considerations should be given to hazardous materials when new development is planned to ensure that high concentrations of vulnerable populations are not located nearby (e.g. schools and nursing homes). If an uptick in oil and gas development and extraction occurs, this could result in greater exposure for transportation incidents.

## Summary

Converse County is at **moderate** risk to hazardous materials spills. Due to proprietary restrictions, it is difficult to monitor the transportation of hazardous materials. Loss estimations indicate that the seven facilities in Converse County would produce a damage estimate of \$9,345,777 in property damage over a five-year period. With 40 hazardous materials incidents occurring between 2008 and 2017, it should be expected that there would be four events each year.

**Table 4.44: Hazardous Materials Hazard Risk Summary**

	Geographic Extent	Potential Magnitude	Probability of Future Occurrence	Overall Significance
Douglas	Significant	Limited	Highly Likely	Medium
Glenrock	Significant	Limited	Highly Likely	Medium
Rolling Hills	Negligible	Limited	Likely	Medium
Lost Springs	Negligible	Limited	Likely	Medium
Converse County	Negligible	Limited	Likely	Medium

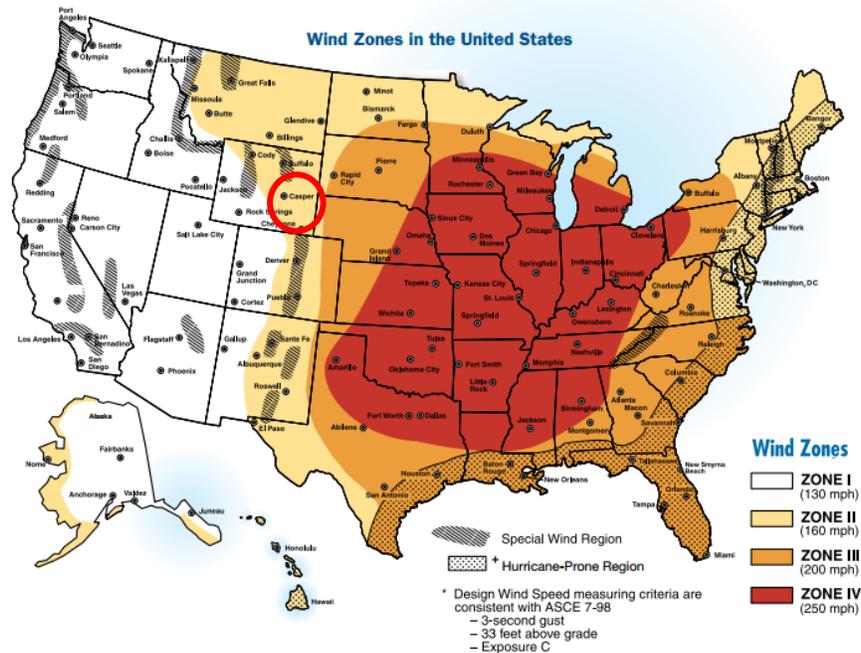
### 4.3.7 High Winds and Downbursts

#### Hazard Description

Wind, because of its constant presence in Wyoming, can be overlooked as a hazard. Upon analysis, wind can be a damage-inducing hazard and warrants review in the County. Wyoming's wind is also becoming an economic factor as renewable wind energy is developed around the state.

The wind zone map shown below indicates the potential magnitude of wind speeds. Most of the Planning area is in Zone II, which could expect winds up to 160 mph.

Figure 4-22: Wind Zones in the United States

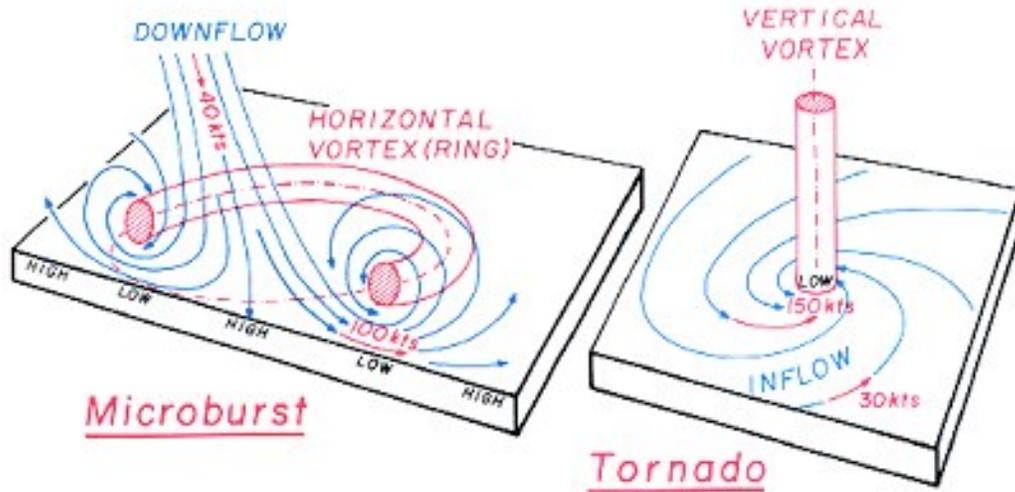


This profile examines the hazard that high winds present including downbursts, a subcategory of high winds. A downburst is a strong down draft which causes damaging winds on or near the ground. Downbursts are much more frequent than tornadoes, and for every one tornado there are approximately 10 downburst damage reports. Downbursts can be associated with either a heavy precipitation or non-precipitation thunderstorm (dry or wet downbursts), and often occur in the dissipation stage of a thunderstorm. Microbursts and macrobursts are categories of downbursts, classified by length of duration, velocity of wind, and radius of impact.

Microbursts generally last between five and 15 minutes, and impact an area less than three miles wide. Macrobursts can last up to 30 minutes with winds up to 130 miles per hour, and can impact areas larger than three miles in radius. Microbursts and macrobursts may induce dangerous wind shears, which can adversely affect aircraft performance, cause property damage and loss of life.

A downburst can occur when cold air begins to descend from the middle and upper levels of a thunderstorm (falling at speeds of less than 20 miles an hour). As the colder air strikes the Earth's surface, it begins to 'roll' outward. As this rolling effect happens, the air expands causing further cooling and having the effect of pulling the shaft of air above it at higher and higher speeds.

**Figure 4-23: Schema of Microburst and Tornado**



Source: [www.erh.noaa.gov](http://www.erh.noaa.gov)

Downbursts can be mistaken for tornadoes by those that experience them since damages and event characteristics are similar. Tornado winds can range from 40 mph to over 300 mph. Downbursts can exceed winds of 165 mph and can be accompanied by a loud roaring sound. Both downbursts and tornadoes can flatten trees, cause damage to homes and upend vehicles. In some instances, aerial surveying is the best method to determine what kind of event has taken place.

In the photograph below, trees are blown down in a straight line - a very strong indication of a downburst as opposed to a tornado.

**Figure 4-24: Aerial Image of Downburst Damage**

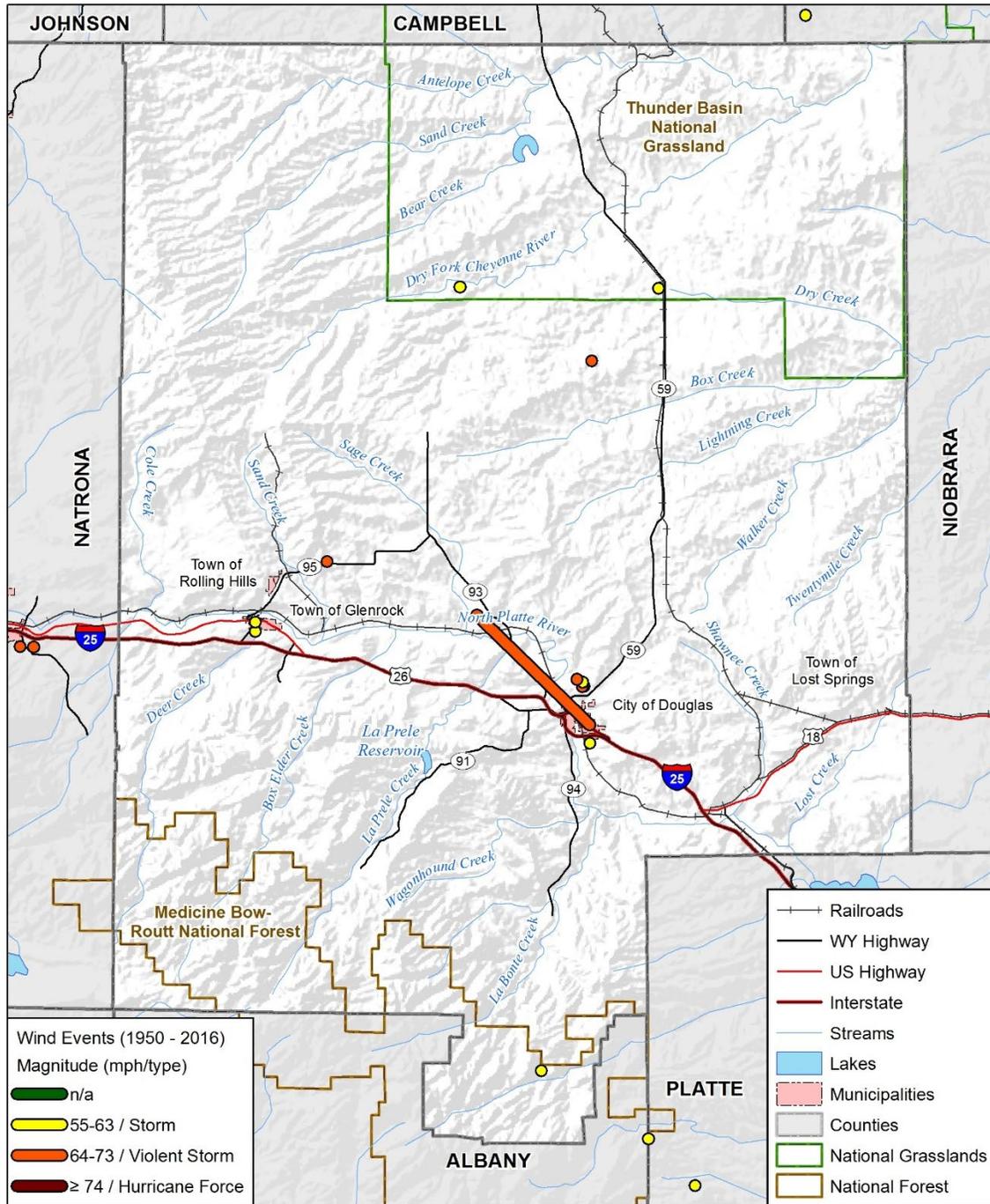


Source: T. Fujita

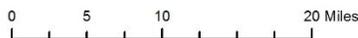
# Geographical Area Affected

Figure 4-25: Historical High Wind Events in Converse County

## Converse County NOAA Wind Events



Map compiled 4/2018;  
 intended for planning purposes only.  
 Data Source: WY Geospatial Hub,  
 WYDOT, HSIP Freedom 2015,  
 NOAA Storm Prediction Center



Winds are not limited to a single geographic area in the County, and can impact anywhere in the planning area.

### Past Occurrences

In the County, most documented wind events causing damage typically range between 50-59 mph; max wind speeds of up to 85 mph have been recorded. It should be noted that the data is limited by what the NCDC is able to record, and what equipment was in place at the time.

High winds are so common in Converse County, and therefore record of occurrence is inconsistent. HMPC members noted a high wind event in 2014 that resulted in tress falling and shingles flying off roofs across the county. Additionally, on October 25, 2017, the winds were so strong that a pickup truck was blown over.

According to the numbers generated by NCDC (detailed in Table 4.45), there has been 98 high wind events in the region, however, none of these events caused any property or crop damage, nor any fatalities/injuries. Though no property damage was reported by NCDC, wind frequently causes damage to structures in Converse County by spreading and catalyzing fire. Additionally, high winds pose a threat to traffic along I-25.

**Table 4.45: Summary of Wind Weather Events and Impacts in Converse County 1996-2015**

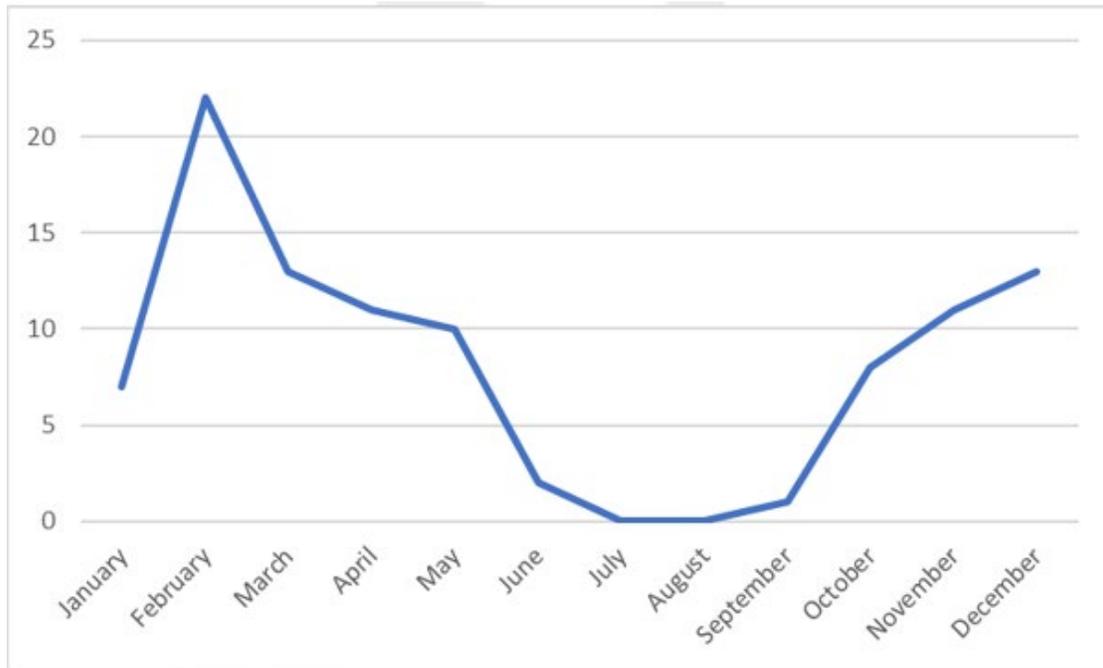
MPH	# of Events	Total Property Damage	Total Crop Damage	Total Fatalities	Total Injuries
30-39	0	0	0	0	0
40-49	35	0	0	0	0
50-59	31	0	0	0	0
60-69	19	0	0	0	0
70-79	12	0	0	0	0
>80	1	0	0	0	0
Total	98	0	0	0	0

Source: National Climatic Data Center

### Likelihood of Future Occurrences

NCDC records 98 confirmed and documented high wind incidents specifically impacting the County since 1996. This means that the region averages about five high wind incidents per year. Based on this data, incidence of recorded events appears to spike between October to February.

**Figure 4-26: High Wind Events by Month for Converse County 1996-2017**



Source: NCDC

### **Vulnerability Assessment**

Vulnerability as it relates to location is mostly random, as damaging winds have occurred everywhere in the County. Damage from high winds is often described in regional or broad areas, but downburst damage will impact a small area most generally less than three miles in diameter. Because state or presidential emergency or disaster declarations have not been necessary in the aftermath of wind events in the County, and because damage to personal property is dealt with by numerous private insurance companies, it is difficult to estimate actual monetary impacts that have occurred due to damaging winds. See section on Potential Losses for loss estimates based on reported damage.

Specific vulnerabilities from high wind events include damage to poorly constructed buildings, building collapse and damage, flying debris, semi rollovers and car accidents, and downed power lines and electric system damage. Cascading hazards caused by high winds can include power loss and hazardous materials spills; depending on the time of year, winds can also exacerbate snow and blizzards by creating deep snow drifts over roads and affecting the normal flow of traffic.

The 2016 Wyoming State Hazard Mitigation Plan lists wind events by county over a period of 55.5 years. Converse County has 84 recorded events, which results in a 100% chance each year, and a Highly Likely probability. According to NCDC recorded events, the annual occurrence rate for significant, high wind in Converse County is about 5 times per year, though none of the previously recorded events had any associated damages.

## Future Development

During the construction period buildings are vulnerable to wind, and construction materials can become airborne if not properly secured. Future residential or commercial buildings built to code should be able to withstand wind speeds of at least 150 miles per hour.

## Summary

Many areas of the United States are prone to damaging wind events, and while Converse County may not be counted in a high category for occurrences across the nation, it does have a history of such episodes which should be anticipated for the future. Primary damage is structural and utility-borne. Although minimal deaths and injuries have been reported, the frequency of occurrence is due consideration, as well as the hazard to rural citizens and town populations from falling trees, power poles, and flying debris.

Photos and scattered reports document property damage (including damage to private utilities) occurring because of wind events, yet cumulative losses due to wind damage have been negligible.

**Table 4.46: High Winds and Downbursts Hazard Risk Summary**

	Geographic Extent	Potential Magnitude	Probability of Future Occurrence	Overall Significance
Douglas	Extensive	Limited	Highly Likely	Medium
Glenrock	Extensive	Limited	Highly Likely	Medium
Rolling Hills	Extensive	Limited	Highly Likely	Medium
Lost Springs	Extensive	Limited	Highly Likely	Medium
Converse County	Extensive	Limited	Highly Likely	Medium

### 4.3.8 Landslide/Rockfall/Debris Flow

#### Hazard Description

A landslide is a general term for a variety of mass movement processes that generate a downslope movement of soil, rock, and vegetation under gravitational influence. Landslides are a serious geologic hazard common to almost every state in the United States. It is estimated that nationally they cause up to \$2 billion in damages and from 25 to 50 deaths annually. Some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly. Gravity is the force driving landslide movement. Factors that allow the force of gravity to overcome the resistance of earth material to landslide include: saturation by water, erosion or construction, alternate freezing or thawing, earthquake shaking, and volcanic eruptions.

Landslides are typically associated with periods of heavy rainfall or rapid snow melt and tend to worsen the effects of flooding that often accompanies these events. In areas burned by forest and brush fires, a lower threshold of precipitation may initiate landslides. Generally significant land

sliding follows periods of above-average precipitation over an extended period, followed by several days of intense rainfall. It is on these days of intense rainfall that slides are most likely.

Areas that are generally prone to landslide hazards include existing old landslides; the bases of steep slopes; the bases of drainage channels; and developed hillsides where leach-field septic systems are used. Landslides are often a secondary hazard related to other natural disasters. Landslide triggering rainstorms often produce damaging floods. Earthquakes often induce landslides that can cause additional damage.

Slope failures typically damage or destroy portions of roads and railroads, sewer and water lines, homes and public buildings, and other utility lines. Even small-scale landslides are expensive due to clean up costs that may include debris clearance from streets, drains, streams and reservoirs; new or renewed support for road and rail embankments and slopes; minor vehicle and building damage; personal injury; and livestock, timber, crop and fencing losses and damaged utility systems.

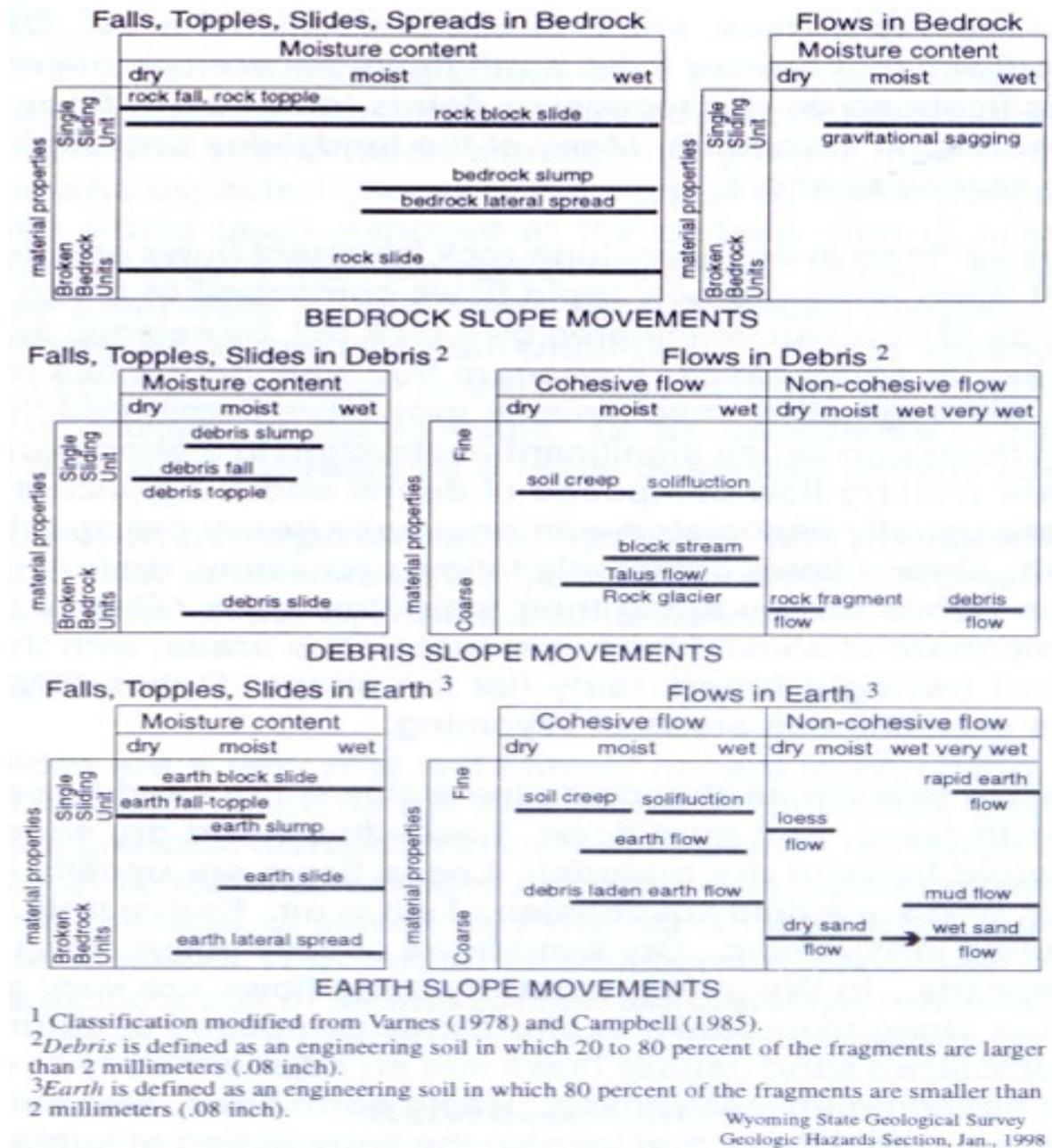
There are many types of landslides present in Wyoming. To properly describe landslide type, the Geologic Hazards Section developed a landslide classification modified from Varnes (1978) and Campbell (1985). As can be seen in Figure 4-25, there are five basic types of landslides that occur in three types of material. Falls, topples, slides, lateral spreads, and flows can occur in bedrock, debris, or earth. While individual landslide types can occur in nature, most landslides are complex, or composed of combinations of basic types of landslides.

### ***Rockfall***

A rockfall is the falling of a detached mass of rock from a cliff or down a very steep slope. Weathering and decomposition of geological materials produce conditions favorable to rockfalls. Rockfalls are caused by the loss of support from underneath through erosion or triggered by ice wedging, root growth, or ground shaking. Changes to an area or slope such as cutting and filling activities can also increase the risk of a rockfall. Rocks in a rockfall can be of any dimension, from the size of baseballs to houses. Rockfall occurs most frequently in mountains or other steep areas during the early spring when there is abundant moisture and repeated freezing and thawing. Rockfalls are a serious geological hazard that can threaten human life, impact transportation corridors and communication systems and result in other property damage.

Spring is typically the landslide/rockfall season in Wyoming as snow melts and saturates soils and temperatures enter freeze/thaw cycles. Rockfall and landslides are influenced by seasonal patterns, precipitation and temperature patterns. Earthquakes could trigger rockfalls and landslides too.

Figure 4-27: Wyoming Landslide Classifications

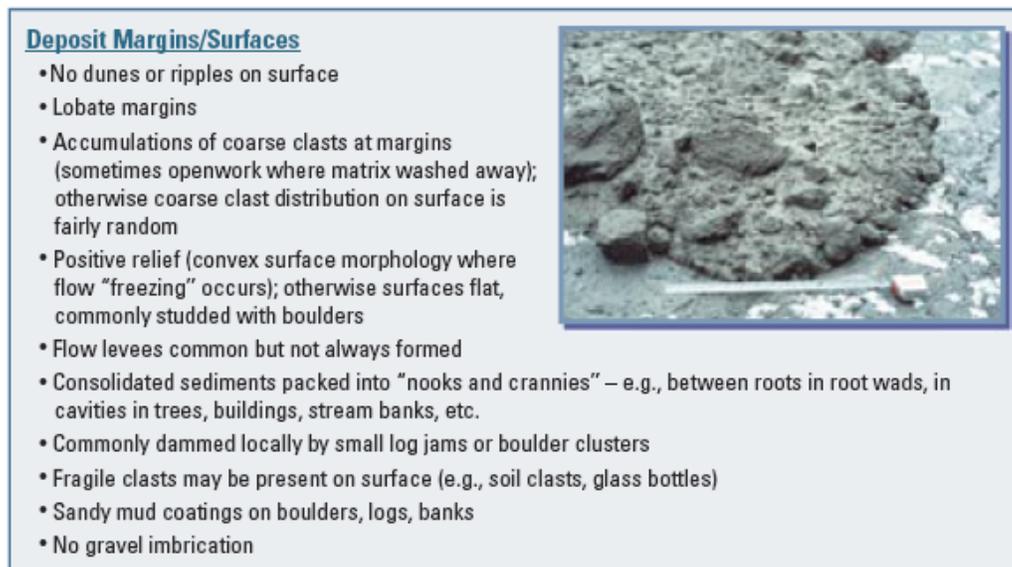


**Debris Flow**

Debris flows, sometimes referred to as mudslides, mudflows, lahars, or debris avalanches, are common types of fast-moving landslides. They are a combination of fast moving water and a great volume of sediment and debris that surges down slope with tremendous force. These flows generally occur during periods of intense rainfall or rapid snowmelt and may occur with little onset warning, similar to a flash flood. They usually start on steep hillsides as shallow landslides that liquefy and accelerate to speeds that are typically about 10 miles per hour, but can exceed 35 miles

per hour. Figure 4-26 describes identifying characteristics of debris flows. The consistency of debris flow ranges from watery mud to thick, rocky mud that can carry large items such as boulders, trees, and cars. Debris flows from many various sources can combine in channels, and their destructive power may be greatly increased. When the flows reach flatter ground, the debris spreads over a broad area, sometimes accumulating in thick deposits that can wreak havoc in developed areas. Mudflows are covered under the National Flood Insurance Program, however landslides are not.

**Figure 4-28: Field Evidence of Debris Flow**



### Geographical Area Affected

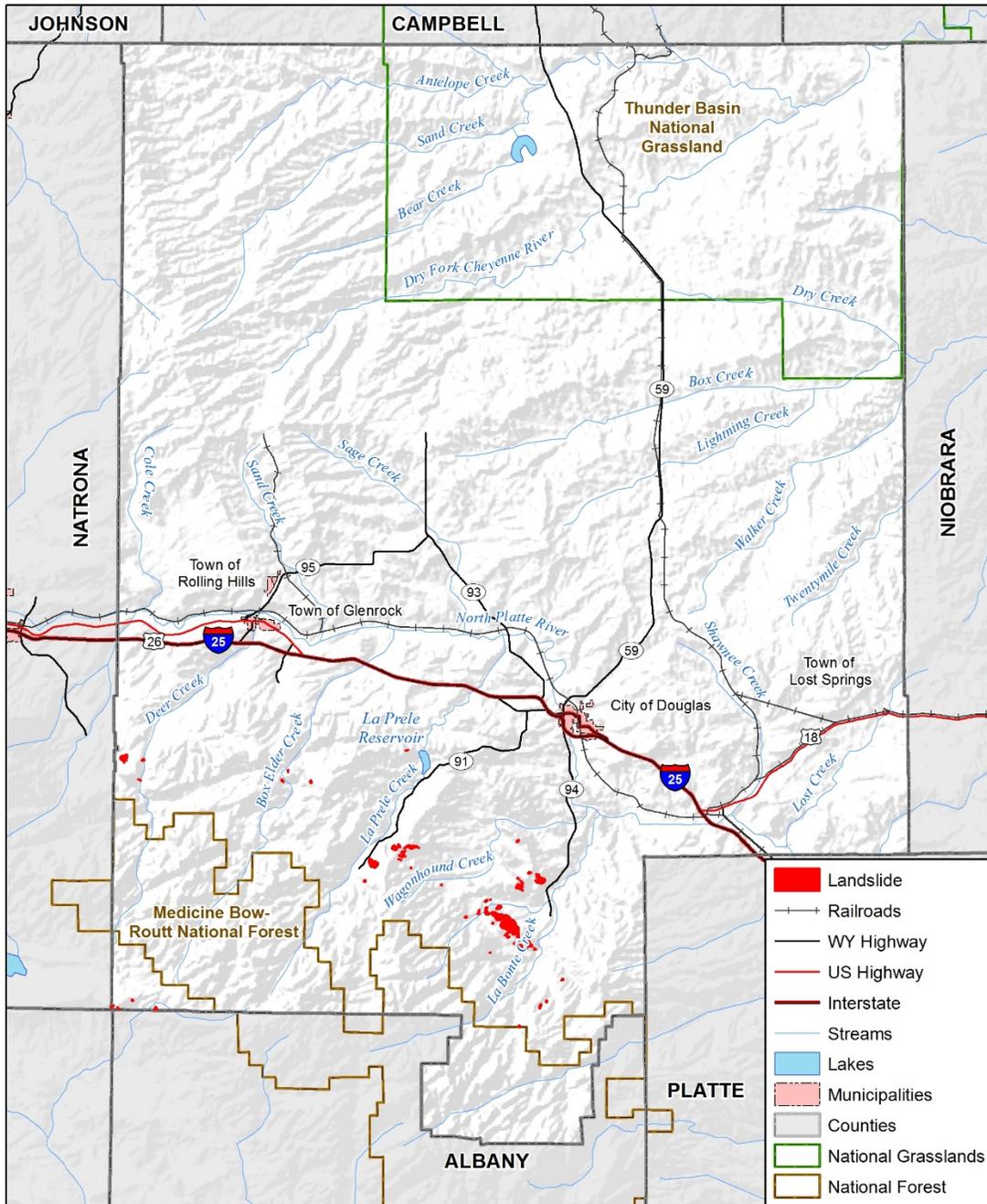
Landslides are one of the most common geologic hazards in Wyoming. However, the geologic conditions of Converse County do not make the area susceptible to landslides, however, subsidence is a concern noted by the HMPC. The issue of subsidence is more significant than the existing mapping data indicates. Glenrock is especially vulnerable to subsidence, and an HMPC member indicated that over 60% of the City is impacted. One pertinent issue facing Glenrock is subsidence as it relates to the mines. Though federal reclamation programs have been instituted, the mines surrounding the Glenrock community are subsiding and prone to flooding. AML Wyoming is now in the area, with one company responsible for roads and another responsible for buildings.

### Past Occurrences

Since landslides, debris flows, and rockfalls occur regularly in Wyoming, previous occurrences are limited to those that caused a high amount of damage or incurred some other cost or unique impact.

Figure 4-29: Historical Landslides in Converse County

## Converse County Landslides



Map compiled 4/2018;  
intended for planning purposes only.  
Data Source: WY Geospatial Hub,  
WYDOT, HSIP Freedom 2015,  
Wyoming State Geological Survey

0 5 10 20 Miles



## Likelihood of Occurrence

The probability of a landslide causing damage in the County is difficult to determine because of the poor historic data. However, given it is reasonable to assume that damaging events have between 10 and 100 percent chance of occurrence in next year, or a recurrence interval of 10 years or less. Therefore, landslides, rockfalls or debris flows are **likely** to occur. Heavy periods of precipitation or significant development could influence slope stability. Typically, there is a landslide/rockfall ‘season’ that coincides with increased freeze-thaw cycles and wetter weather in the spring and early summer.

## Potential Magnitude

There are three measures of future landslide impacts – historic dollar damages, estimated yearly damages, and building exposure values. There are not enough current data to estimate historic or yearly dollar damages. In general terms, landslides can threaten human life, impact transportation corridors and communication systems, and cause damage to property and other infrastructure. Actual losses can range from mere inconvenience to high maintenance costs where very slow or small-scale destructive slides are involved. The potential magnitude of landslides, rockfall and debris flows in the County would be **limited**. However even a small isolated event has potential to close state or US highways in the region that can result in long detours for days or weeks. With the added cost of detours, and the potential for life safety impacts, some landslides could have greater costs.

## Vulnerability Assessment

Wood used GIS to conduct an analysis on potential landslide risk areas in the county. Analysis results indicated that no properties or critical infrastructure intersected map risked areas, meaning no built infrastructure was in areas prone to landslide. Because landslide susceptibility is minimal across the County, the overall vulnerability of population is low. Geologic hazards do not pose a threat to human life in Converse County, however, land subsidence is a significant issue, especially in Glenrock. Current mapping does not accurately reflect subsidence conditions, though HMPC members have noted the high rate of structures located near subsiding land.

Transportation networks are the most exposed aspect of the Planning area to landslide and debris flow incidents. Residents and visitors alike are impacted by landslides when roads are damaged by landslides. This includes Interstate 25, cutting east-west across the County through Glenrock and Rolling Hills, Highway 18, running north through Lost Springs, and State Highway 59, running north-south through Douglas and Bill. The loss of transportation networks could potentially cause secondary damage to the overall County’s infrastructure, including revenue, transportation availability, emergency response mechanisms and other essential capabilities by preventing the means of these resources from activating or moving between locations.

## Future Development

The severity of landslide problems is directly related to the extent of human activity in hazard areas. Human activities such as property development and road construction can also exacerbate the occurrence of landslides. Future development should be done carefully to prevent landslide damage to property or people. Adverse effects can be mitigated by early recognition and avoiding incompatible land uses in these areas or by corrective engineering. Improving mapping and information on landslide hazards and incorporating this information into the development review process could prevent siting of structures and infrastructure in identified hazard areas.

## Summary

Overall, landslides, rockfalls and debris flows range from **low** to **medium** significance hazards in the County. Landslides have the potential for direct property impacts including residential structures but more likely infrastructure corridors including roads and highways, power line corridors, and gas lines.

**Table 4.47: Landslide Hazard Risk Summary**

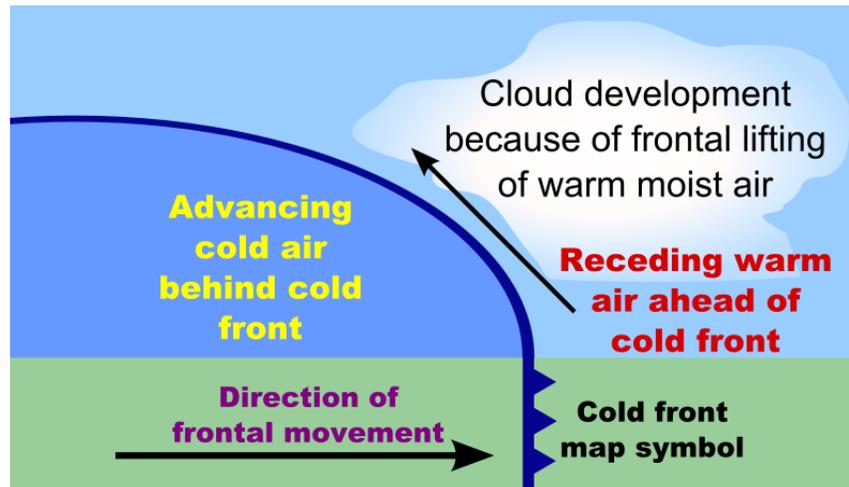
	<b>Geographic Extent</b>	<b>Potential Magnitude</b>	<b>Probability of Future Occurrence</b>	<b>Overall Significance</b>
Douglas	Negligible	Negligible	Unlikely	Low
Glenrock	Significant	Limited	Occasional	Medium
Rolling Hills	Negligible	Negligible	Unlikely	Low
Lost Springs	Negligible	Negligible	Unlikely	Low
Converse County	Negligible	Negligible	Unlikely	Low

### 4.3.9 Severe Thunderstorms (includes Hail and Lightning)

#### Hazard Description

Severe thunderstorms in Converse County are generally characterized by heavy rain, often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. According to the National Weather Service, a thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. This chapter profiles several sub-hazards that can impact the County in diverse ways – monsoon, hail and lightning. Flooding because of the monsoon is addressed in the Flood profile.

**Figure 4-30: Formation of a Thunderstorm**



Source: NASA. [http://rst.gsfc.nasa.gov/Sect14/Sect14\\_1c.html](http://rst.gsfc.nasa.gov/Sect14/Sect14_1c.html)

Thunderstorms result from the rapid upward movement of warm, moist air. They can occur inside warm, moist air masses and at fronts. As the warm, moist air moves upward, it cools, condenses, and forms cumulonimbus clouds that can reach heights of greater than 35,000 feet. As the rising air reaches its dew point, water droplets and ice form and begin falling the long distance through the clouds towards earth's surface. As the droplets fall, they collide with other droplets and become larger. The falling droplets create a downdraft of air that spreads out at Earth's surface and causes strong winds associated with thunderstorms.

The term monsoon generally refers to a seasonal wind shift, or monsoon circulation, that produces a radical change in moisture conditions in a given area or region.

- The movement northward from winter to summer of the huge upper level subtropical high-pressure system, specifically known as the Bermuda High, and
- The intense heating of the Mojave Desert creates rising air and surface low pressure, called a thermal low.

These two features then combine to create a strong southerly flow that helps bring in moisture (i.e., from the Gulf of Mexico, the Gulf of California, and the Pacific Ocean) that lifts and forms thunderstorms when it encounters Wyoming.

### ***Hail***

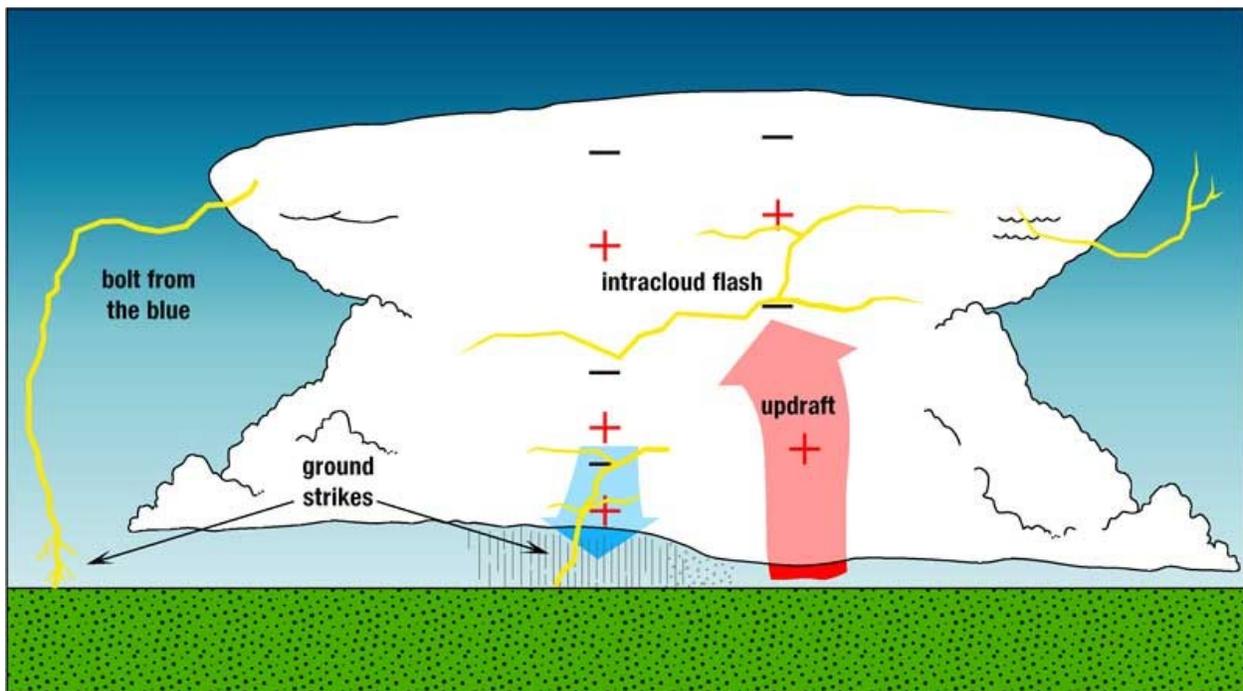
Hail is formed when water droplets freeze and thaw as they are thrown high into the upper atmosphere by the violent internal forces of thunderstorms. Hail is sometimes associated with severe storms within Converse County. Hailstones are usually less than two inches in diameter and can fall at speeds of 120 miles per hour (mph). Severe hailstorms can be quite destructive, causing damage to roofs, buildings, automobiles, vegetation, and crops.

## Lightning

Lightning is defined as any and all of the various forms of visible electrical discharge caused by thunderstorms. Thunderstorms and lightning are usually (but not always) accompanied by rain. Cloud-to-ground lightning can kill or injure people by direct or indirect means. Objects can be struck directly, which may result in an explosion, burn, or destruction. Damage may also be indirect, when the current passes through or near an object, which generally results in less damage.

Cloud-to-ground lightning is the most damaging and dangerous type of lightning. Most flashes originate near the lower-negative charge center and deliver negative charge to earth. However, a large minority of flashes carry positive charge to earth. These positive flashes often occur during the dissipating stage of a thunderstorm's life. Positive flashes are also more common as a percentage of total ground strikes during the winter months. This type of lightning is particularly dangerous for several reasons. It frequently strikes away from the rain core, either ahead or behind the thunderstorm. It can strike as far as 5 or 10 miles from the storm in areas that most people do not consider to be a threat. Positive lightning also has a longer duration, so fires are more easily ignited. And, when positive lightning strikes, it usually carries a high peak electrical current, potentially resulting in greater damage.

**Figure 4-31: Cloud to Ground Lightning**



Source: National Weather Service

## Geographical Area Affected

Thunderstorms are generally expansive in size. The entire county is susceptible to any of the effects of a severe thunderstorm, including monsoon, hail and lightning. The typical thunderstorm is 15 miles in diameter, and lasts 30 minutes. Thunderstorms generally move from west to east across the county.

## Extent

The National Weather Service classifies hail by diameter size, and corresponding everyday objects to help relay scope and severity to the population. The table below indicates the hailstone measurements utilized by the National Weather Service.

**Table 4.48: Hailstone Measurements**

Average Diameter	Corresponding Household Object
.25 inch	Pea
.5 inch	Marble/Mothball
.75 inch	Dime/Penny
.875 inch	Nickel
1.0 inch	Quarter
1.5 inch	Ping-pong ball
1.75 inch	Golf-Ball
2.0 inch	Hen Egg
2.5 inch	Tennis Ball
2.75 inch	Baseball
3.00 inch	Teacup
4.00 inch	Grapefruit
4.5 inch	Softball

Source: National Weather Service

Damaging hail events occur sporadically throughout the County, usually associated with severe summer storms and wind events. Hail up to 3 inches in diameter has been recorded by the NCDC in Converse County

Lightning is measured by the Lightning Activity Level (LAL) scale, created by the National Weather Service to define lightning activity into a specific categorical scale. The LAL is a common parameter that is part of fire weather forecasts nationwide. The LAL is reproduced below and the planning area is susceptible to all levels:

**Table 4.49: Lightning Activity Level Scale**

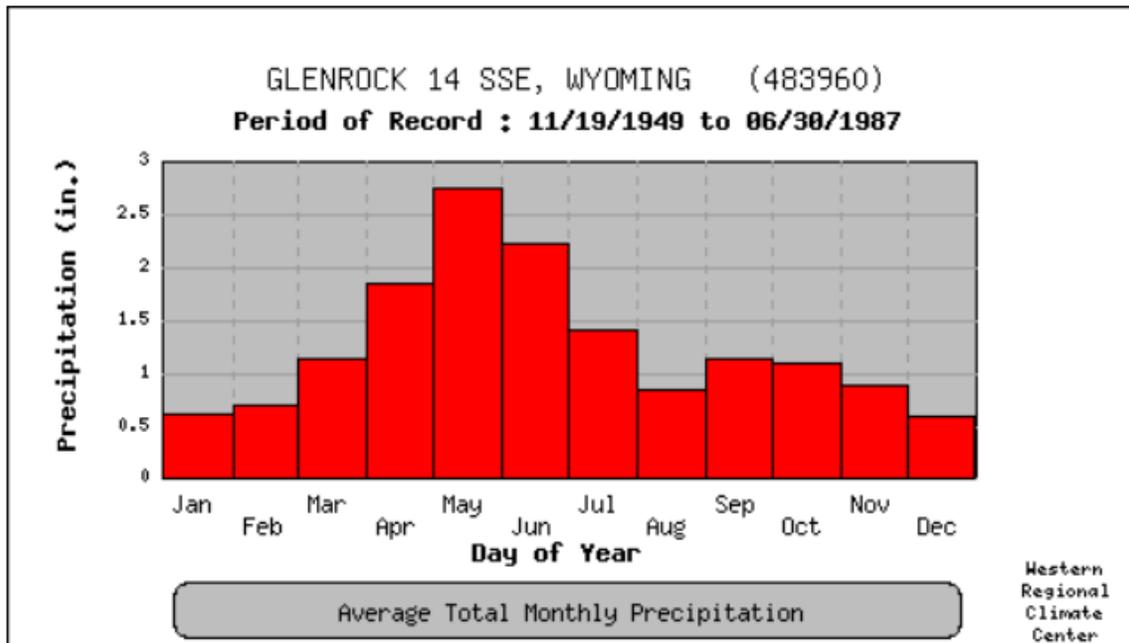
Level	Description
LAL 1	No thunderstorms
LAL 2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 clouds to ground strikes in a five-minute period
LAL 3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 clouds to ground strikes in a five-minute period.
LAL 4	Scattered thunderstorms. Moderate rain is commonly produced. Lightning is frequent, 11 to 15 clouds to ground strikes in a five-minute period.
LAL 5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 clouds to ground strikes in a five-minute period.
LAL 6	Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag warning.

Source: National Weather Service. Converse County is at risk to experience lightning in any of these categories.

**Previous Occurrences**

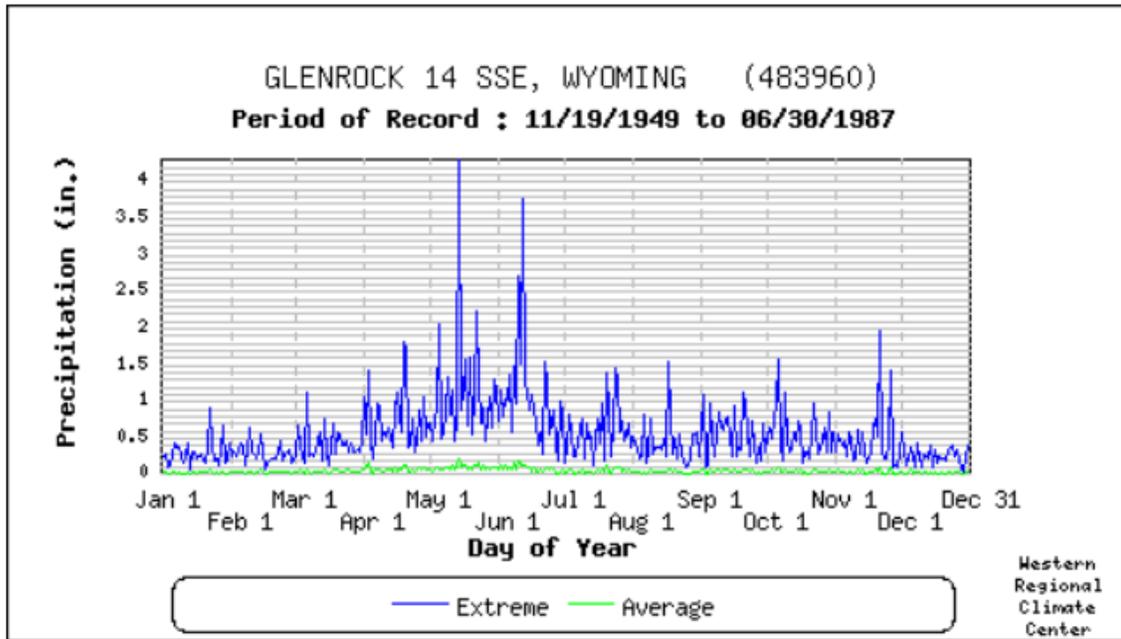
Average monthly precipitation totals for Converse County are shown in Figure 4-29. Precipitation extremes for the County are shown in Figure 4-30. Many of these extremes have occurred between April and July.

**Figure 4-32: Converse County Monthly Average Total Precipitation (Glenrock Coop Station)**



Source: Western Regional Climate Center

**Figure 4-33: Converse County Daily Precipitation Ave. & Extremes (Glenrock Coop Station)**



Source: Western Regional Climate Center

Heavy rain, thunderstorms, lightning, and hail in the County are many in number and occur on a yearly basis. The NCDC has not recorded a heavy rain incident between 1960 and 2015.

**Hail**

NCDC records any hail events with hailstones that are .75 inch or larger in diameter, or any hail of a smaller diameter which causes property and/or crop damage, or casualties. According to the NCDC definition, there have been 90 separate hail incidents in the County since 1985. The cumulative hail incidents had a total recorded property damage of \$60,000. No deaths and one injury have been associated with these storms in the region during this timeframe. Statewide, four injuries have been reported since 1985. Most hail-related injuries are minor and go unreported.

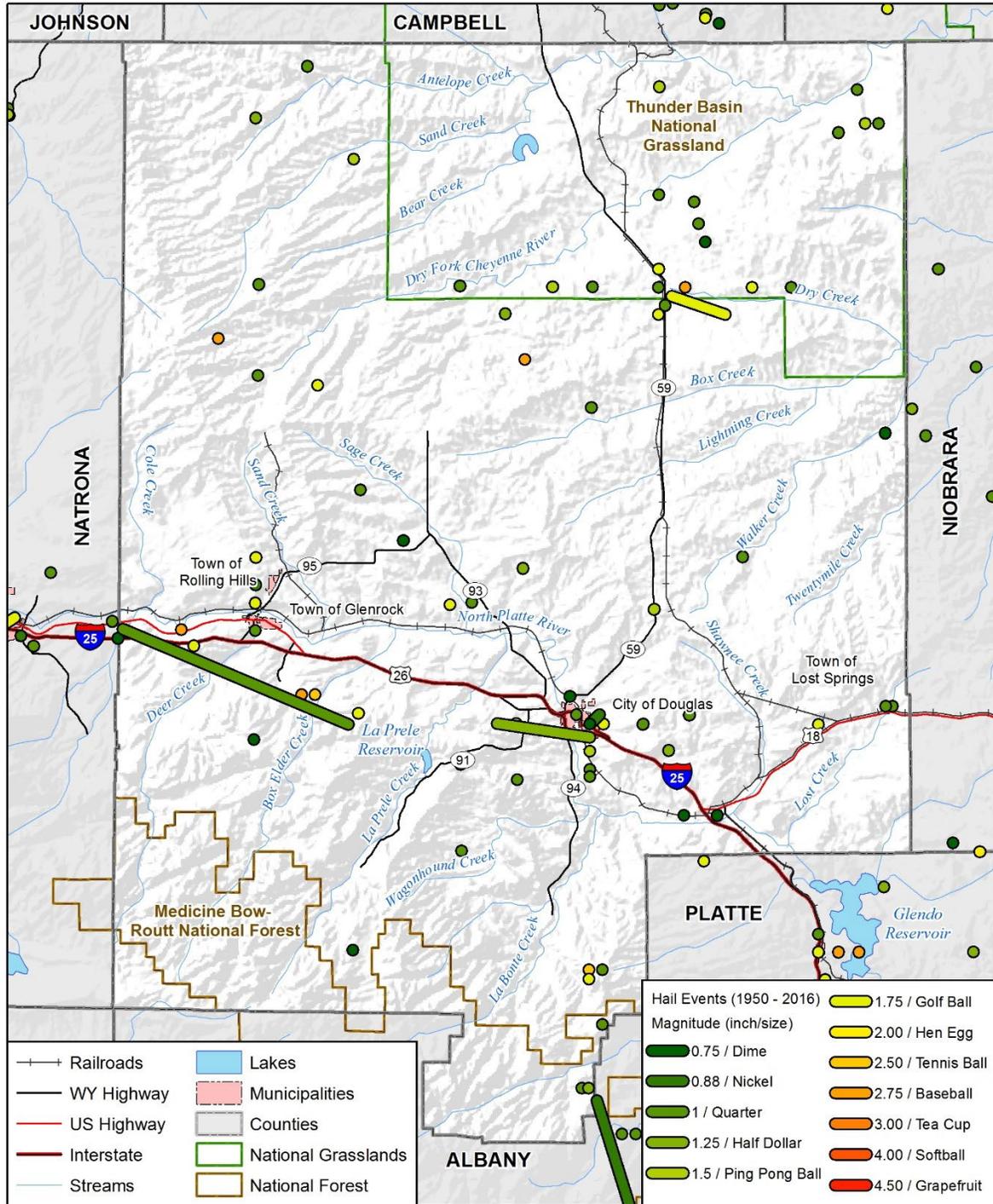
**Table 4.50: Converse County Hail History with Impacts 1955-2015**

Location	Date	Time	Hail Size	Deaths	Injuries	Property Damage	Crop Damage
Unincorporated	8/18/1989	6:45pm	0.75 in	0	1	\$0	0
Douglas	8/15/1996	3:20pm	1.75 in	0	0	\$30,000	0
Glenrock	8/19/1997	4:20am	1.75 in	0	0	\$2,000	0
Glenrock	8/29/1997	3:30pm	1.75 in	0	0	\$2,000	0
Douglas	7/1/1998	10:00pm	2.75 in	0	0	\$7,000	0
Bill	7/1/1998	10:34pm	1.75 in	0	0	\$4,000	0
Douglas	7/12/2009	5:30pm	1.25 in	0	0	\$15,000	0

Source: National Climactic Data Center

Figure 4-34: Historical Hail Events in Converse County

## Converse County NOAA Hail Events



Map compiled 4/2018;  
intended for planning purposes only.  
Data Source: WY Geospatial Hub,  
WYDOT, HSIP Freedom 2015,  
NOAA Storm Prediction Center

0 5 10 20 Miles



Historically, seven of the 103 NCDC recorded incidents had some level of recorded impact. While most storms don't have much impact, history shows a few outliers, summarized below:

**August 19, 1997**—A few golf ball sized hailstones accompanied by a large amount of pea size stones caused \$2,000 worth of property damage to structures in Glenrock.

**July 1, 1998**—A storm produced golf ball to baseball size hail, which covered the ground, on several ranches 40 miles northwest of Douglas. Additionally, this same storm produced golf ball size hail in the eastern portion of the County, seven miles east of Bill.

**July 12, 2009**—The County's costliest hail event occurred when a couple of severe thunderstorms produced large hail and some flooding in Douglas. Strong wind gusts were also reported, with trees damaged or down, and some car windows broken.

Beyond the data supplied by NCDC, members of the HMPC provided anecdotal reports of recent hail events. Not listed in NCDC was hail storms in '96 (Glenrock), August '07 (entire County), and June '17 (entire County).

### **Lightning**

Vaisala's National Lightning Detection Network (NLDN) recorded 347,035 clouds to ground lightning flashes in Wyoming in 2015; they also record an average of 279,632 cloud to ground lightning flashes per year between 2006 and 2015 for the state. This ranks Wyoming 39<sup>th</sup> nationally for flashes per square mile, averaging 2.9 cloud to ground lightning flashes per square mile, per year.

Nationally, Wyoming ranks 36th in number of lightning fatalities, 33rd in injuries, and 40th in property damage from 1959 to 1994 according to the National Oceanic and Atmospheric Administration, National Severe Storms Laboratory (NOAA, NSSL). Wyoming is number one in the nation in lightning deaths per capita according to the National Weather Service in Salt Lake City. According to the NCDC, lightning has been responsible for 8 deaths, 75 injuries, over \$1 million in property damage and \$91,000 in crop damage in Wyoming between 1996 and 2015.

According to the National Climatic Data Center, there has only been one lightning event in Converse County between 1950 and 2017. This event occurred in Orin on July 21, 1997 and did not cause any property or crop damage. There were no injuries or fatalities associated with this incident. Table 4.51 presents the details below.

**Table 4.51: Converse County Lightning History 1969– 2015**

Location	Date	Begin Time	Fatalities	Injuries	Property Damage	Crop Damage
Orin	7/21/1997	3:30pm	0	0	0	\$5,000

On May 8, 2006, a lightning strike caused a fire near Orin. The fire burned 500 acres of grass on a ranch, causing \$5,000 of crop damage.

Though no fatalities have been reported by NCDC, livestock fatalities are common in Converse County. There have been numerous instances where lightning caused death to cattle and herds of sheep. Other effects include damaged or destroyed wells, as well as to lightning blowing out the power grid. Additionally, with wildfire being a major concern in Converse County, lightning is especially relevant and annually, many tree fires are ignited from lightning strikes. According to the Federal Wildfire Occurrence data obtained through the USGS, of the 209 wildfires occurring in Converse County between 1989 and 2016, 174 fires were ignited due to natural causes. In this instance, natural fire causes involve fires caused without direct human intervention, such as lightning, earthquake, wind, and the like. The data does not distinguish any further specifics.

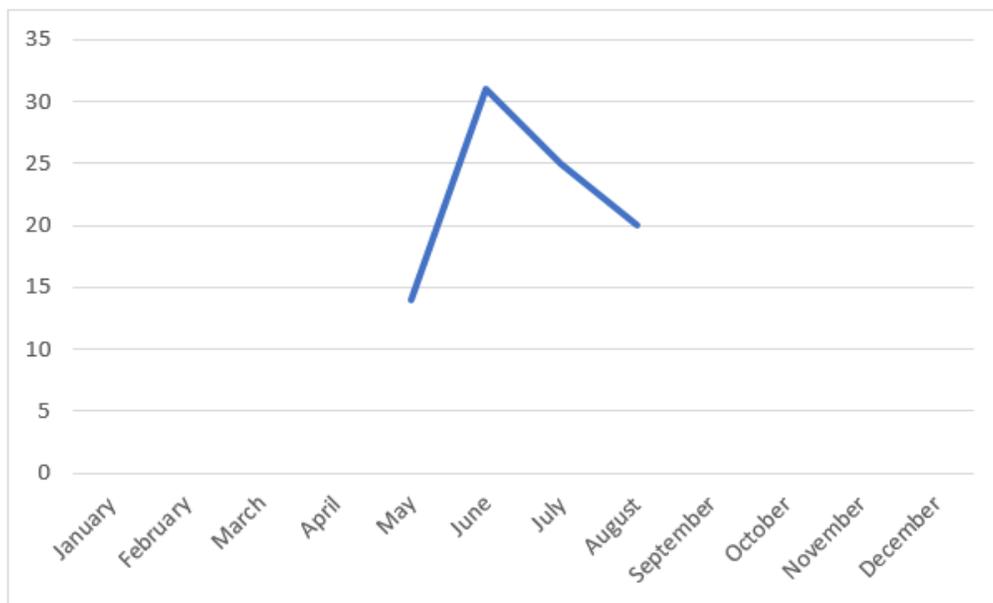
## Likelihood of Occurrence

### Hail

With 90 hail events recorded by the NCDC over 32 years, hail is estimated to occur almost three times per year in Converse County.

Figure 4-35 displays the month that hail events occur. Hail has only been recorded to occur from April to September. The highest number of events occur in June and July.

**Figure 4-35: Month of Occurrence - Hail Events in Converse County 1985 to 2016**



Source: National Climactic Data Center

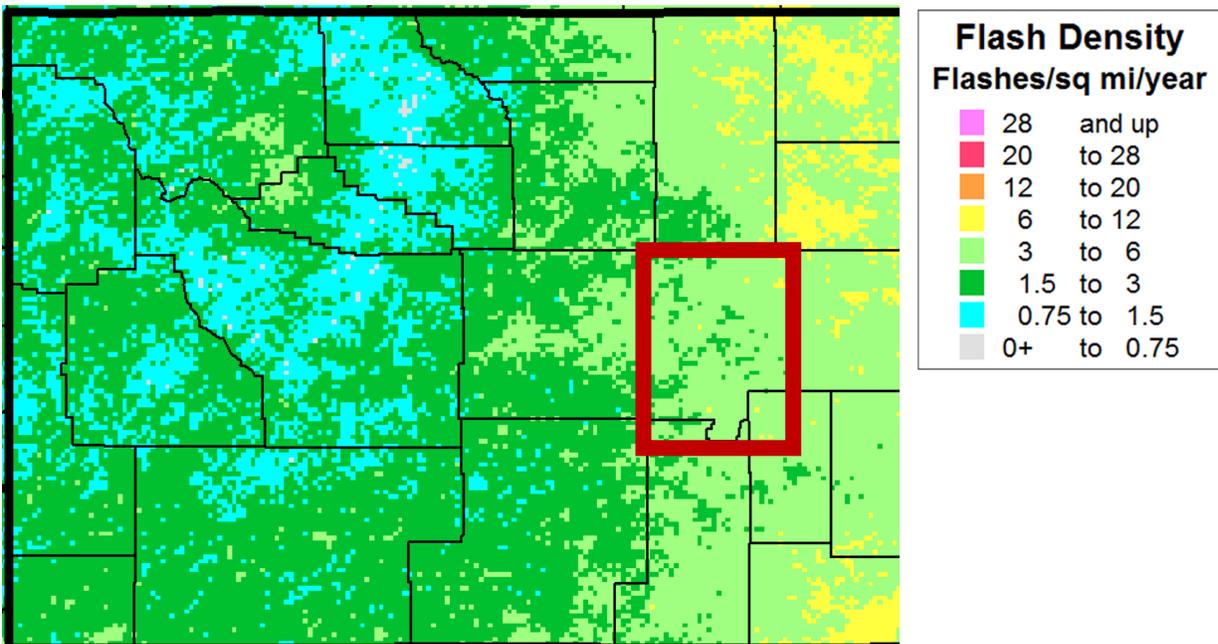
### Lightning

Nationwide, lightning strikes are routinely monitored by Vaisala, Inc. with accuracies to within a 0.625-mile (1 kilometer) resolution. The Wyoming annual lightning strike frequency is depicted in Figure 10.1 for the period of 2005 through 2014. Clearly the eastern plains have more than three

times the cloud to ground lightning strikes as the western half of the state. Despite annual variation, the locations of maximum and minimum strikes do not change much from year to year. A warming climate may also affect the frequency of lighting; in 2014 researchers at the University of Berkeley conducted a study that found that for everyone degree Celsius rise in the average global temperature, there will be a 12 percent increase in the amount of lightning strikes.

(Source: Science Magazine, <http://www.sciencemag.org/content/346/6211/851.abstract;>)

**Figure 4-36: Average annual lightning flash density (flashes/sq. mi/year) 2005-2014 over Wyoming.**



Source: Illustration courtesy of Vaisala Inc.

U.S. statistics show that one in 345,000 lightning flashes results in a death and one in 114,000 results in an injury nationwide. According to meteorologists at Vaisala, Inc., the odds for an American being hit by lightning sometime during an 80-year lifespan is about 1 in 3,000.

### Vulnerability Assessment

Exposure is the greatest danger to people from severe thunderstorms. People can be hit by lightning, pelted by hail, and caught in rising waters. Serious injury and loss of human life is rarely associated with hailstorms.

While national data shows that lightning causes more injuries and deaths than any other natural hazard except extreme heat, there doesn't seem to be any trend in the data to indicate that one segment of the population is at a disproportionately high risk of being directly affected. Anyone who is outside during a thunderstorm is at risk of being struck by lightning. Aspects of the

population who rely on constant, uninterrupted electrical supplies may have a greater, indirect vulnerability to lightning. As a group, the elderly or disabled, especially those with home health care services relying on rely heavily on an uninterrupted source of electricity. Resident populations in nursing homes, residential facilities, or other special needs housing may also be vulnerable if electrical outages are prolonged. If they do not have a back-up power source, rural residents and agricultural operations reliant on electricity for heating, cooling, and water supplies are also especially vulnerable to power outages.

Economic impact of severe thunderstorms is typically short term. Lightning can cause power outages and fires. Hail can destroy exposed property; an example is car lots, where entire inventories can be damaged. Generally, long-term economic impacts center more on hazards that cascade from a severe thunderstorm, including wildfires ignited by lightning and flooding.

The Converse County Planning Area experiences a rainy season in the summer. These summer storms can include significant precipitation, winds, and hail. According to historical hazard data, severe weather is an annual occurrence in Converse County. Damage and disaster declarations related to severe weather have occurred and will continue to occur in the future. Heavy rain and thunderstorms are the most frequent type of severe weather occurrences in the County. Utility outages, downing of trees, debris blocking streets and damage to property can be a direct result of these storm events. Given the nature of these types of storms, the entire County is potentially at risk. The HMPC specifically noted that wells often get hit by lightning, and that lightning is a prevalent cause of wildfire. Rolling Hills noted a lightning strike to the town water tank which drained stored water.

There are no indications that cultural or historic resources are more vulnerable to lightning than as previously accounted for as general structures. Natural resources may be vulnerable to indirect impacts of lightning, such as wild fires caused by lightning strikes. The presence of large areas of water, or of wide, open spaces in natural habitats may increase the danger of lightning strikes to trees, people, or structures, but these vulnerabilities are not directly related to natural resources. Campgrounds are areas where lightning strikes have more dangerous impacts, so populations utilizing the campgrounds may have a higher vulnerability.

Lightning doesn't just strike unprotected people, as the HMPC reported that lightning causes the death of unprotected livestock. Lightning can also have many cascading impacts, including power failure and ignition of wildfires.

## **Future Development**

As the County population increases, more people and property will be exposed to lightning and hail risk. While hail events occur at a regional scale and impact large areas at a time, it is difficult to quantify where specific lightning impacts will occur due to the random nature of lightning strikes.

## Summary

Converse County experiences heavy rains and severe thunderstorms during the spring and summer on an annual basis. Both global and regional climate patterns determine the potential severity of these storms from year to year. The entire planning area is equally at risk; it is a matter of chance as to which drainage area a slow-moving storm might linger over. Based on historical information, the primary effect of these storms has not resulted in significant injury or damage to people or property. Hail damage to property is expected to be highest in the municipalities; much of the damage to both property and crops is covered under insurance policies. The most significant threat associated with lightning is the threat of igniting a wildfire. Given the lightning statistics for Wyoming, the County remains at **moderate** risk and is vulnerable to the effects of lightning.

**Table 4.52 Severe Thunderstorms Hazard Risk Summary**

	<b>Geographic Extent</b>	<b>Potential Magnitude</b>	<b>Probability of Future Occurrence</b>	<b>Overall Significance</b>
Douglas	Limited	Limited	Highly Likely	Medium
Glenrock	Limited	Limited	Highly Likely	Medium
Rolling Hills	Limited	Limited	Highly Likely	Medium
Lost Springs	Limited	Limited	Highly Likely	Medium
Converse County	Limited	Limited	Highly Likely	Medium

### 4.3.10 Tornado

#### Hazard Description

A tornado is a swirling column of air extending from a thunderstorm to the ground. Maximum winds in tornadoes are often confined to extremely small areas, and vary tremendously over very short distances, even within the funnel itself. Tornadoes can have wind speeds from 40 mph to over 300 mph, the majority displaying wind speeds of 112 mph or less. Erratic and unpredictable, they can move forward at up to 70 miles per hour, pause, slow down and change directions. Most have a narrow path, less than 100 yards wide and a couple of miles long. However, damage paths from major tornadoes can be more than a mile wide and 50 miles long.

Based on national statistics for 1970 – 1980, for every person killed by a tornado, 25 people were injured and 1,000 people received some sort of emergency care. Tales of complete destruction of one house next to a structure that is totally unscathed are well documented. Within a building, flying debris or missiles are generally stopped by interior walls. However, if a building has no partitions or has any glass, brick or other debris blown into the interior, the tornado winds can be life threatening. To examine tornado activity and the potential impact on Converse County and its residents, it is important to understand how tornadoes are rated.

## Rating a Tornado

In 1971, Dr. T. Theodore Fujita of the University of Chicago devised a six-category scale to classify U.S. tornadoes into intensity categories, F0 through F5. These categories are based upon the estimated maximum winds occurring within the funnel. The Fujita Tornado Scale (or the "F Scale") became the definitive scale for estimating wind speeds within tornadoes based upon the damage done to buildings and structures. It is used extensively by the National Weather Service in investigating tornadoes, and by engineers in correlating damage to building structures and techniques with different wind speeds caused by tornadoes.

**Table 4.53: Fujita Scale Description**

F-Scale Number	Intensity Phrase	Wind Speed	Type of Damage Done
F0	Gale tornado	40-72 mph	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages signboards.
F1	Moderate tornado	73-112 mph	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
F2	Significant tornado	113-157 mph	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
F3	Severe tornado	158-206 mph	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted
F4	Devastating tornado	207-260 mph	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
F5	Incredible tornado	261-318 mph	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel reinforced concrete structures badly damaged.

## Recent Changes to Tornado Rating Scale

Devastating tornadoes in Jarrell, Texas on May 1997 and Moore/Oklahoma City on May 1999 demonstrated that wind estimates in the original F-scale may be too high. From 2000 to 2004, the Wind Science and Engineering Research Center at Texas Tech University, in cooperation with numerous expert meteorologists, civil engineers and the National Weather Service (NWS), developed an Enhanced Fujita Scale, or EF-scale. In addition to improving the ranking process, it was essential to the development team that the new EF-scale support and be consistent with the original F-scale. The EF-scale documentation includes additional enhanced descriptions of

damage to multiple types of structures and vegetation with photographs, a PC-based expert system, and enhanced training materials.

In February 2007, the Enhanced Fujita scale replaced the original Fujita scale in all tornado damage surveys in the United States. The following table compares the estimated winds in the original F-scale with the operational EF-scale that is currently in use by the NWS.

**Table 4.54: The Enhanced Fujita Tornado Scale**

F Number Fastest	Fujita Scale		Operational EF-Scale	
	Fastest 1/4 – mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
0	40-72	45-78	0	65-85
1	73-112	79-117	1	86-110
2	113-157	118-161	2	111-135
3	158-207	162-209	3	136-165
4	208-260	210-261	4	166-200
5	261-318	262-317	5	Over 200

### Geographical Areas Affected

The entire area of the Converse County is susceptible to tornadoes. While some areas may see more tornadoes than others, this is more of a statistical anomaly than a causal result. The average tornado in the United States is 500 feet across and travels five miles.

### Past Occurrences

Tornado statistics, especially prior to the 1970s, must be viewed as incomplete since many twisters have occurred without being witnessed. Wyoming's open rangelands experience little if any damage from these storms, so many go unreported. Many documented tornadoes occurring in Converse County are given low ratings on the Fujita Scale (F0s and F1s) simply because these tornadoes are often formed over open land and result in little or no damage.

Since 1955 there have been 41 tornadoes recorded for Converse County by the National Climatic Data Center. From 1950-2016, there were five injuries, no fatalities, and \$105,090 in total recorded property damage in the County. A full accounting of those tornadoes can be found in the following table.

**Table 4.55: Tornado History 1950-2016, Converse County**

Location	Date	Time	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Converse Co.	7/25/1955	1530	-	0	0	\$30	0
Converse Co.	6/14/1965	1700	F1	0	1	\$25,000	0
Converse Co.	5/9/1977	2300	F1	0	0	\$2,500	0
Converse Co.	6/20/1977	1845	F1	0	0	\$30	0
Converse Co.	5/16/1978	1915	-	0	0	0	0
Converse Co.	5/16/1978	2100	-	0	0	0	0

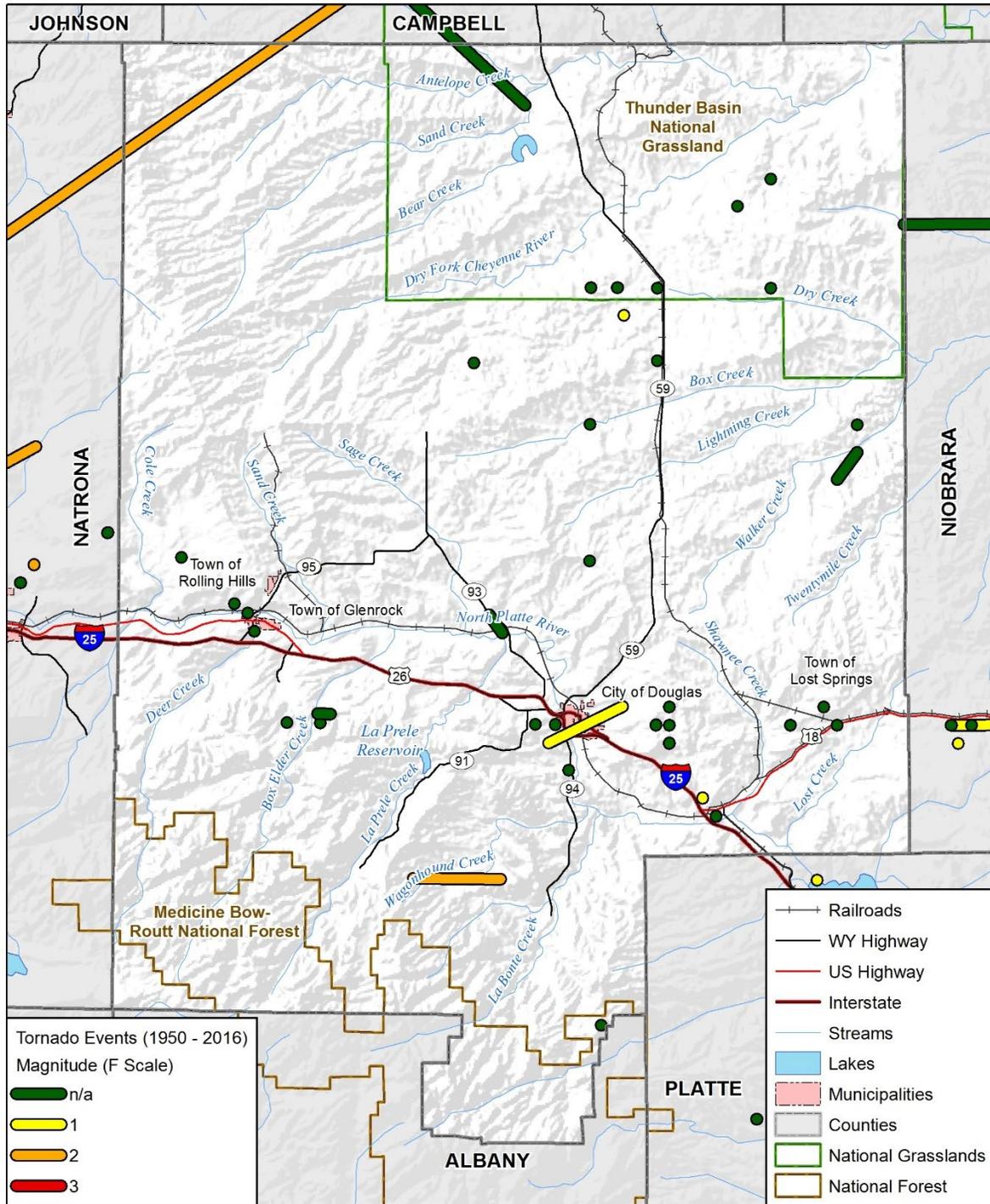
Location	Date	Time	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Converse Co.	5/18/1978	1800	-	0	0	0	0
Converse Co.	5/18/1978	1800	-	0	0	0	0
Converse Co.	5/18/1978	1800	-	0	0	0	0
Converse Co.	5/18/1978	1800	-	0	0	0	0
Converse Co.	5/27/1978	1214	-	0	0	0	0
Converse Co.	7/27/1979	2020	F0	0	0	0	0
Converse Co.	7/27/1979	2020	F0	0	0	0	0
Converse Co.	7/27/1979	2020	F0	0	0	0	0
Converse Co.	7/27/1979	2235	F0	0	0	0	0
Converse Co.	7/25/1980	1630	-	0	0	0	0
Converse Co.	6/5/1982	1904	F0	0	0	\$30	0
Converse Co.	6/5/1982	1925	F2	0	1	\$25,000	0
Converse Co.	6/5/1982	1945	F1	0	3	\$25,000	0
Converse Co.	6/13/1984	1640	F0	0	0	0	0
Converse Co.	6/13/1984	1645	F1	0	0	\$25,000	0
Converse Co.	6/13/1984	1755	F0	0	0	0	0
Converse Co.	6/13/1984	1800	F0	0	0	\$2,500	0
Converse Co.	6/18/1984	1330	F0	0	0	0	0
Converse Co.	7/16/1989	1621	F0	0	0	0	0
Converse Co.	7/16/1989	1715	F0	0	0	0	0
Converse Co.	5/13/1990	1520	F0	0	0	0	0
Converse Co.	5/11/1991	1754	F0	0	0	0	0
Converse Co.	7/29/1997	1450	F0	0	0	0	0
Converse Co.	7/29/1997	1454	F0	0	0	0	0
Converse Co.	7/29/1997	1500	F0	0	0	0	0
Converse Co.	7/29/1997	1558	F0	0	0	0	0
Converse Co.	5/5/1998	1512	F0	0	0	0	0
Converse Co.	6/13/1998	1040	F0	0	0	0	0
Converse Co.	6/12/1999	1549	F0	0	0	0	0
Converse Co.	6/12/1999	1611	F0	0	0	0	0
Converse Co.	9/3/1999	1551	F0	0	0	0	0
Converse Co.	8/12/2005	1805	F0	0	0	0	0
Converse Co.	7/3/2006	1634	F0	0	0	0	0
Converse Co.	6/20/2010	1620	EF0	0	0	0	0
Converse Co.	6/16/2015	1403	EF0	0	0	0	0
<b>Totals:</b>				0	5	\$105,090	0

Source: National Climatic Data Center

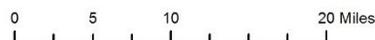
The NCDC data allows for examination and statistical analysis of tornadoes occurring in the county. Of the tornadoes in Converse County, twenty-six were rated F0 or EF0 (63%), 5 tornadoes were rated F1 or EF1 (12%), and 10 tornadoes did not receive a rating (24%).

Figure 4-37: Historical Tornadoes in Converse County

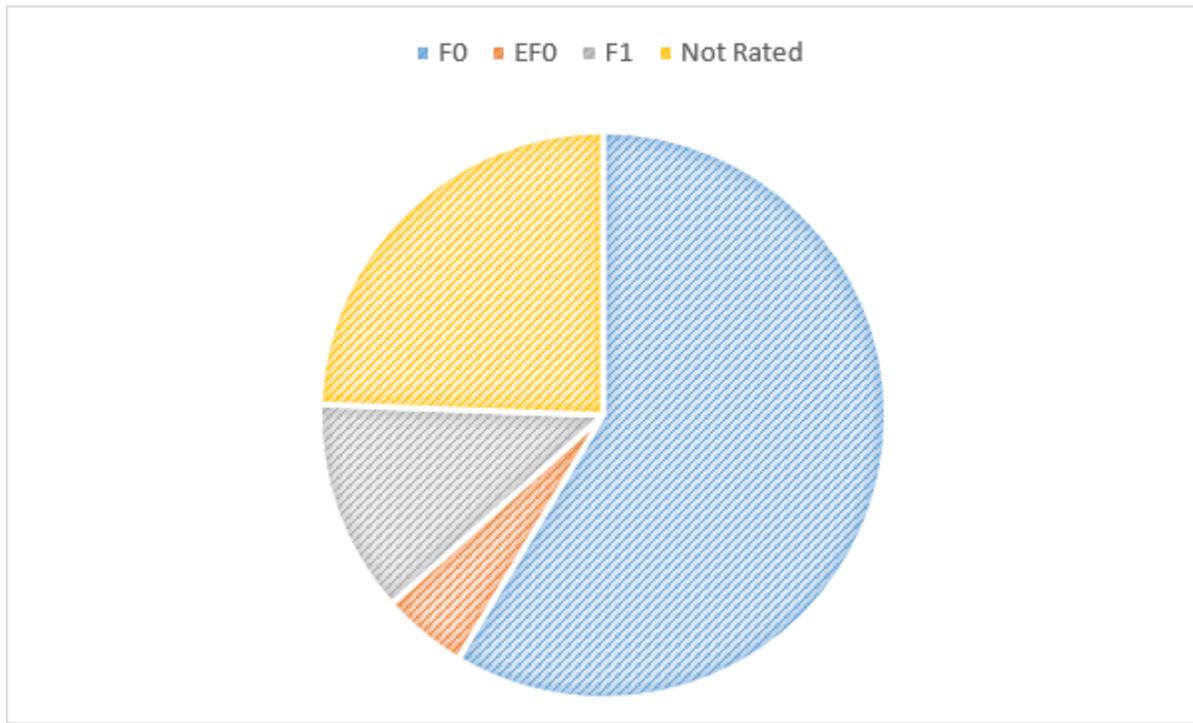
## Converse County NOAA Tornado Events



Map compiled 4/2018;  
intended for planning purposes only.  
Data Source: WY Geospatial Hub,  
WYDOT, HSIP Freedom 2015,  
NOAA Storm Prediction Center

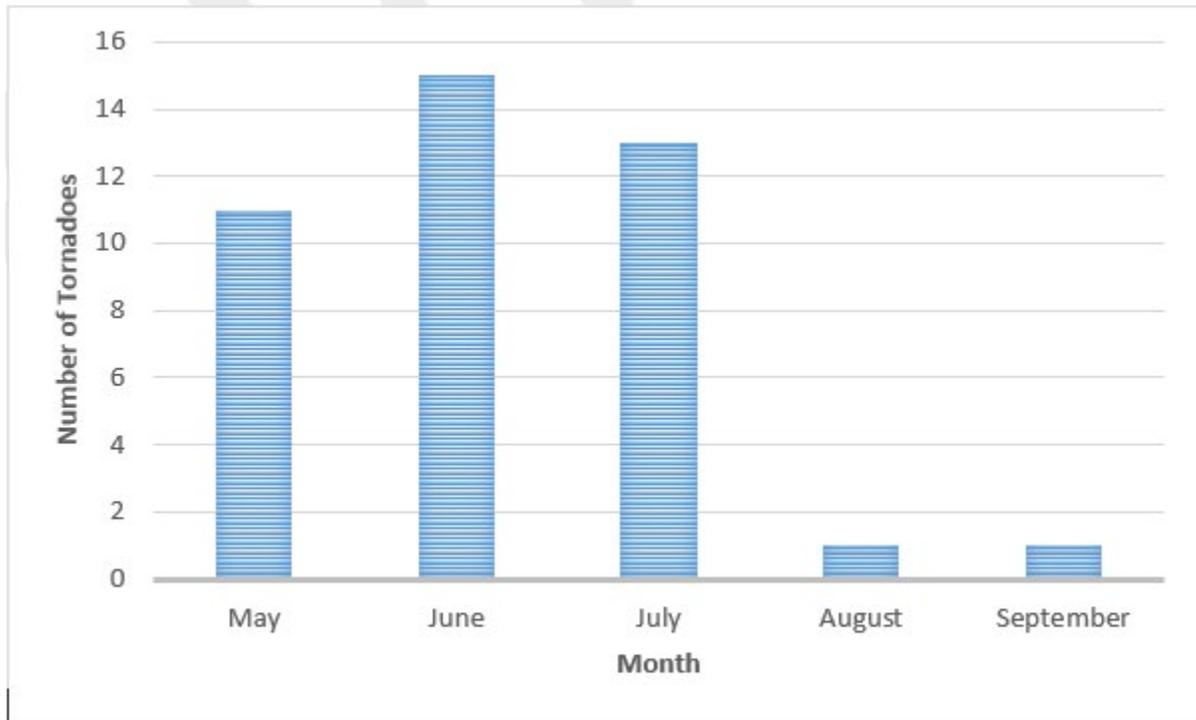


**Figure 4-38: Converse County Tornadoes by Rating: 1950-2016**

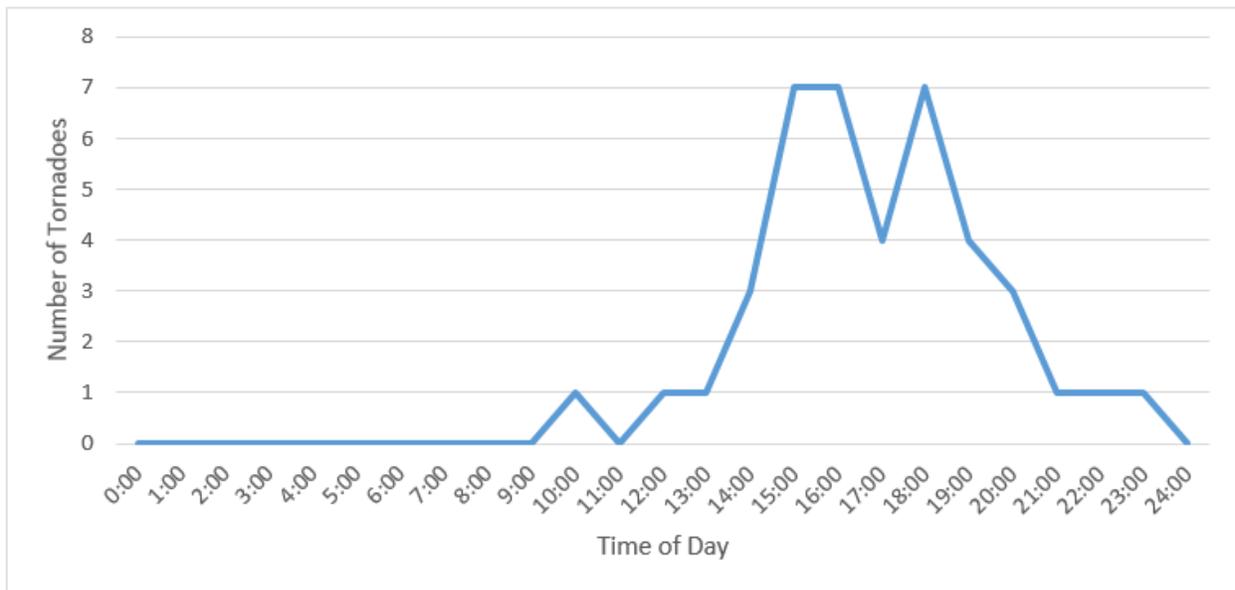


The data also allows for the development of profiles on historical time periods of tornadoes. Figure 4-33 and Figure 4-40 give historical perspective on the time of year and time of day that tornadoes in the planning area have occurred.

**Figure 4-39: Converse County Historical Tornadoes by Month: 1950-2016**



**Figure 4-40: Historical Tornadoes by Time of Day: 1950-2016**



Most tornadoes recorded in Converse County cause no recorded injuries, no recorded fatalities, and little to no damage to property (\$2,500 - \$25,000 range). Of the 35 tornadoes that have been recorded by the NCDC in Converse County from 1950 to 2016, six have caused property damage and none have caused crop damage.

## **Likelihood of Occurrence**

On average, Converse County experiences a tornado every 1.6 years. Recorded tornadoes in the County occurred during the months of May through September; most of the tornadoes occurred between 11 a.m. and 11 p.m. Historical ratings vary between F0 and F2 on the F-scale; after the advent of the EF-scale, the planning area has experienced four EF-0 tornadoes. An average tornado occurs in June in the evening, is rated EF-0 or EF-1, and causes less than \$25,000 worth of damage to property, though it mostly strikes rural areas causing no damage. This is due more to chance than any environmental factor, however, as inhabited areas are statistically equally at risk of a tornado strike; the potential for injuries, fatalities and damage in these areas is much greater.

NCDC has recorded five injuries and no fatalities attributed to these tornadoes. Cumulatively, the storms have caused \$105,090 in recorded property damage, and no recorded crop damage.

## **Potential Magnitude of Impacts**

The National Weather Service considers tornadoes to be among nature's most violent storms. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Tornadic winds can cause people and autos to become airborne, rip ordinary homes to shreds, and turn broken glass and other debris into lethal missiles. Even weaker tornados can cause large economic damages.

According to NCDC records, the three most significant storms of record for Converse County occurred in 1965, and 1982. These three storms each caused \$25,000 in property damage, with at least one injury per event.

Though the strength of the tornado often dictates the impacts, it is important to remember that the location (rural or urban) of the tornado is just as important when assessing these risks. Impacts can vary depending on multiple factors, including the size and strength of a tornado, and its path.

## **Vulnerability Assessment**

Because of its rural composition, people or property within the county have not had a history of being severely impacted during past tornado incidents. While the F-Scale ratings of historical tornadoes in the counties in the planning area are low, those ratings are partially based on recorded damage. Recorded damage may have been much more substantial if these tornadic events had impacted one of the many communities in the planning area, rather than timber, outlying range, and farm acreage.

Tornadoes occur at random locations throughout the jurisdiction; for that reason, all structures, critical facilities, essential services, and populations are considered vulnerable.

## Future Development

Any future development that is exposed and above ground will be vulnerable to a direct or indirect hit by a tornado. In areas where building codes are not in place and enforced, buildings may not be built to withstand tornado-force winds. Safe room installation in unprotected development can provide an additional safety measure.

## Summary

Tornadoes are a credible threat, and will continue to occur in Converse County. While the County has been relatively lucky in its tornado history in its past, it is not immune to the threat of a much larger and more ferocious tornado. Depending on a tornado's size, ferocity and path, it can cause devastating damage to people, property and infrastructure.

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**Table 4.56: Tornado Hazard Risk Summary**

	<b>Geographic Extent</b>	<b>Potential Magnitude</b>	<b>Probability of Future Occurrence</b>	<b>Overall Significance</b>
Douglas	Negligible	Limited	Highly Likely	Low
Glenrock	Negligible	Limited	Highly Likely	Low
Rolling Hills	Negligible	Limited	Highly Likely	Low
Lost Springs	Negligible	Limited	Highly Likely	Low
Converse County	Negligible	Limited	Highly Likely	Low

### 4.3.11 Severe Winter Weather

#### Hazard Description

The National Weather Service defines a storm as “any disturbed state of the atmosphere, especially affecting the Earth’s surface, and strongly implying destructive and otherwise unpleasant weather.” Winter storms occur during the winter months and produce snow, ice, freezing rain, sleet, and/or cold temperatures. Winter storms are an annual occurrence in climates where precipitation may freeze and are not always considered a disaster or hazard. Disasters occur when the severe storms impact the operations of the affected community by damaging property, stalling the delivery of critical services, or causing injuries or deaths among the population.

Winter storm watches and warnings may be helpful for determining the difference between a seasonal winter storm and a severe winter storm. Warnings are issued if the storm is producing or suspected of producing heavy snow or significant ice accumulations. Watches are usually issued 24 to 36 hours in advance for storms capable of producing those conditions, though criteria may vary between locations. Winter Weather Advisories are issued when a low-pressure system

produces a combination of winter weather that presents a hazard but does not meet warning criteria.<sup>5</sup>

Heavy snow can immobilize the planning region, isolating communities, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse roofs and knock down trees and power lines. In rural areas, homes and farms may be isolated for days, and unprotected livestock may be lost. The cost of snow removal, damage repair, and business losses can have a tremendous impact on cities and towns. Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days until damages are repaired. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians.

Some winter storms are accompanied by strong winds, creating blizzard conditions with blinding wind-driven snow, severe drifting, and dangerous wind chills. Strong winds with these intense storms and cold fronts can knock down trees, utility poles, and power lines. Blowing snow can reduce visibilities to only a few feet in areas where there are no trees or buildings. Serious vehicle accidents can result with injuries and deaths.

Winter storms in the County, including strong winds and blizzard conditions, may cause localized power and phone outages, closures of streets, highways, schools, businesses, and non-essential government operations, and increase the likelihood of winter-weather related injury or death. People may be stranded in vehicles or other locations not suited to sheltering operations or isolated from essential services. A winter storm can escalate, creating life threatening situations when emergency response is limited by severe winter conditions. Converse County is prepared with the delivery of extra oxygen as a preventative measure if a large storm is forecasted. The dialysis center also has a generator hookup and contract with a generator company after previous occurrences. All fire stations have backup generators to ensure doors can be opened. Other issues associated with severe winter storms include the threat of physical overexertion that may lead to heart attacks or strokes. Snow removal costs can pose significant budget impacts, as can repairing the associated damages caused by downed power lines, trees, structural damages, etc. Heavy snowfall during winter can also lead to flooding or landslides during the spring if the area snowpack melts too quickly.

Extreme cold often accompanies a winter storm or is left in its wake. It is most likely to occur in the winter months of December, January, and February. Prolonged exposure to the cold can cause frostbite or hypothermia and can become life-threatening. Infants and the elderly are most susceptible. Pipes may freeze and burst in homes or buildings that are poorly insulated or without heat. Extreme cold can disrupt or impair communications facilities. Extreme cold temperatures

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<sup>5</sup> This information is drawn from the National Weather Association Online Glossary, which may be accessed at <http://www.weather.gov/glossary/>

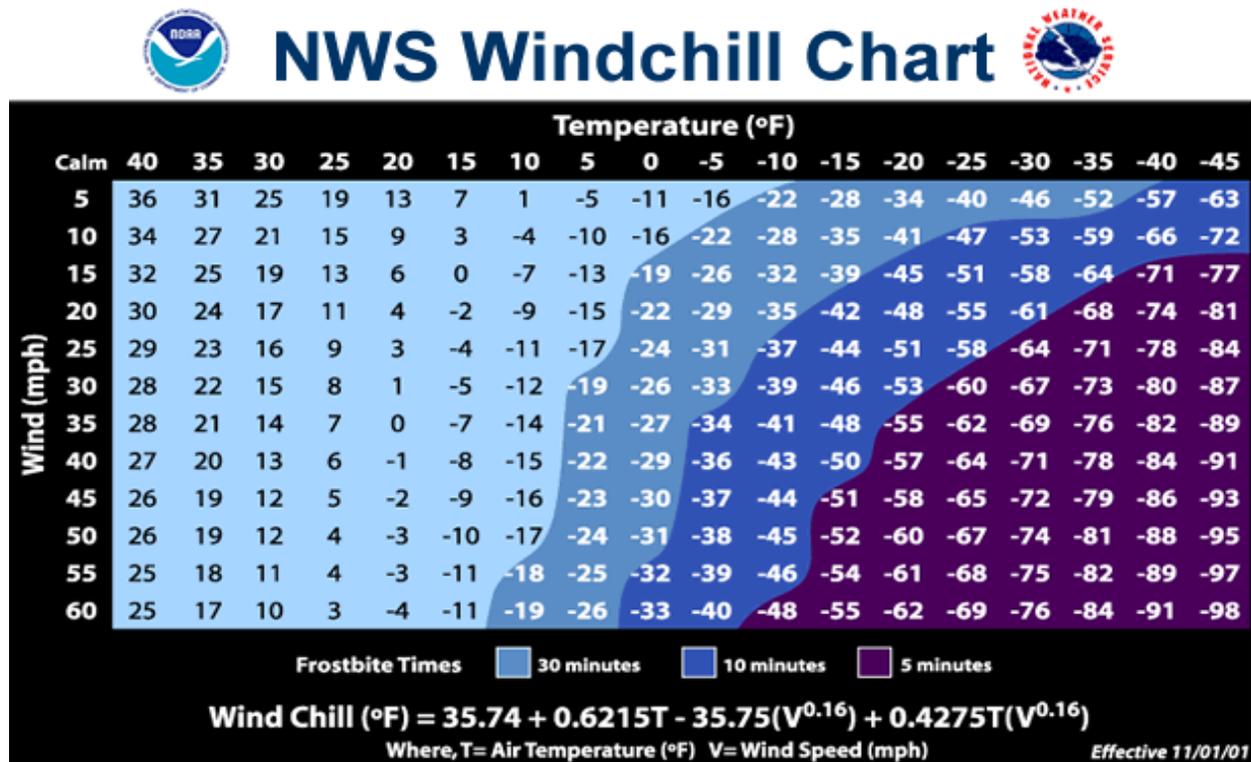
can destroy crops and cause utility outages, leaving people without water or power until the utility companies are able to restore service.

What constitutes extremely cold temperatures varies across different areas of the United States, based on normal climate temperatures for the time of year. When temperatures drop at least 20 degrees below normal winter lows, the cold is considered extreme and begins to impact the daily operations of the county. Extreme cold/wind chill impacts inanimate objects, plants, animals and water supplies.

The effects of extremely cold temperatures are amplified by strong to high winds that can accompany winter storms. Wind-chill measures how wind and cold feel on exposed skin and is not a direct measurement of temperature. As wind increases, heat is carried away from the body faster, driving down the body temperature, which in turn causes the constriction of blood vessels, and increases the likelihood of severe injury or death to exposed persons. Animals are also affected by wind-chill however cars, buildings, and other objects are not.

In 2001, the NWS implemented an updated Wind-Chill Temperature index. This index was developed to describe the relative discomfort/danger resulting from the combination of wind and temperature. Wind chill is based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature.

**Figure 4-41: National Weather Service Wind-Chill Chart**



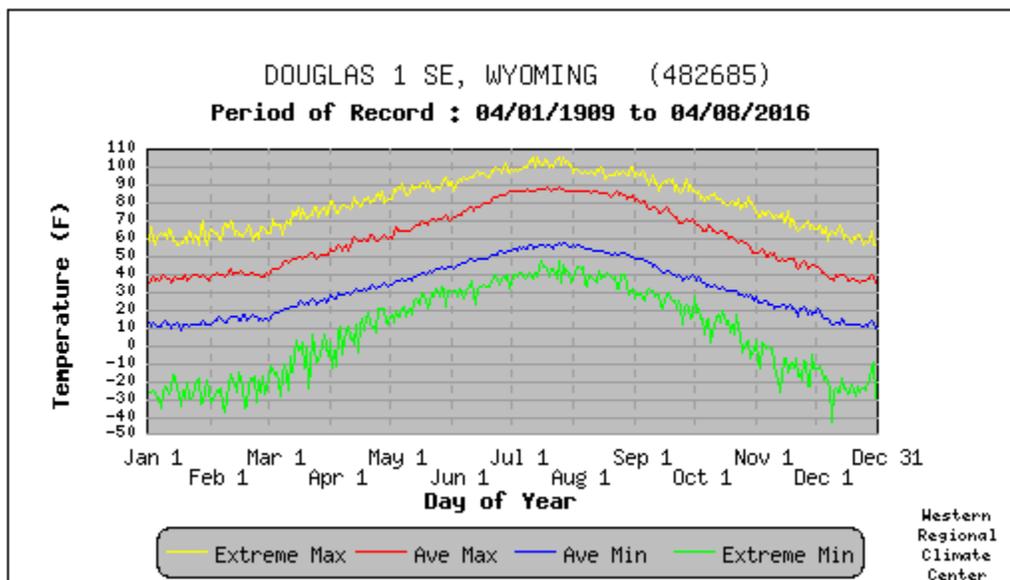
## Geographical Area Affected

Winter storms are a yearly feature of the Wyoming climate and may occur anywhere in the state. Generally, severe winter storm events are considered regional, which implies the storms impact multiple counties simultaneously, often for extended time periods. It is possible for the geographic extent of the hazard to vary significantly within a single county - a regional storm may directly impact only a small portion of the planning area while still extending over a large portion of the surrounding area. However, even in these instances, the impacts and effects of a regional hazard are still felt within the planning area. Therefore, while the percent of the planning area directly affected ranges from less than 10% to 100% depending on the specific circumstances, if any portion of the planning area is impacted by the storm, then the entire planning area suffers indirect impacts. Sheltering of stranded travelers on I-25 can be an issue, even from storms affecting Colorado. Glenrock and Douglas can quickly be overwhelmed with shelter needs when I-25 is closed to Casper.

## Past Occurrences

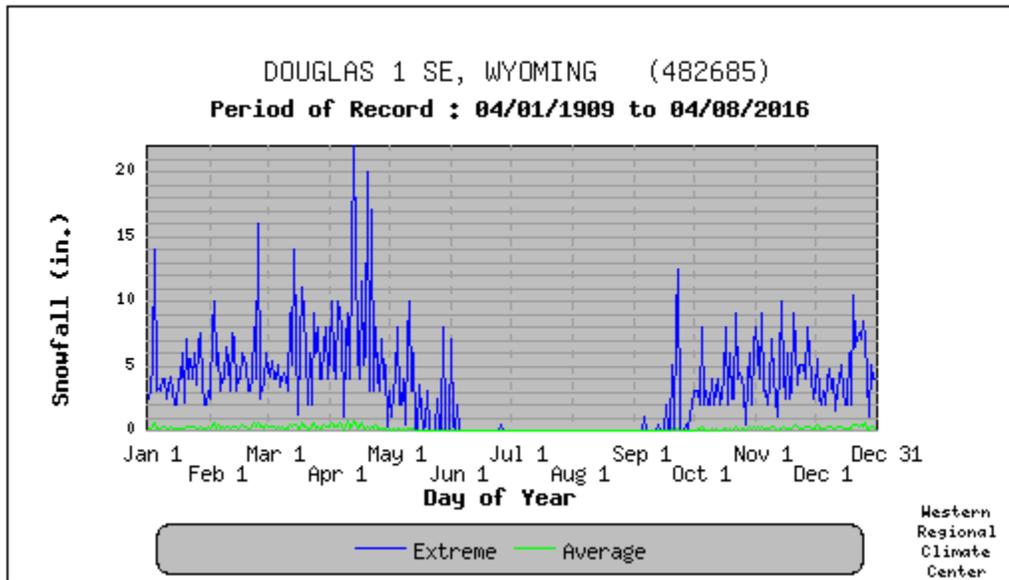
Monthly temperature extremes and averages for Converse County are shown in the following figure. Monthly snowfall extremes and averages for the County are also shown.

**Figure 4-42: Converse County Daily Temperature Average and Extremes (Douglas Coop Station)**



Source: Western Regional Climate Center

**Figure 4-43: Converse County Daily Snowfall Average and Extremes (Casper Coop Station)**



Source: Western Regional Climate Center

The winter storm history in Converse County extends from 2009 to January 2017. The County has experienced 96 winter storm incidents during this timeframe. No winter storms in the County caused recorded damage, fatalities, or injuries.

**Table 4.57: Summary of NCDL Winter Weather Events in Converse County 2009- 2016**

Year	# of Winter Storm Events	# of Blizzard Events	# of Cold/Wind Chill Events	# of Heavy Snow Events	Total Events
2009	1	0	0	4	5
2010	1	1	1	6	9
2011	2	0	0	9	11
2012	0	0	0	0	0
2013	19	1	0	0	20
2014	5	0	0	6	11
2015	7	0	0	0	7
2016	26	0	0	0	26
2017	7	0	0	0	7
Totals	68	2	1	25	96

Source: National Climate Data Center

On October 3, 2013, a potent early season winter storm moved into Wyoming and continued through much of Friday, October 4. Snow began in the higher elevations of western Wyoming early Thursday morning. Rain across the lower elevations changed to snow during the afternoon and evening hours of Thursday as colder air moved across Wyoming from west to east. Wind gusts

to 50 mph created blizzard conditions in some areas where visibilities were reduced to near zero and snow drifts of two to eight feet. Several roads and highways were closed, including Interstate 25 from north of Cheyenne to Douglas and Interstate 25 from west of Cheyenne to Rawlins. Total snow accumulations ranged from six to 24 inches. Several warming shelters were established Friday along the I-25 corridor to help those without heat.

### **Likelihood of Occurrence**

Winter storms are an annual occurrence in Wyoming, often occurring multiple times each winter, and affecting entire regions in their size and scope.

### **Potential Magnitude**

The damages caused by severe winter storms and blizzards vary and are dependent on several factors: the duration of the storm; the geographic extent; the time of year; meteorological factors such as wind, moisture content of the snow, ground and air temperatures; and the advance warning of the storm. Impacts from the storm dictate the magnitude of the event, emphasizing that the amount snow may not always directly correlate to how bad the storm is. Damaged power lines and dangerous or impassable roadways may forestall the delivery of critical services such as medical and emergency assistance, the delivery of food supplies and medications, or even the provision of basic utilities such as heat and running water. When events happen with a long warning time, it is possible to pre-mitigate the effects of insufficient supply levels or to pre-test emergency generators, which may prevent some of the previously described impacts from occurring. Unanticipated storms increase the number of people stranded, both in cars and at public locations, which may increase the number of injuries and deaths attributed to the event (often caused by exposure) and place uneven and unanticipated strains on public sheltering capacities. The weight of the snow, driven by the water content of the fall, increases the potential for damages caused to structures and trees. Lighter snow caused by extreme cold increases the damages caused to livestock, agriculture and landscaping due to freezing conditions. Winter storms which go through periods of thaw and freeze prolong dangerous icy conditions, increasing the likelihood of frozen and damaged water pipes, impassable or dangerous roadways, damaged communication lines, or more extensive damages to infrastructure and structures caused by seeping water freezing under roofs, porches, patios, inside sidings, or causing damage to vehicles.

Winter storms usually cover a significant part of the State, and as such are easier to describe regionally than on a county by county basis.

### **Vulnerability Assessment**

The threat to public safety is typically the greatest concern during severe winter storms. While virtually all aspects of the population are vulnerable to severe winter weather, there are segments of the population that are more vulnerable to the potential indirect impacts of a severe winter storm than others, particularly the loss of electrical power. As a group, the elderly or disabled, especially those with home health care services that rely heavily on an uninterrupted source of electricity.

Resident populations in nursing homes or other special needs housing may also be vulnerable if electrical outages are prolonged. If they do not have a back-up power source, rural residents and agricultural operations reliant on electricity for heating and water supplies are also especially vulnerable to power outages.

Severe winter weather also increases the vulnerability of the commuting population. While there is no way to quantify which of these accidents occur during severe winter storms versus regular winter storms, the numbers indicate that winter driving conditions raise the vulnerability of the commuting population.

Property vulnerabilities to severe weather include damage caused by high winds, ice, or snow pack and subsequently melting snow. Vehicles may be damaged by the same factors, or temporarily un-useable due to the driving conditions created by severe winter weather. Contents of homes, storage units, warehouses and storefronts may be damaged if the structures are compromised or fail due to the weather, or during potential flooding caused by melting snow. Very wet snow packs down densely and is very heavy. This may create strains on structures, causing partial or entire collapses of walls, roofs, or windows. This is impacted both by architecture and construction material, and should be assessed on a building-by-building basis. These records are probably tracked via insurance or other private vendors. Crops, livestock and other agricultural operations are also highly vulnerable to severe winter storms.

The physical structures which comprise essential infrastructure are as vulnerable as those outlined in the General Property subsection of this profile. Severe winter weather may also disrupt the availability of services from essential infrastructure, including utility delivery (gas, electric and water), telephone service, emergency response personnel capabilities, road plowing, and childcare availability. Severe winter storms may even halt the operation of an area for periods of time, making the vulnerability of the counties even higher.

As mentioned previously, ice or heavy accumulations of snow, particularly with blowing and drifting, can temporarily impact the roadway system. These accumulations also require vast amounts of overtime for county and local highway and streets departments to remove snow and melt ice. Ice storms or high winds in winter storms can cause extensive loss of overhead utility lines due to buildup either on the lines or on adjacent trees that either collapse due to the weight or blow down onto the utility lines. Services such as telephone, electricity, and cable TV are frequently affected by winter storms. The overall vulnerability of essential infrastructure is medium.

Natural resources may be damaged by the severe winter weather, including broken trees and death of unsheltered wildlife. Unseasonable storms may damage or kill plant and wildlife, which may impact natural food chains until the next growing season. Historical areas may be more vulnerable to severe winter storms due to construction and age of structures. Cultural resources generally experience the same vulnerabilities outlined in General Property, in addition to lost revenue impacts due to transportation impacts. The overall vulnerability of these resources is medium.

## Future Development

Where building codes are applicable, future residential or commercial buildings built to code should be able to withstand snow loads from severe winter storms. Future power outages or delays in power delivery to future developments may be mitigated by construction considerations such as buried power lines. Future development will also require future considerations for snow removal capacity including equipment, personnel, and logistical support. Adequate planning will help establish the cost-effective balance.

Public education efforts may help minimize the risks to future populations by increasing knowledge of appropriate mitigation behaviors, clothing, sheltering capacities, and decision making regarding snow totals, icy roads, driving conditions, and outdoor activities (all of which are contributors to decreased public safety during severe winter storms). New establishments or increased populations who are particularly vulnerable to severe winter storms (such as those with health concerns or those who live in communities that may be isolated for extended periods of time due to the hazard) should be encouraged to maintain at least a 72-hour self-sufficiency as recommended by FEMA. Encouraging contingency planning for businesses may help alleviate future economic losses caused by such hazards while simultaneously limiting the population exposed to the hazards during commuting or commerce-driven activities.

## Summary

Winter Storms are a **medium** significance hazard in the County. While the percent of the planning area directly affected ranges depending on the specific circumstances, if any area near Converse County is impacted by the storm, then the entire County suffers indirect impacts. Sheltering of stranded travelers on I-25 can be an issue, even from storms affecting Colorado. Glenrock and Douglas can quickly be overwhelmed with shelter needs when I-25 is closed to Casper.

**Table 4.58: Winter Storm Hazard Risk Summary**

	<b>Geographic Extent</b>	<b>Potential Magnitude</b>	<b>Probability of Future Occurrence</b>	<b>Overall Significance</b>
Douglas	Significant	Limited	Highly Likely	Medium
Glenrock	Significant	Limited	Highly Likely	Medium
Rolling Hills	Significant	Limited	Highly Likely	Medium
Lost Springs	Significant	Limited	Highly Likely	Medium
Converse County	Significant	Limited	Highly Likely	Medium

### 4.3.12 Wildfire

#### Hazard Description

Wildfire is defined as a highly destructive fire or any instance of uncontrolled burning in grasslands, brush or woodlands. Wildfire has encroached into urban interface situations as more people move closer to forest settings. As defined by the National Interagency Fire Center (NIFC),

a “wildland fire” is any non-structure fire, other than prescribed fire, that occurs in the wildland. The term “wildland/urban interface” or WUI is widely used within the wildland fire management community to describe any area where man-made buildings are constructed close to or within a boundary of natural terrain and fuel, where high potential for wildland fires exists. “Aspect” refers to the direction in which a slope faces. “Fuel” consists of combustible material, including vegetation, such as grass, leaves, ground litter, plants, shrubs, and trees that feed a fire.

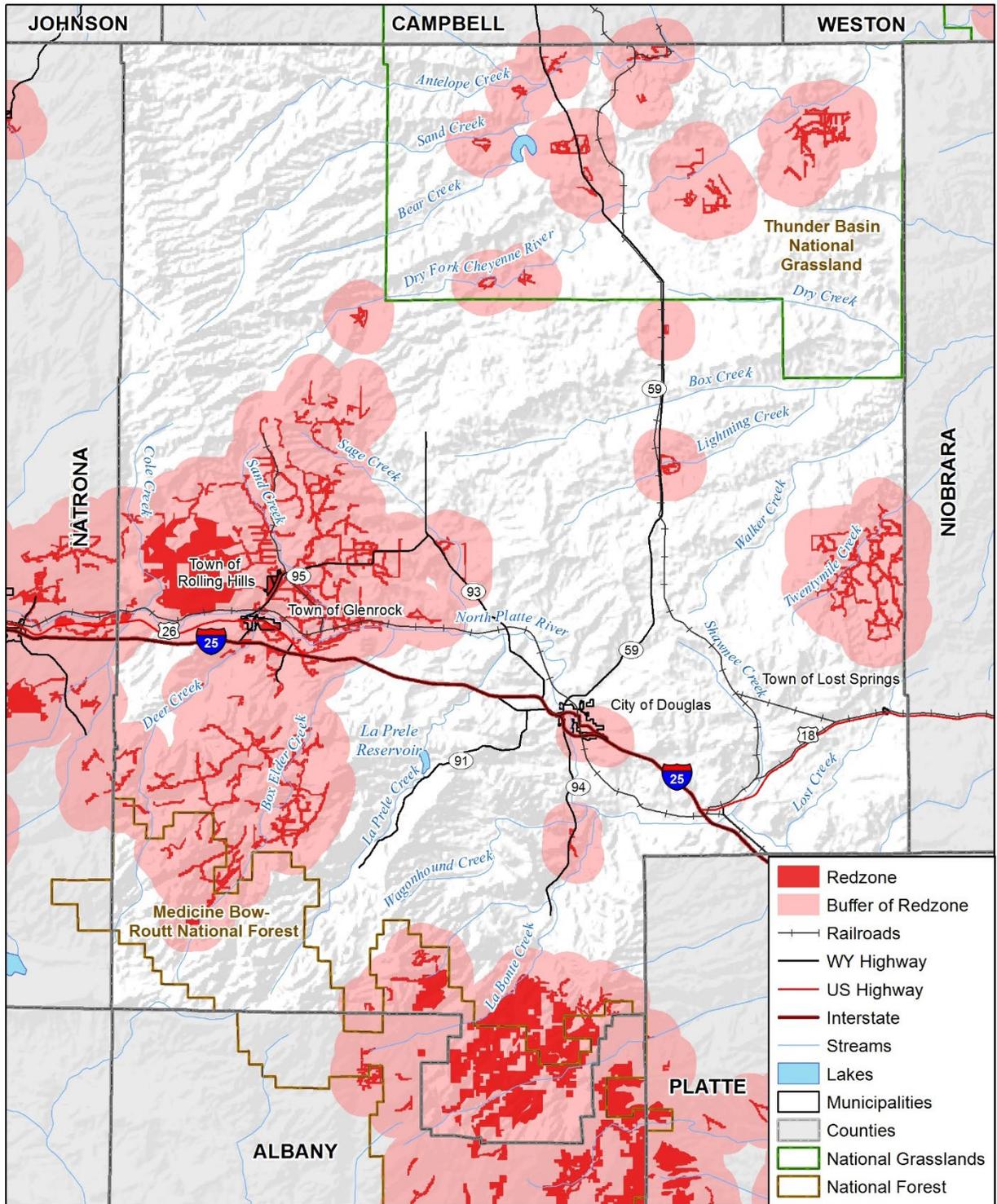
Wildfires can occur at any time of the year, but are most likely to occur during the spring, summer or fall. Thunderstorms that contain lightning frequently start wildfires, but they can also be caused by humans. Wyoming’s semi-arid climate and rural character make the state vulnerable to catastrophic wildland fires, which comprise more than 50% of all fires in Wyoming.

As the population and the wildland/urban interface in Wyoming increases, the more significant the risk of wildland fire hazard. The past 100 years of wildland fire suppression has led to heavy vegetation growth and thus has greatly increased the potential fuel-load for a wildfire to burn. As the wildland/urban interface has grown into these densely packed forests, the potential for catastrophic wildland fires has increased as well. Fires have historically played a natural role on western landscapes. For example, some species of trees occupy sites following fire until replaced by more shade-tolerant species. In some cases, regeneration of vegetation can be enhanced by fire. Fires may have positive or negative effects, or both, depending upon the resources at risk in the fire area.

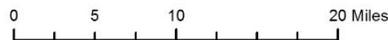
### **Geographical Area Affected**

While brushfires could ignite anywhere across the county, the wildland and wildland-urban interface areas are of most concern and are shown in Figure 4-39 based on the Wildland Urban Interface Hazard Assessment. This assessment was produced by a joint venture of the Wyoming State Forestry Division, USFS, BLM, NPS, and other interested parties. This Geographic Information System (GIS)-based mapping effort builds on the Front Range Redzone Project in Colorado (the first fire-hazard mapping program of its kind). The Assessment maps fire hazard incorporating population density against slope, aspect, and fuels. With the mapping analysis evaluating areas of varying wildfire vulnerability, the final output results in a Risk, Hazard, and Value (RHV) map displaying areas of concern (Redzones) for catastrophic wildland fires. The following figure shows RedZone areas, based on available data.

Figure 4-44: Wildland Fire Redzones



Map compiled 4/2018;  
intended for planning purposes only.  
Data Source: Natrona County, WYDOT,  
WY Geospatial Hub, HSIP Freedom 2015,  
Wyoming Forest Service



**Figure 4-45: Douglas Wildland Fire Redzones**

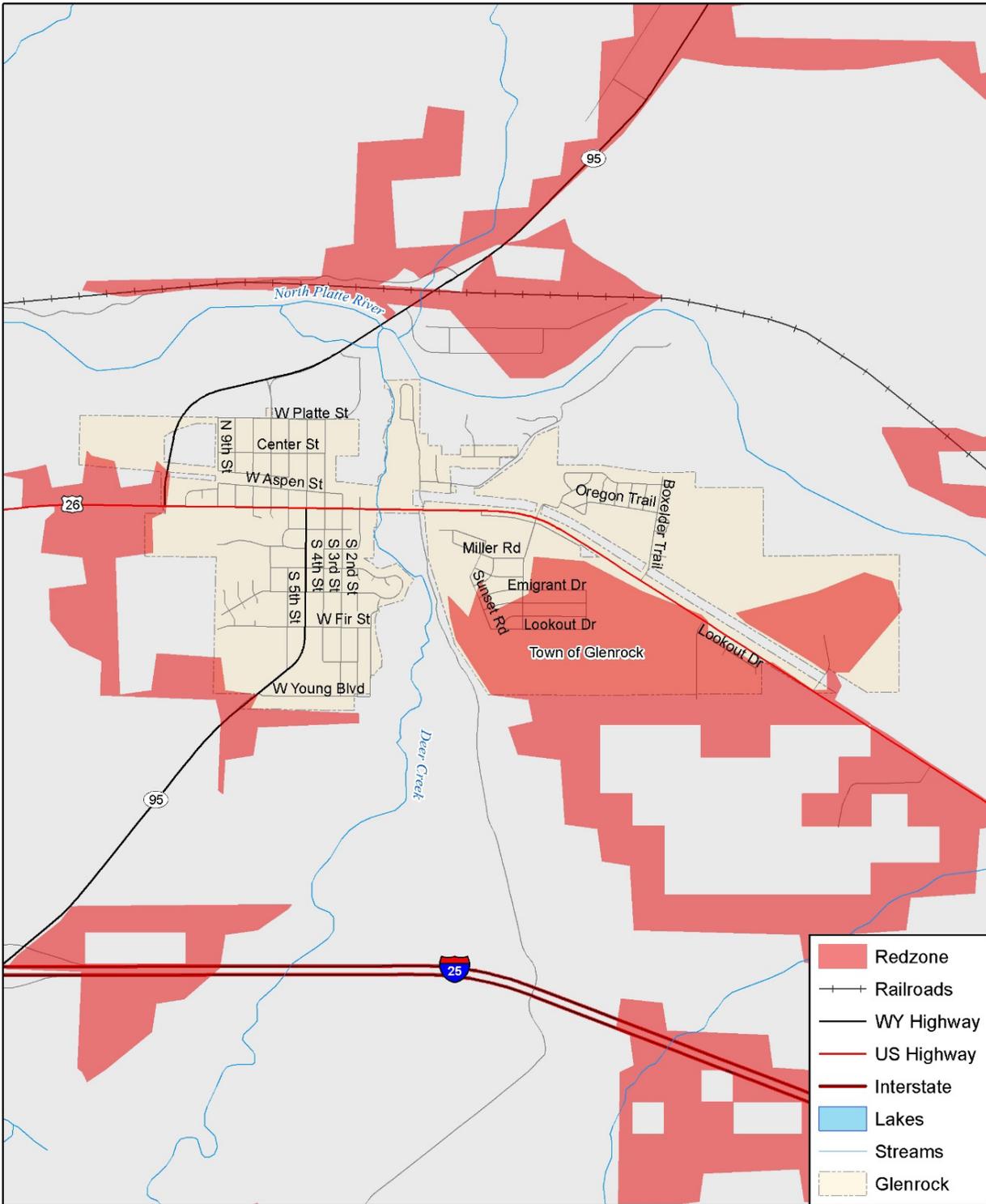


Map compiled 10/2017;  
intended for planning purposes only.  
Data Source: WY Geospatial Hub,  
WYDOT, HSIP Freedom 2015,  
WY Geospatial Hub, USGS: BLM, FS, NPS

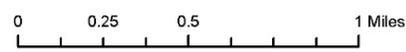
0 0.25 0.5 1 Miles



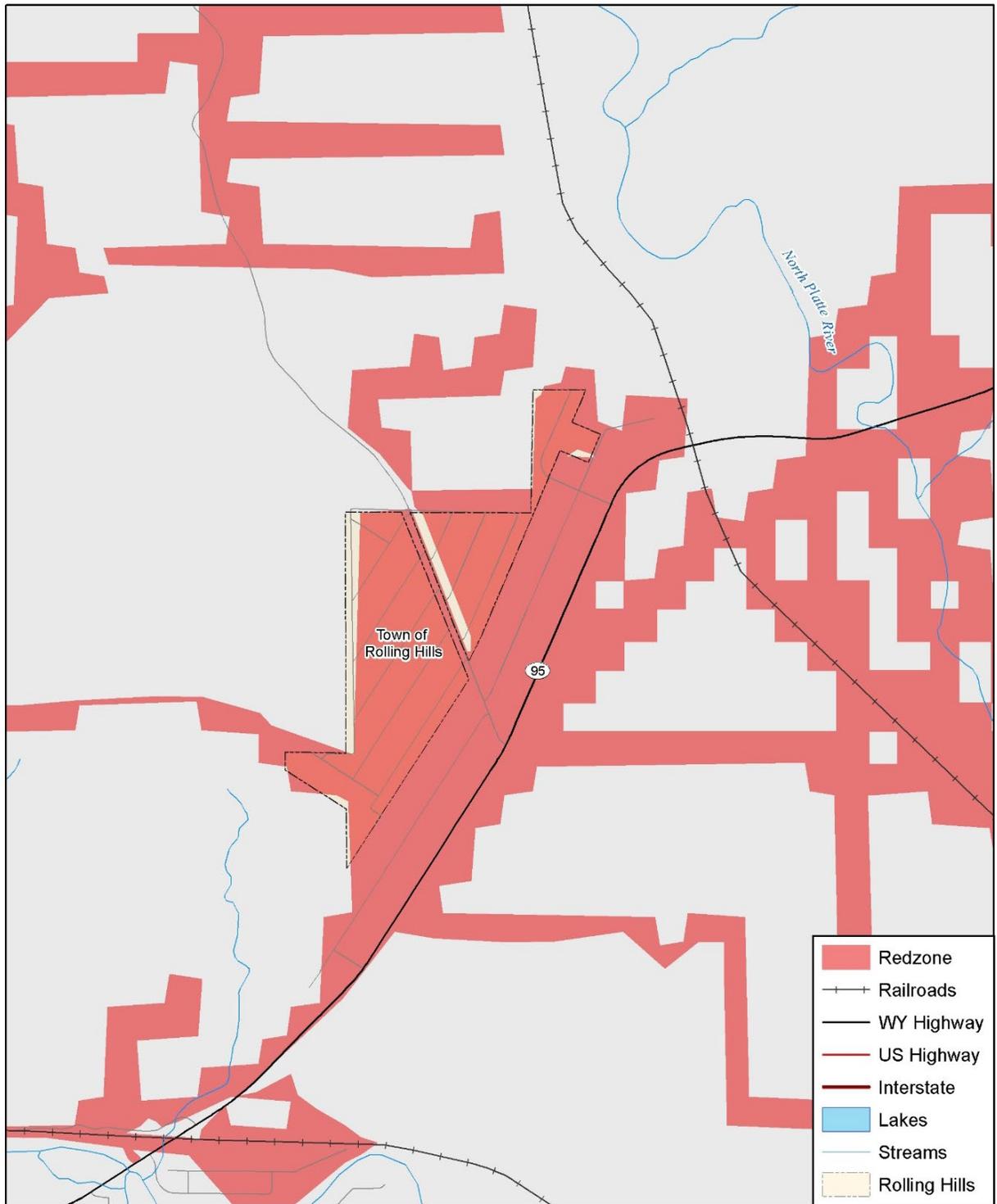
**Figure 4-46: Glenrock Wildland Fire Redzones**



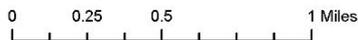
Map compiled 10/2017;  
intended for planning purposes only.  
Data Source: WY Geospatial Hub,  
WYDOT, HSIP Freedom 2015,  
WY Geospatial Hub, USGS: BLM, FS, NPS



**Figure 4-47: Rolling Hills Wildland Fire Redzones**



Map compiled 10/2017;  
intended for planning purposes only.  
Data Source: WY Geospatial Hub,  
WYDOT, HSIP Freedom 2015,  
WY Geospatial Hub, USGS: BLM, FS, NPS



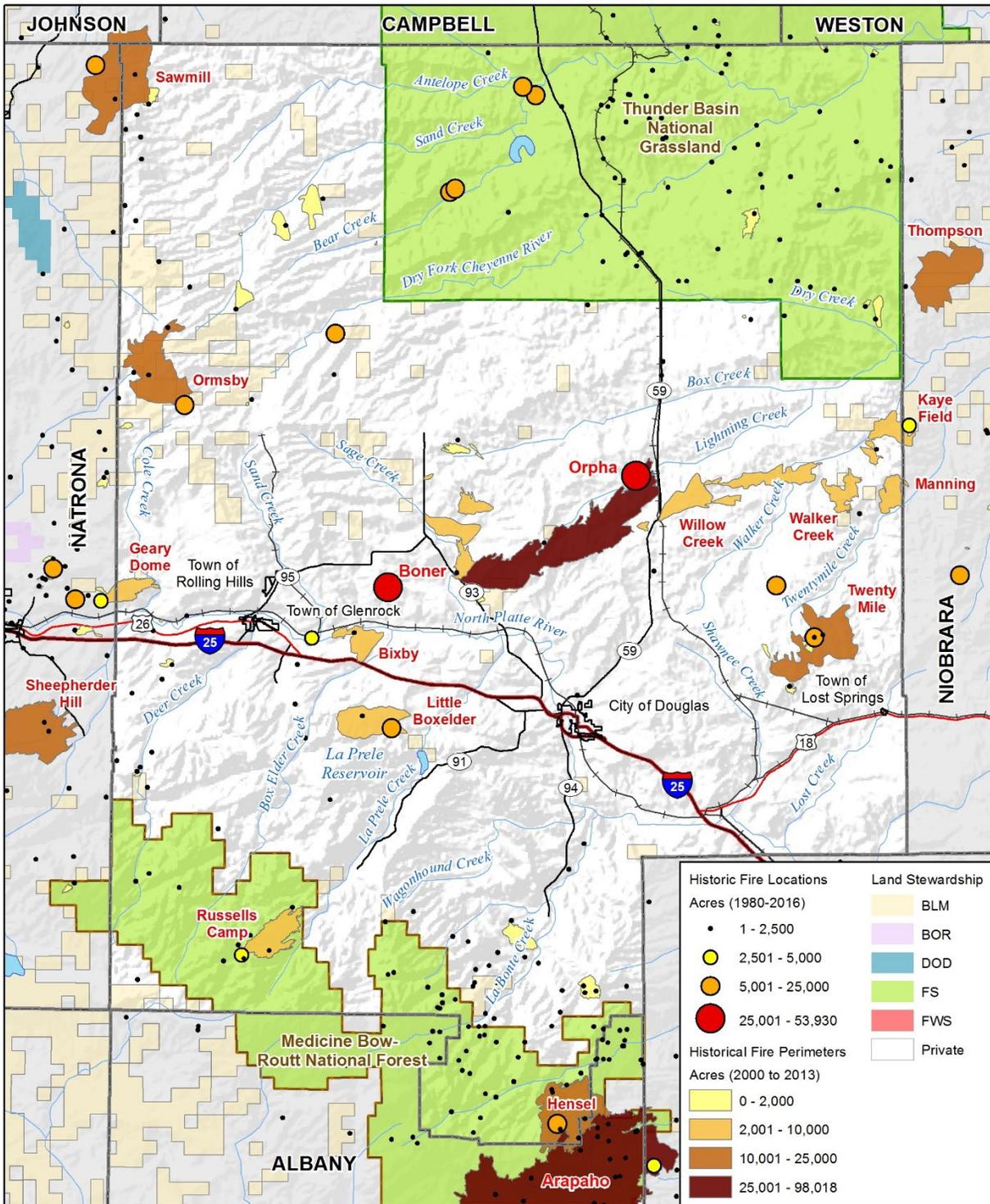
## Past Occurrences

The Federal Wildland Occurrence Database was used to analyze fire history in Converse County.

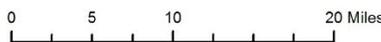
The Federal Wildland Fire Occurrence database, maintained by the USGS and other agencies, includes perimeter and point GIS layers for fires on public lands throughout the United States. The data includes fires dating back to 1980. The Bureau of Land Management, and US Forest Service reports include fires of 10 acres and greater. The database is limited to fires on federal lands. Some fires may be missing altogether or have missing or incorrect attribute data. Some fires may be missing because historical records were lost or damaged, fires were too small for the minimum cutoffs, documentation was inadequate, or fire perimeters have not yet been incorporated into the database. Also, agencies are at different stages of participation. For these reasons, the data should be used cautiously for statistical or analytical purposes.

The following figure shows a map of wildfires that have affected the area based on the Federal Wildland Occurrence Database. Most of the recorded fires occurred in the eastern part of the county.

Figure 4-48: Wildland Fire Occurrences in Converse County 1935 - 2016



amec  
foster  
wheeler  
Map compiled 4/2018;  
intended for planning purposes only.  
Data Source: WY Geospatial Hub,  
WYDOT, HSIP Freedom 2015,  
USGS: BLM, FS, NPS



There have been several fires affecting over 1,000 acres, and many smaller fires throughout the county. According to the Federal Wildland Occurrence data, of the fires affecting over 1,000 acres, a total of 23 fires burned 208,354 acres. In total, there were 209 fires, affecting 223,628 acres between 1935 and 2015. The largest fire in the County occurred in 2006, when the Boner fire burned 53,930 acres north of Glenrock. The following table describes wildfires in Converse County that burned 1,000 or more acres between 1980 and 2016.

**Table 4.59: Wildfires over 1,000 acres in Converse County: 1980-2015**

Fire Name	Acres Burned	Cause	Year
Boner	53,930	Natural	2006
Orpha	25,093	Human	2010
Hensel	14,855	Natural	2002
Hensel	14,855	Natural	2002
Twenty Mile	11,083	Natural	2006
Ormsby	11,042	Natural	2000
Antelope	10,000	Human	1999
Walker	10,000	Human	1999
Antelope	10,000	Human	1999
Henry's	9,500	Natural	1996
Little boxelder	5,882	Natural	2012
Carson	5,670	Human	2011
Carson Fire	5,670	Human	2011
Russells Camp Fire	4,905	Natural	2012
Bixby	3,030	Human	2005
Harshman	2,128	Natural	2000
Cheyenne River	2,000	Natural	2006
Ugly	1,827	Natural	2000
Olmstead D	1,520	Natural	1996
Ross #1	1,160	Natural	1996
Lance Creek	1,116	Natural	2006
Sand Creek	1,044	Natural	2012
Lake Creek	1,034	Natural	2003
Wagonhound	1,010	Human	2015

Source: Federal Wildland Occurrence Database

NCDC tracks wildfire incidents, including damages, however, there are no crop or property damages reported for wildfire in Converse County. During the HMP Risk and Goals Meeting, it was noted that during the Orpha fire in 2010, a fire truck got stuck and 3 fire fighters were injured. Additionally, in 2014, the Box Elder Canyon Fire damaged critical facility infrastructure at the halfway point between Douglas and Glenrock. Since this event, the facility has been completely retrofitted and is now more resilient.

## **Likelihood of Occurrence**

Wildfires are **highly likely** to occur in each county in Converse County each year, meaning that there is nearly a 100% chance of a fire happening in any given year. It is important to note that the risk of wildfires occurring may increase during times of drought, especially prolonged droughts such as the statewide Wyoming drought that began between 1999 and 2000 and the 1988 drought in northwestern Wyoming.

It is important to note that this probability is based on total fires; many fires recorded in Converse County are relatively small in size or cause relatively little property damage.

## **Potential Magnitude**

Wildfires can have significant economic impacts as they often coincide with the busy tourist season in the summer months, as well as posing a threat to agriculture and farming. It is important to note that the magnitude of a wildfire can be intensified by drought; drought can also cause significant complications to firefighting operations. Additionally, the high winds of the County also exacerbate fire threat. Most of fires in Converse County have occurred in the unincorporated areas, and therefore there are minimal damages to property or crops. Though the best available data does not indicate any economic costs associated with wildfire in Converse County, anecdotal information emphasizes the inherent threat to people, property, and environment.

## **Vulnerability Assessment**

The 2016 Wildland Fire Management Annual Operating Plan includes Converse County, Goshute County, Natrona County, and Platte County, in conjunction with the USDI Bureau of Land Management (BLM) High Plains District & Wind River/Bighorn Basin District, USDA Forest Service (USFS) Medicine Bow/Routt National Forest and Thunder Basin National Grasslands, USDI US Fish & Wildlife Service (USFWS), National Park Service (NPS), Wyoming State Forestry Division (WSFD). The plan primarily focuses on implementation of the Wyoming Interagency Cooperative Fire Management Agreement, and addresses issues affecting cooperation, interagency working relationships and protocols, financial arrangements, and joint activities.

In 2005, Converse County developed the Mountain Community Wildfire Protection Plan (MCWPP) for communities identified as —at risk of wildfire. These communities, all located within the Medicine Bow National Forest in the southern part of the County, were assessed for wildfire risk and mitigation strategies. The MCWPP used a Wildfire Hazard Information Extraction (WHINFOE) model to calculate the wildfire hazard rating for parcels in the WUI. Primary factors that determine the hazard rating for each site include topography, structure construction, access, utilities, landscape, and water supply. Results give the percent of structures at low, moderate, high, and very high risk; and the percent of structures at risk if the mitigation measures are enacted. The document also describes how cooperation is needed between rural fire

districts, year-round residents, part-time residents, and neighboring fire response districts if they are to be prepared to respond as quickly and safely as possible in case of a wildland fire.

The most exposed population are those living in the wildland-urban interface (WUI) zones, where residential properties are directly intruding into traditional wildland areas. The exposure of the population in these zones increases with the exposure of the corresponding general property, examined in the section below. Other exposed groups include children, the elderly, or those with breathing conditions who may be exposed to high levels of smoke.

Population at-risk estimates were developed by multiplying the average household size from the U.S. Census for the county by the number of residential structures within the Redzone. These results are shown in the table below. It is important to note that many of these structures may include seasonal homes that could be vacant, although the likelihood of them being occupied during fire season is higher. Converse County's MCWPP focuses on the rural mountain communities of Esterbrook, Downey Park, Cold Springs, and Boxelder. Before modern settlement and the disruption of established fire patterns by grazing, timber harvesting, and fire suppression, these areas experienced regularly-occurring wildfires.

GIS is a tool that is used to compare, capture, input, output, store, manipulate, analyze, model, and display spatial data. In the case of the Wildland Urban Interface Hazard Assessment, wildfire hazard vulnerability is determined by comparing values such as slope, vegetation, housing density, and aspect. The following is from the *Wyoming Wildland Urban Interface Hazard Assessment Methodology*—a report written by the Wyoming State Forestry Division:

“The Wildland Urban Interface Hazard Assessment uses three main layers to determine fire danger—Risk, Hazard, and Values. The following lists include the data used to create each of the three layers.

- 1) Risk – Probability of Ignition
  - a. Lightning Strike density
  - b. Road density
  - c. Historic fire density
- 2) Hazard – Vegetative and topological features affecting intensity and rate of spread
  - a. Slope
  - b. Aspect
  - c. Fuels – Interpreted from GAP Vegetation information.
- 3) Values – Natural or man-made components of the ecosystem on which a value can be placed
  - a. Housing Density – Life and property
- 4) Non-flammable areas Mask – a mask was created to aid in the analysis for areas that will not carry fire such as water and rock areas. These areas show in the final assessment as a zero value for hazard.”

The statewide Wildland Urban Interface Hazard Assessment and its resultant outputs serve two primary purposes: assisting in prioritizing and planning mitigation projects and creating a

communications tool to which agencies can relate to common information and data. With the mapping analysis evaluating areas of varying wildfire vulnerability, the final output will result in a Risk, Hazard, and Value (RHV) map displaying areas of concern (RedZones) for catastrophic wildland fires.

Another method of estimating vulnerability is to determine the value of structures that are located within RedZones, or wildland fire building exposure values. Wildland fire building exposure value is the value of buildings that can be potentially damaged by wildland fire in an area. The total building exposure value is \$917,900,339 according to this analysis. The RedZone analysis also includes a buffer zone to exhibit potential areas at risk within two miles of the RedZone; since wildfires can spread rapidly, it is important to consider areas close to the RedZone boundary. According to the RedZone Buffer analysis, the total building exposure value is \$143,511,121. The following table details exposure by jurisdiction and property type. For most communities in the RedZone, residential property presented by far the greatest amounts of exposure.

**Table 4.60: RedZone Fire Hazard by Jurisdiction and Property Type**

Jurisdiction	Property Type	Building Count	Improved Value	Est. Content Value	Total Exposure
Douglas	Commercial	1	\$1,169,266	\$1,169,266	\$2,338,532
	Exempt	1	\$374,388	\$374,388	\$748,776
	<b>Total</b>	<b>2</b>	<b>\$1,543,654</b>	<b>\$1,543,654</b>	<b>\$3,087,308</b>
Glenrock	Industrial	1	\$594,938	\$892,407	\$1,487,345
	Residential	65	\$9,049,914	\$4,524,957	\$13,574,871
	<b>Total</b>	<b>66</b>	<b>\$9,644,852</b>	<b>\$5,417,364</b>	<b>\$15,062,216</b>
Rolling Hills	Commercial	1	\$11,204	\$11,204	\$22,408
	Residential	146	\$26,025,440	\$13,012,720	\$39,038,160
	<b>Total</b>	<b>147</b>	<b>\$26,036,644</b>	<b>\$13,023,924</b>	<b>\$39,060,568</b>
Unincorporated	Agricultural	38	\$8,084,185	\$8,084,185	\$16,168,370
	Commercial	11	\$2,737,195	\$2,737,195	\$5,474,390
	Exempt	2	\$1,286,071	\$1,286,071	\$2,572,142
	Residential	287	\$41,390,752	\$20,695,376	\$62,086,128
	<b>Total</b>	<b>338</b>	<b>\$53,498,203</b>	<b>\$32,802,827</b>	<b>\$86,301,030</b>
<b>Grand Total</b>		<b>553</b>	<b>\$90,723,353</b>	<b>\$52,787,769</b>	<b>\$143,511,122</b>

Source: Wildland Urban Interface Hazard Assessment, Wood analysis based on Assessor's Office data 2017

Population counts were generated using the average household size figure provided by the US Census Bureau. Accordingly, Converse County has an average household size of 2.8. GIS analysis was used to estimate the total population located in the RedZone for each participating jurisdiction. The results are outlined in the table below, and indicate that there are 1,230 people total in the RedZone, of which, the majority are residents of the unincorporated areas (58%).

**Table 4.61: RedZone Population by Jurisdiction**

Jurisdiction	RedZone Population
Douglas	n/a
Glenrock	165
Rolling Hills	371
Unincorporated	729
<b>Total</b>	<b>1,265</b>

Source: Census, Wildland Urban Interface Hazard Assessment, Wood analysis based on Assessor’s Office data 2017

Any flammable materials are vulnerable during a wildfire, including structures and personal property. The vulnerability of general property increases as the distance of the property to wildfire-prone areas decreases, and is particularly high for structures located in the WUI. These structures receive an even higher level of vulnerability if the properties surrounding them are not properly mitigated for fire. Appropriate mitigation techniques include using non-flammable materials such as concrete for construction, leaving appropriate spaces between buildings and vegetation areas filled with non-flammable materials (such as decorative rock or stone), and clearing of underbrush and trees.

Essential infrastructure, facilities, and other community assets may be exposed directly or indirectly to wildfire. Direct exposures are like those of General Property and increase as the infrastructure or facilities and capabilities moves into the WUI zone. Communications lines passing through susceptible areas such as forests are more exposed than those located in cities and other more urban areas. The indirect exposure of response capability increases seasonally and with the number of occurrences. Though the populations making up the response capability are not directly exposed to all fire events, the response of some of the personnel to an event lessens the capabilities overall for response to other emergency situations. If there is a significant increase in the number of simultaneous wildland fires, even small ones, the response capability of the county could easily be compromised.

The following table shows numbers of facilities that fall within the RedZones, along with the type of facility. Ten critical facilities reside in the RedZones, all in the unincorporated County.

**Table 4.62: Critical Facilities within Redzone**

Jurisdiction	Critical Facility Type	Facility Count
Unincorporated	High Potential Loss Facility	2
	Transportation and Lifeline Facilities	8
	<b>Total</b>	<b>10</b>

Source: Wildland Urban Interface Hazard Assessment, Converse County GIS, HSIP, HAZUS

Natural resources and natural areas may benefit from wildland fire, as at some level they must also be exposed to wildfire for a healthy ecological development of the area. Historic and cultural resources could include cabins in the WUI. In addition, older buildings may be exempt

from internal fire mitigation such as sprinklers and fire suppression technology, which may increase the vulnerability of the resource.

## Future Development

The wildland/urban interface (WUI) is a very popular building location, as shown by national and statewide trends. More and more homes are being built in the interface. Overall, Wyoming has less developed wildland urban interface than most western states. According to the 2016 Wyoming Hazard Mitigation Plan the areas of highest existing risk from wildfire (number of square miles of the wildland urban interface with homes now) mainly occur within Park, Teton and northern Lincoln Counties. Throughout Wyoming there remains potential for future home construction in undeveloped, forested private lands adjacent to fire-prone public lands. Building homes in these high-risk areas would put lives and property in the path of wildfires. Regulating growth in these areas will be a delicate balance between protecting private property rights and promoting public safety.

## Summary

Wildfires occur within the county on generally an annual basis. Based on GIS analysis, the planning area has over \$143 million in building and content value, as well as 1,230 people potentially at risk to wildland fires in the Redzone. Though it is not likely that the areas at risk will simultaneously face a completely destructive event, this figure provides the upper end of what could be affected.

Overall, wildfire is a **high** significance hazard in Converse County.

**Table 4.63: Converse County Wildfire Hazard Risk Summary**

	Geographic Extent	Potential Magnitude	Probability of Future Occurrence	Overall Significance
Douglas	Extensive	Critical	Likely	High
Glenrock	Extensive	Critical	Likely	High
Rolling Hills	Extensive	Critical	Likely	High
Lost Springs	Extensive	Critical	Likely	High
Converse County	Extensive	Critical	Likely	High

# 5 MITIGATION STRATEGY

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**Requirement §201.6(c)(3): [The plan shall include] a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.**

## 5.1 Mitigation Strategy: Overview

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This section describes the mitigation strategy process and mitigation action plan for the Converse County Hazard Mitigation Plan. It describes how the HMPC met the following requirements from the 10-step planning process:

- Planning Step 6: Set Goals
- Planning Step 7: Review Possible Activities
- Planning Step 8: Draft an Action Plan

The results of the planning process, the risk assessment, the goal setting, the identification of mitigation actions, and the hard work of the HMPC led to this mitigation strategy and action plan. **Section 5.2** identifies the goal of this plan and **Section 5.4** describes the mitigation action plan.

## 5.2 Goals and Objectives

**Requirement §201.6(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.**

Up to this point in the planning process, the HMPC had organized resources, assessed hazards and risks, and documented mitigation capabilities; the resulting goals and mitigation actions were developed and updated based on these tasks. During the original development as well as 2018 update of this plan, the County held a series of meetings designed to achieve a collaborative mitigation strategy as described further throughout this section.

Goals were defined for the purpose of this mitigation plan as broad-based public policy statements that:

- Represent basic desires of the community;
- Encompass all aspects of community, public and private;
- Are nonspecific, in that they refer to the quality (not the quantity) of the outcome;
- Are future-oriented, in that they are achievable in the future; and
- Are time-independent, in that they are not scheduled events.

Goals are stated without regard to implementation. Implementation cost, schedule, and means are not considered. Goals are defined before considering how to accomplish them so that they are not dependent on the means of achievement. Goal statements form the basis for actions that will be used as means to achieve the goals.

The update of goals for Converse County was initiated through a facilitated discussion at two planning workshops held in November 2017 and January 2018. The HMPC members were provided a PowerPoint presentation that explained goals and actions, and listed examples of each. The plan goals from the 2011 plan were provided to allow HMPC members to provide suggestions for revisions. The updated goals for the 2018 Converse County Hazard Mitigation plan are listed below.

**Goal 1:** Strengthen public infrastructure.

**Goal 2:** Improve local mitigation capabilities.

**Goal 3:** Reduce economic losses due to hazard events.

**Goal 4:** Reduce local costs of response and recovery.

### 5.3 Identification and Analysis of Mitigation Actions

**Requirement §201.6(c)(3)(ii): [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.**

The next step in the mitigation strategy is to identify and analyze a comprehensive range of specific mitigation actions and projects to reduce the effects of each hazard on new and existing buildings and infrastructure. During the 2018 Plan update, the HMPC analyzed viable mitigation options by hazard that supported the identified goals. The HMPC was provided with the following list of categories of mitigation actions, which originate from the Community Rating System:

- **Prevention:** Administrative or regulatory actions or processes that influence the way land and buildings are developed and built.
- **Property protection:** Actions that involve the modification of existing buildings or structures to protect them from a hazard or remove them from the hazard area.
- **Structural:** Actions that involve the construction of structures to reduce the impact of a hazard.
- **Natural resource protection:** Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems.
- **Emergency services:** Actions that protect people and property during and immediately after a disaster or hazard event.
- **Public information/education and awareness:** Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them.

In order to identify and select mitigation actions to support the mitigation goals, each hazard identified and profiled in Chapter 4 was evaluated. At the mitigation strategy meeting, the HMPC was also provided a matrix showing examples of potential mitigation action alternatives for each of the above categories, for each of the identified hazards. The HMPC was also provided a handout that explains the categories and provided further examples. Finally, another reference document titled “Mitigation Ideas” developed by FEMA was distributed. This document lists the common

alternatives for mitigation by hazard grouped by the FEMA categories of Plans and Regulations, Structure and Infrastructure Projects, Education and Awareness, Natural Systems Protection and Emergency Services. The HMPC was asked to consider both future and existing buildings in considering possible mitigation actions. A facilitated discussion then took place to examine and analyze the options. Appendix B provides the matrix of alternatives considered. Jurisdictions were requested to return to their communities, discuss potential mitigation measures and add any new actions.

The mitigation strategy builds on existing local authorities, policies, programs, and resources, as well as the ability to expand on and improve these existing tools. Those capabilities are noted in Chapter 2 and can be assessed to identify gaps to address or strengths to enhance through new mitigation actions. For instance, gaps in design or enforcement of existing regulations could be addressed through additional personnel or a change in procedure or policy. Final action strategies are discussed in **Section 5.4**.

### **5.3.1 Prioritization Process**

Once the mitigation actions were identified, the HMPC was provided FEMA’s recommended prioritization criteria STAPLEE to assist in deciding why one recommended action might be more important, more effective, or more likely to be implemented than another. STAPLEE is an acronym for the following:

- Social: Does the measure treat people fairly? (e.g., different groups, different generations)
- Technical: Is the action technically feasible? Does it solve the problem?
- Administrative: Are there adequate staffing, funding, and other capabilities to implement the project?
- Political: Who are the stakeholders? Will there be adequate political and public support for the project?
- Legal: Does the jurisdiction have the legal authority to implement the action? Is it legal?
- Economic: Is the action cost-beneficial? Is there funding available? Will the action contribute to the local economy?
- Environmental: Does the action comply with environmental regulations? Will there be negative environmental consequences from the action?

Other criteria used to assist in evaluating the priority of a mitigation action includes:

- Does the action address hazards or areas with the highest risk?
- Does the action protect lives?
- Does the action protect infrastructure, community assets or critical facilities?

At the mitigation strategy meeting, the HMPC used STAPLEE to determine which of the actions were most likely to be implemented and effective. Keeping the STAPLEE criteria in mind, each member assigned a “high,” “medium” or “low” level of priority to each action. The results of the

STAPLEE evaluation process produced prioritized mitigation actions for implementation within the planning area.

The process of identification and analysis of mitigation alternatives allowed the HMPC to come to consensus and to prioritize recommended mitigation actions for their jurisdictions. During the voting process, emphasis was placed on the importance of a benefit-cost review in determining project priority as this is a requirement of the Disaster Mitigation Act regulations; however, this was a planning level analysis as opposed to a quantitative analysis. Quantitative cost-benefit analysis will be considered in additional detail when seeking FEMA mitigation grant funding for eligible projects identified in this plan.

Each mitigation action developed for this plan contains a description of the problem and proposed project, the entity with primary responsibility for implementation, any other alternatives considered, a cost estimate, expected project benefits, potential funding sources, and a schedule for implementation. Development of these project details for each action led to the determination of a high, medium, or low priority for each. For mitigation actions carried forward from the previous Converse County Hazard Mitigation Plan, priority levels were revisited but in most cases remained unchanged. Wholesale changes to priorities across the county (for example changes to the financial, legal and/or political climates in the county) were not identified during this process.

## 5.4 Mitigation Action Plan

**Requirement §201.6(c)(3)(iii): [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.**

This section outlines the development of the updated mitigation action plan. The action plan consists of the specific projects, or actions, designed to meet the plan's goals. Over time the implementation of these projects will be tracked as a measure of demonstrated progress on meeting the plan's goals.

### 5.4.1 Progress on Previous Mitigation Actions

As part of the update process Converse County reviewed the previously identified actions in the 2011 plan to assess progress on implementation. These reviews were completed using a worksheet and follow up discussion to capture information on each action including if the action was completed or deferred to the future. Actions that were not completed were discussed for continued relevance and were either continued in this plan or in some cases recommended for deletion.

The County and the majority of their participating jurisdictions have been successful in implementing actions identified in this plan, thus, working steadily towards meeting the plan's goals. Progress on mitigation actions previously identified in these planning mechanisms are detailed in the mitigation action strategy; see **Table 5.1** for more details on progress on implementation.

**Table 5.1. 2011 Mitigation Action Status**

2015 Action ID	Mitigation Action	2018 Status	Comment
1.2.1	Implement and enforce city ordinances to restrict where trucks are hauling	Continue in progress	Project is continuing. Douglas has designated a specific truck route.
1.3.1	Review and exercise Douglas evacuation plan	Continue in progress	The plan is being developed.
1.3.2	Conduct hazmat tabletop exercises in Glenrock for a yellow cake spill at junction of Highways 26 and 95	Continue in progress	Community is currently planning an exercise to test this scenario.
2.1.1	Put on severe weather spotter training for the public	Continue in progress	Classes have been offered over previous plan life cycle
2.2.1	Enforce building codes (to include use of hurricane clips)	Continue in progress	Douglas requires the use of hurricane clips; Glenrock has codes and enforces them. Glenrock re-prioritizes this mitigation strategy as "high priority."
3.1.1	Work with existing floodplain residents to elevate or flood-proof their structures. Obtain funding assistance and technical guidance	Continue in progress	The project is continuing as structures are altered or constructed; Douglas participates in the FEMA Community Rating System (CRS) program.
3.3.1	Continue to participate in National Flood Insurance Program (NFIP)	Continue in progress	All communities remain in good standing with the NFIP; Douglas participates in the FEMA CRS program.
3.3.2	Implement direction in Converse County Together for Now and Tomorrow (CCTNT) to steer development away from floodplains in Douglas and Glenrock or require mitigation	Continue in progress	Douglas follows FEMA guidelines; Glenrock enforces codes and ordinances.
3.4.1	Obtain funding to implement engineer's recommendation for drainage plans in West Plains subdivision	Continue in progress	The project should be complete by 2022.
3.4.3	Make stormwater system improvements identified in Glenrock.	Continue in progress	Glenrock has been making improvements; improvements will continue in updated plan.
4.1.1	Expand defensible space program begun by State Forestry Division to include more areas of the forested southern part of the County	Continue in progress	State Forestry continues to offer funding for debris removal
4.2.1	Improve access to rural water sources for fire trucks. Fit stock ponds, rural water tanks, etc. with valves compatible to fire apparatus	Continue in progress	this is an ongoing process
4.2.2	Implement communications interoperability for emergency responders via the use of cooperative infrastructure to meet all agencies' wireless communications needs	Continue in progress	Converse County Joint Communications brings Douglas and the County together for communications. Jurisdictions use other systems to supplement communication. County and communities continue to improve communications systems as appropriate.

2015 Action ID	Mitigation Action	2018 Status	Comment
4.2.3	Drill strategically-placed deep source water wells around rural areas for firefighting	Continue in progress	this is an ongoing process
4.3.4	Incorporate Firewise access requirements into county subdivision review for WUI areas	Continue in progress	
4.3.5	Assist addressing issues in Downey Park, Little Medicine, Boxelder Roads, driveways	Continue in progress	Process is continuing
4.4.1	Support hazard fuel reduction projects on all ownerships	Continue in progress	Hazard fuel reduction continues throughout the county
5.1.1	Review water restrictions and continue to implement water rationing measures in Douglas (regulatory) and Glenrock (voluntary) as necessary during drought situations	Continue in progress	Douglas has plan in place to manage water restrictions due to drought conditions. Glenrock has not implemented rationing measures, though water rate increases have been instrumental in customers cutting back on water usage.
6.1.2	Publish snow plowing priorities for county roads. Sign road locations where people are repeatedly stranded by snow	Continue in progress	Snow plow priorities have been recorded. Share and publicize this information with appropriate parties.
6.1.3	Enhance tree trimming program near utility lines and other vulnerable areas	Continue in progress	Utility companies maintain trees; Douglas offers and will continue to offer a cost share tree trimming program to residents.
6.1.4	Continue to work with WYDOT on location and timing of Interstate closures	Continue in progress	This is an ongoing process every winter season, and will continue
7.2.2	Obtain means of back-up power for Rolling Hills town hall.	Continue not started	Incomplete due to lack of funding.
7.3.1	Obtain emergency access easement to Dunham Road in Rolling Hills.	Continue not started	Incomplete due to lack of funding.
7.3.2	Develop plan to deliver potable water to Glenrock if water pipelines are compromised	Continue in progress	Public Works is developing a vulnerability assessment plan with Rural Water; part of the plan will address this strategy.

#### 5.4.2 Deleted Mitigation Actions

As part of mitigation action development for the plan update, the HMPC review of the mitigation actions identified in the previous plan yielded a few actions that the group determined should not continue into the new plan and instead be deleted. **Table 5.2** shows these actions with an explanation for their removal.

**Table 5.2. Deleted Mitigation Actions**

2015 Action ID	Mitigation Action	Benefitting Jurisdiction(s)	Hazard(s) Addressed	Lead Agency(ies)	2018 Status	Comment
1.1.1	Raise awareness and educate the public on sheltering in place, disaster/emergency supplies and plans, and evacuation	Unincorporated Converse County	Hazardous Materials	Converse County Emergency Management (Converse County Emergency Management Agency), Red Cross, Homeland Security	Delete	Replace with new action
1.1.2	Train and equip local emergency responders to enhance their ability to respond to HazMat incidents	Unincorporated Converse County	Hazardous Materials	Dept. of Justice, Dept. of Defense, Federal Emergency management Agency (FEMA), Wyoming Office of Homeland Security (WOHS)	Delete	Not a mitigation strategy; focuses on response
2.1.2	Educate the public on tornado awareness and what to do in case of a tornado	Unincorporated Converse County	Tornado	Converse County Emergency Management Agency, Red Cross, National Weather Service	Delete	Replace with new action
3.4.2	Engineer and construct a berm to protect the Deer Creek RV Park	Unincorporated Converse County	Flood	Converse County Emergency Management Agency	Delete	Not a priority
3.4.4	Monitor snowpack in Deer Creek and devise method to warn RV Park operator of floods	Unincorporated Converse County	Flood	Converse County Emergency Management Agency, NRCS	Delete	Warning accomplished by direct communication
3.4.5	Address debris collection on Coal Shadow Rd and Hwy 20/26 Deer Creek bridges	Unincorporated Converse County	Flood	Converse County Emergency Management Agency, County Road and Bridge	Delete	this is an ongoing process
4.1.2	Educate rural residents about the use of defensible space to protect property from wildland fire. Educate public on fire resistant construction materials.	Unincorporated Converse County	Wildland Fire	Converse County Emergency Management Agency, County Extension, Bureau of Land Management	Delete	Replace with new action
5.1.2	Educate residents on benefits of conserving water not just during drought. Include education on drought-tolerant plantings (crops & residential).	Unincorporated Converse County	Drought	Converse County Emergency Management Agency, University of WY, County Extension Office, Converse Conservation District (CCD)	Delete	Replace with new action

2015 Action ID	Mitigation Action	Benefitting Jurisdiction(s)	Hazard(s) Addressed	Lead Agency(ies)	2018 Status	Comment
5.1.3	Develop or increase water storage capabilities for livestock industry	Unincorporated Converse County	Drought	Private land owners, CCD, Ag. Organizations	Delete	Not a priority
6.1.1	Educate the public on winter storm preparedness including emergency supplies	Unincorporated Converse County	Winter Storm	Converse County Emergency Management Agency< Red Cross, National Weather Service	Delete	Replace with new action
6.2.2	Obtain 2 snowmobiles for Search and Rescue.	Unincorporated Converse County	Winter Storm	County Sheriff, Converse County Emergency Management Agency	Delete	Not a mitigation strategy; focuses on response
7.1.1	Set up mobile command center as a dual console dispatch	Unincorporated Converse County	All	Converse County Emergency Management Agency	Delete	Not a mitigation strategy; focuses on response
7.1.2	Identify two additional areas outside the downtown core of Douglas to access into 911 if needed. Hardwire these locations ahead of time	Unincorporated Converse County	All	Converse County Emergency Management Agency and LEPC	Delete	Not a mitigation strategy; focuses on response
7.1.3	Install a 911 trunk in the Rolling Hills Fire Station.	Rolling Hills	All	Converse County Emergency Management Agency	Delete	Rolling Hills contracts out comms with GPD and GFD.
7.1.4	Develop and run a PSA educating people to listen to their car radios during a loss of power	County	All	Converse County Emergency Management Agency, Radio Station	Delete	Rolled up into larger public information campaign about different hazards Converse County is vulnerable to
7.1.5	Evaluate communications means for Lost Springs during a disaster	Lost Springs	All	Converse County Emergency Management Agency, Lost Springs	Delete	Not a mitigation strategy; focuses on response
7.2.1	Obtain back-up power for the radio station in Douglas	Unincorporated Converse County	All	Converse County Emergency Management Agency	Delete	Not a priority

### 5.4.3 Continued Compliance with NFIP

Given the significance of the flood hazard in the planning area and as required by DMA, an emphasis will be placed on continued compliance with the National Flood Insurance Program (NFIP). Unincorporated Converse County, Douglas and Glenrock participate in the NFIP; each jurisdiction will continue to make every effort to remain in good standing with the program. The table below summarizes the NFIP mapping and participation status for jurisdictions in the County.

**Table 5.1 NFIP Participation Status Summary**

Jurisdiction	Effective Map Status	Date Joined	Comments
Unincorporated County	11/04/09	04/05/88	
Douglas	11/04/09	10/17/78	Douglas is a CRS participant
Glenrock	11/04/09	11/15/85	
Lost Springs	N/A	N/A	Not mapped; not required to participate
Rolling Hills	N/A	N/A	Not mapped; not required to participate

The mitigation strategy reflects each participant’s commitment to continue NFIP compliance and participation. Information related to specific floodplain management capabilities can be found in Chapter 2, Table 2.3. Specific efforts include continuing to comply with the NFIP’s standards for updating and adopting floodplain maps and maintaining and updating the floodplain zoning ordinance. Actions related to continued compliance include:

- Continued designation of a local floodplain manager whose responsibilities include reviewing floodplain development permits to ensure compliance with the local floodplain management ordinances and rules;
- Suggest changes to improve enforcement of and compliance with regulations and programs;
- Participate in Flood Insurance Rate Map updates by adopting new maps or amendments to maps;
- Utilize Digital Flood Insurance Rate maps in conjunction with GIS to improve floodplain management, such as improved risk assessment and tracking of floodplain permits;
- Promote and disperse information on the benefits of flood insurance.

Also to be considered are the flood mitigation actions contained in this plan that support the ongoing efforts by participating counties to minimize the risk and vulnerability of the community to the flood hazard, and to enhance their overall floodplain management program. It is also important to note that the City of Douglas is a participant in the Community Rating System which underscores the City’s commitment to managing its floodplains above and beyond the FEMA minimum standards and keeping flood insurance affordable. Actions related to continued compliance in the CRS include:

- Assessing community flood problems
- Mapping and flood data
- Managing new development to minimize flood damage
- Implementing and updating the Flood Mitigation Assistance Plan

- Reducing flood losses to existing development
- Improving emergency preparedness and response
- Implementing public information and floodplain awareness activities

#### **5.4.4 Mitigation Action Plan**

The mitigation action plan presents the recommendations developed by the County planning team, outlining how each jurisdiction can reduce the risk and vulnerability of people, property, infrastructure, and natural resources to future disaster losses. The mitigation strategy is designed to be realistic based on the capabilities in the Unincorporated County and participating jurisdictions.

The actions are captured in **Table 5.3**, and include a description of the action, priority, hazards intended to be mitigated, the parties responsible for implementation, and an action identification number to make actions easier to track and reference in the future. Some mitigation actions are detailed further in the pages that follow. These details include the action description, hazard(s) mitigated, lead and partner agencies responsible for initiating implementation, costs, and timeline. Many of the action items included in this plan are a collaborative effort among local, state, and federal agencies and stakeholders in the planning area.

Further, it should be clarified that the actions included in this mitigation strategy are subject to further review and refinement; alternatives analyses; and reprioritization due to funding availability and/or other criteria. The jurisdictions are not obligated by this document to implement any or all of these projects. Rather, this mitigation strategy represents the desires of each community to mitigate the risks and vulnerabilities from identified hazards. The participating jurisdictions also realize that new needs and priorities may arise as a result of a disaster or other circumstances and reserves the right to support new actions, as necessary, as long as they conform to their overall goals, as listed in this plan.

Where feasible it is recommended that mitigation be integrated and implemented through existing planning mechanisms. Specific related mechanisms are noted in the table where applicable and also discussed in Chapter 6.

**Table 5.3. Mitigation Action Strategy 2018-2022**

Goal	Action ID	Mitigation Action	Jurisdiction(s)	Project Benefits	Hazard(s) Addressed	Potential Funding Sources	Lead Agency(ies)	Priority	Timeframe
1	1.1	Implement and enforce city ordinances to restrict where trucks are hauling	Douglas	Ensure hazardous chemicals transported away from critical facilities and population centers where possible, mitigating potential release impacts	Hazardous Materials	N/A	Elected officials, Law enforcement	Medium	2019
1	1.2	Steer development away from floodplains in Douglas and Glenrock or require mitigation activities consistent with each community's long term planning and flood regulations	Douglas, Glenrock	Reduced impacts from flooding hazards	Flood	N/A	Town and City Planning Departments	High	Ongoing
1	1.3	Enforce building codes (to include use of hurricane clips)	Douglas, Glenrock	Reduced vulnerability to impacts due to high winds, tornadic weather	Tornado; high winds and downbursts	N/A	Code enforcement officers, Douglas, Glenrock	Medium	Ongoing
1	1.4	Make stormwater system improvements identified in Glenrock per the Glenrock Stormwater Management Plan and Master Plan	Glenrock	Increased stormwater flow and reduced vulnerability to flash flooding	Flood	Glenrock, HMGP	Glenrock, FEMA	Medium	2022

Goal	Action ID	Mitigation Action	Jurisdiction(s)	Project Benefits	Hazard(s) Addressed	Potential Funding Sources	Lead Agency(ies)	Priority	Timeframe
1	1.5	Obtain means of back-up power for Rolling Hills town hall	Rolling Hills	Continued operations for Rolling Hills town hall during power loss	Dam failure; drought; earthquake; flood; hail; hazardous materials; landslide and subsidence; tornado and windstorm; wildland fire; winter storm	Rolling Hills, Converse County Emergency Management Agency	Rolling Hills, Converse County Emergency Management Agency	Medium	2021
1	1.6	Obtain emergency access easement to Dunham Road in Rolling Hills	Rolling Hills	Additional access to Rolling Hills	Dam failure; drought; earthquake; flood; hail; hazardous materials; landslide and subsidence; tornado and windstorm; wildland fire; winter storm	Rolling Hills, FEMA	Rolling Hills, Converse County Emergency Management Agency	Medium	2022
1	1.7	Remove debris from storm sewers, culverts and other impacted waterways to conserve the unimpeded flow of water	Unincorporated Converse County; Douglas; Glenrock; Lost Springs; Rolling Hills	Improved water flow and reduced risk of flash flooding	Flash Flood	Community funding; County funding	Public Works	High	2019

Goal	Action ID	Mitigation Action	Jurisdiction(s)	Project Benefits	Hazard(s) Addressed	Potential Funding Sources	Lead Agency(ies)	Priority	Timeframe
1	1.8	Develop an implementation plan and investigate funding availability and feasibility for saferooms in rural schools (White School, Moss Agate School, Dry Creek School and Walker Creek School)	Unincorporated Converse County	Safe space for schools during tornado or other severe weather incidents	Tornado; Severe Thunderstorm	County funds; staff time	Converse County Emergency Management; School Districts	Medium	2019

Goal	Action ID	Mitigation Action	Benefitting Jurisdiction(s)	Project Benefits	Hazard(s) Addressed	Potential Funding Sources	Lead Agency(ies)	Priority	Timeframe
2	2.1	Continue to participate in National Flood Insurance Program (NFIP) with activities including continued designation of a floodplain manager, improving enforcement of and compliance with regulations and programs, participation in any new FIRM updates, using GIS to improve floodplain management, and promoting the benefits of flood insurance	Unincorporated Converse County, Douglas, Glenrock	Floodplain mitigation and reduced flood vulnerability	Flood	N/A	Converse County Emergency Management Agency, Douglas, Glenrock, Converse County	High	Ongoing
2	2.2	Enhance tree trimming program near utility lines and other vulnerable areas	Unincorporated Converse County, Douglas, Glenrock	Reduce vulnerability of utility lines to failure caused by tree limbs	Winter Storm; high winds and downbursts	County and municipalities	Town/city maintenance, County Road and Bridge	Medium	Ongoing
2	2.3	Review water restrictions and continue to implement water rationing measures in Douglas (regulatory) and Glenrock (voluntary) as necessary during drought situations	Douglas, Glenrock	Enforced and voluntary citizen water conservation during drought conditions	Drought	N/A	City of Douglas; Town of Glenrock	High	One year
2	2.4	Support hazard fuel reduction projects on all ownerships	Unincorporated Converse County	Reduced vulnerability to wildland fire due to reduction in available fuels	Wildland Fire	Bureau of Land Management, Forest Service, WDF	Converse County Emergency Management Agency, local fire departments	High	Ongoing

Goal	Action ID	Mitigation Action	Benefitting Jurisdiction(s)	Project Benefits	Hazard(s) Addressed	Potential Funding Sources	Lead Agency(ies)	Priority	Timeframe
2	2.5	Incorporate Firewise access requirements into county subdivision review for WUI areas	Unincorporated Converse County	Reduced vulnerability to wildland fire due to reduction in available fuels and other fire mitigation measures	Wildland Fire	County staff	County Planning, Converse County Emergency Management Agency	Medium	2020
2	2.6	Continue programs across the County to subsidize water usage during winter months to prevent frozen pipes, and ensure these programs are publicized	Unincorporated Converse County; Douglas; Glenrock; Lost Springs; Rolling Hills	Mitigated impacts to homes and buildings due to freezing winter weather	Winter Weather			High	2019
2	2.7	Develop a public information campaign to increase public awareness of dam failure risk in the County, focused on identified risks, county and community mitigation actions and actions citizens can take to understand and reduce their risk to dam failure.	Unincorporated Converse County; Douglas; Glenrock; Lost Springs; Rolling Hills	Citizen awareness; personal hazard mitigation	Dam failure	County funds; community funds; staff time	County Emergency Management	High	2019
2	2.8	Continue 50/50 tree trimming program in Douglas and Glenrock to defray homeowner cost in preventive tree care	Douglas; Glenrock	Cooperative approach to reduce utility risk from overgrown trees	High Wind and Downburst; Severe Thunderstorm	Local funds	City of Douglas; Town of Glenrock	High	2019

Goal	Action ID	Mitigation Action	Benefitting Jurisdiction(s)	Project Benefits	Hazard(s) Addressed	Potential Funding Sources	Lead Agency(ies)	Priority	Timeframe
2	2.9	Develop a public information campaign to increase public awareness of hazardous materials risk in the County, focused on identified risks, county and community mitigation actions and actions citizens can take to understand and reduce their risks during a hazmat incident.	Unincorporated Converse County; Douglas; Glenrock; Lost Springs; Rolling Hills	Citizen awareness; personal hazard mitigation	Hazardous Materials	County funds; community funds; staff time	County Emergency Management	High	2019
2	2.10	Develop a public information campaign to increase public awareness of drought risk in the County, focused on identified risks, county and community mitigation actions and actions citizens can take to understand and reduce their risk to drought.	Unincorporated Converse County; Douglas; Glenrock; Lost Springs; Rolling Hills	Citizen awareness; personal hazard mitigation; specific focus on drought tolerant plantings (crops/residential), benefits of water conservation	Drought	County funds; community funds; staff time	County Emergency Management	High	2019
2	2.11	Develop a public information campaign to increase public awareness of earthquake risk in the County, focused on identified risks, county and community mitigation actions and actions citizens can take to understand and reduce their risk to earthquake.	Unincorporated Converse County; Douglas; Glenrock; Lost Springs; Rolling Hills	Citizen awareness; personal hazard mitigation	Earthquake	County funds; community funds; staff time	County Emergency Management	High	2019

Goal	Action ID	Mitigation Action	Benefitting Jurisdiction(s)	Project Benefits	Hazard(s) Addressed	Potential Funding Sources	Lead Agency(ies)	Priority	Timeframe
2	2.12	Develop a public information campaign to increase public awareness of expansive soils risk in the County, focused on identified risks, county and community mitigation actions and actions citizens can take to understand and reduce their risk to expansive soils.	Unincorporated Converse County; Douglas; Glenrock; Lost Springs; Rolling Hills	Citizen awareness; personal hazard mitigation	Expansive Soils	County funds; community funds; staff time	County Emergency Management	High	2019
2	2.13	Develop a public information campaign to increase public awareness of flood risk in the County, focused on identified risks, county and community mitigation actions and actions citizens can take to understand and reduce their risk to flood.	Unincorporated Converse County; Douglas; Glenrock; Lost Springs; Rolling Hills	Citizen awareness; personal hazard mitigation	Flood	County funds; community funds; staff time	County Emergency Management	High	2019
2	2.14	Develop a public information campaign to increase public awareness of high wind and downburst risk in the County, focused on identified risks, county and community mitigation actions and actions citizens can take to understand and reduce their risk to high winds and/or downbursts.	Unincorporated Converse County; Douglas; Glenrock; Lost Springs; Rolling Hills	Citizen awareness; personal hazard mitigation	High Wind and Downburst	County funds; community funds; staff time	County Emergency Management	High	2019

Goal	Action ID	Mitigation Action	Benefitting Jurisdiction(s)	Project Benefits	Hazard(s) Addressed	Potential Funding Sources	Lead Agency(ies)	Priority	Timeframe
2	2.15	Develop a public information campaign to increase public awareness of risks associated with severe thunderstorms in the County (including hail and lightning), focused on identified risks, county and community mitigation actions and actions citizens can take to understand and reduce their risk to severe thunderstorms.	Unincorporated Converse County; Douglas; Glenrock; Lost Springs; Rolling Hills	Citizen awareness; personal hazard mitigation	Severe Thunderstorm	County funds; community funds; staff time	County Emergency Management	High	2019
2	2.16	Develop a public information campaign to increase public awareness of tornado risk in the County, focused on identified risks, county and community mitigation actions and actions citizens can take to understand and reduce their risk to tornado.	Unincorporated Converse County; Douglas; Glenrock; Lost Springs; Rolling Hills	Citizen awareness; personal hazard mitigation	Tornado	County funds; community funds; staff time	County Emergency Management	High	2019
2	2.17	Develop a public information campaign to increase public awareness of winter weather risks in the County, focused on identified risks, county and community mitigation actions and actions citizens can take to understand and reduce their risk to winter weather.	Unincorporated Converse County; Douglas; Glenrock; Lost Springs; Rolling Hills	Citizen awareness; personal hazard mitigation	Winter Weather	County funds; community funds; staff time	County Emergency Management	High	2019

Goal	Action ID	Mitigation Action	Benefitting Jurisdiction(s)	Project Benefits	Hazard(s) Addressed	Potential Funding Sources	Lead Agency(ies)	Priority	Timeframe
2	2.18	Develop a public information campaign to increase public awareness of wildfire risk in the County, focused on identified risks, county and community mitigation actions and actions citizens can take to understand and reduce their risk to wildfire.	Unincorporated Converse County; Douglas; Glenrock; Lost Springs; Rolling Hills	Citizen awareness; personal hazard mitigation; educate rural residents about the use of defensible space to protect property from wildland fire, and fire-resistant construction materials.	Wildfire	County funds; community funds; staff time	County Emergency Management	High	2019

Goal	Action ID	Mitigation Action	Benefitting Jurisdiction(s)	Project Benefits	Hazard(s) Addressed	Potential Funding Sources	Lead Agency(ies)	Priority	Timeframe
3	3.1	Work with existing floodplain residents to elevate or flood-proof their structures. Obtain funding assistance and technical guidance	Unincorporated Converse County, Douglas	Reduced flooding impacts	Flood	HMGP, FEMA Funds	County Planning Dept., Town and City Planning Depts., Converse County Emergency Management Agency	Medium	2023
3	3.2	Obtain funding to implement engineer's recommendation for drainage plans in West Plains subdivision	Unincorporated Converse County, Douglas	Improved drainage in the Unincorporated Converse County and Douglas	Flood	HMGP, FEMA	Converse County Emergency Management Agency, Douglas, Converse County	High	2022
3	3.3	Expand defensible space program begun by State Forestry Division to include more areas of the forested southern part of the County	Unincorporated Converse County	Reduced vulnerability to wildland fire due to reduction in available fuels	Wildland Fire	State Disaster Preparedness grant, EMPA Grant, DRI, National Weather Service, E911 funds	WY Division of Forestry, Bureau of Land Management (Bureau of Land Management), Forest Service 9FS, Rural Fire Districts	High	2022

Goal	Action ID	Mitigation Action	Benefitting Jurisdiction(s)	Project Benefits	Hazard(s) Addressed	Potential Funding Sources	Lead Agency(ies)	Priority	Timeframe
3	3.4	Maintain compliance with and participate in the National Flood Insurance Program (NFIP) and the Community Rating System (CRS) through continued management and enforcement of floodplain regulations, as well as continual assessment of flood problems, managing new development to mitigate flood damage, implementing and updating the FMA plan, improving emergency preparedness and response, and public awareness	Douglas	Floodplain mitigation and reduced flood vulnerability	Flood	N/A	Douglas	High	Ongoing

Goal	Action ID	Mitigation Action	Benefitting Jurisdiction(s)	Project Benefits	Hazard(s) Addressed	Potential Funding Sources	Lead Agency(ies)	Priority	Timeframe
3	3.5	Participate in the Great Wyoming Shakeout Statewide Earthquake Drill; encourage schools to participate as well	Unincorporated Converse County; Douglas; Glenrock; Lost Springs; Rolling Hills	Reduced impacts of potential earthquake incidents	Earthquake	County funds; community funds; staff time	County Emergency Management	Medium	2019
3	3.6	Conduct annual cleanup and mowing of grasses and underbrush to reduce the potential impacts of grass and/or wildland fire	Lost Springs	Reduce fuel and create buffer around community buildings from grass fire risk	Wildfire	Community funds	Lost Springs	Medium	2019

Goal	Action ID	Mitigation Action	Benefitting Jurisdiction(s)	Project Benefits	Hazard(s) Addressed	Potential Funding Sources	Lead Agency(ies)	Priority	Timeframe
4	4.1	Continue to work with WYDOT on location and timing of Interstate closures	Unincorporated Converse County	Coordinated road closures; reduced impacts of winter storms	Winter Storm	N/A	Converse County Emergency Management Agency, Wyoming Department of Transportation (WYDOT)	High	Ongoing
4	4.2	Publish snow plowing priorities for county roads. Sign road locations where people are repeatedly stranded by snow	Unincorporated Converse County	Increase public awareness and individual resilience; lessen impact of winter storms	Winter Storm	County Road and Bridge	County Road and Bridge, Converse County Emergency Management Agency	Medium	Ongoing

Goal	Action ID	Mitigation Action	Benefitting Jurisdiction(s)	Project Benefits	Hazard(s) Addressed	Potential Funding Sources	Lead Agency(ies)	Priority	Timeframe
4	4.3	Review and exercise Douglas evacuation plan	Douglas	Increased capability to move people from Douglas quickly if necessary	Hazardous Materials	N/A	Converse County Emergency Management Agency, Douglas	Medium	2021
4	4.4	Conduct hazmat tabletop exercises in Glenrock for a yellow cake spill at junction of Highways 26 and 95	Glenrock	Improved ability to respond to hazmat incident; improved interagency coordination	Hazardous Materials	N/A	Converse County Emergency Management Agency, Douglas	Medium	2021

Goal	Action ID	Mitigation Action	Benefitting Jurisdiction(s)	Project Benefits	Hazard(s) Addressed	Potential Funding Sources	Lead Agency(ies)	Priority	Timeframe
4	4.5	Develop plan to deliver potable water to Glenrock if water pipelines are compromised	Glenrock	Reduced vulnerability to infrastructure failure	Dam failure; drought; earthquake; flood; hail; hazardous materials; landslide and subsidence; tornado and windstorm; wildland fire; winter storm	Glenrock	Glenrock Public Works, Converse County Emergency Management Agency	Medium	2021
4	4.6	Implement communications interoperability for emergency responders via the use of cooperative infrastructure to meet all agencies' wireless communications needs	Unincorporated Converse County, Douglas, Glenrock, Rolling Hills	Improved coordination during incident	Wildland Fire	Unknown	PSMC Steering Committee	High	Five years
4	4.7	Put on severe weather spotter training for the public	Unincorporated Converse County	Increased awareness of severe weather occurrences; increased warning time	Tornado	National Weather Service	Converse County Emergency Management Agency, National Weather Service	High	Ongoing

Goal	Action ID	Mitigation Action	Benefitting Jurisdiction(s)	Project Benefits	Hazard(s) Addressed	Potential Funding Sources	Lead Agency(ies)	Priority	Timeframe
4	4.8	Improve access to rural water sources for fire trucks. Fit stock ponds, rural water tanks, etc. with valves compatible to fire apparatus	Unincorporated Converse County	Improved access to water sources during fire response	Wildland Fire	Unknown	Private land owners	Medium	2023
4	4.9	Drill strategically-placed deep source water wells around rural areas for firefighting	Unincorporated Converse County	Improved access to water sources during fire response	Wildland Fire	State of Wyoming	Private land owners, Converse Co. Rural Fire Department	Low	2023
4	4.10	Implement the IPAWS system across the county	Unincorporated Converse County; Douglas; Glenrock; Lost Springs; Rolling Hills	Reduced impacts from hazards due to improved early warning system	All	Local funds	Joint Justice; County Emergency Management	High	2019

Goal	Action ID	Mitigation Action	Benefitting Jurisdiction(s)	Project Benefits	Hazard(s) Addressed	Potential Funding Sources	Lead Agency(ies)	Priority	Timeframe
4	4.11	Develop a public information campaign to increase public awareness of basic community preparedness in the County, focused on identified risks, county and community mitigation actions and actions citizens can take to understand and reduce their risk to identified hazards.	Unincorporated Converse County; Douglas; Glenrock; Lost Springs; Rolling Hills	Citizen awareness; personal hazard mitigation and preparedness	All	County funds; community funds; staff time	County Emergency Management	High	2019
4	4.12	Conduct soils testing for expansive soils in identified risk areas in Glenrock and Douglas	Glenrock; Douglas	Reduced risk to impacts in areas with identified expansive soils potential	Expansive Soils	Staff time	City of Douglas; Town of Glenrock	High	2019
4	4.13	Assist addressing issues in Downey Park, Little Medicine, Boxelder Roads, driveways	Unincorporated Converse County	Improved addressing in Unincorporated areas of the County, improving response time and efficiency	Wildland Fire	County, Subdivisions, Forest Service	WDF, Bureau of Land Management, FS, Co Road and Bridge, Subdivisions	High	Ongoing



# 6 PLAN ADOPTION, IMPLEMENTATION AND MAINTENANCE

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**Requirement §201.6(c)(4): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.**

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. This is Planning Step 10 of the 10-step planning process. This chapter provides an overview of the strategy for plan implementation and maintenance and outlines the method and schedule for monitoring, updating, and evaluating the plan. The chapter also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

## 6.1 Formal Adoption

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The purpose of formally adopting this plan is to secure buy-in from participating jurisdictions, raise awareness of the plan, and formalize the plan's implementation. The adoption of this plan completes Planning Step 9 of the 10-step planning process: Adopt the Plan. The governing board for each participating jurisdiction has adopted this local hazard mitigation plan by passing a resolution. A copy of the generic resolution and the executed copies are included in Appendix C, Plan Adoption. This plan will be updated and re-adopted every five years in concurrence with the required DMA local plan update requirements.

## 6.2 Implementation

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Converse County has made demonstrated progress toward successful plan implementation since this plan's initial development. Continued implementation will be accomplished by adhering to the schedules identified for each action and through constant, pervasive, and energetic efforts to network and highlight the benefits to the counties, communities and stakeholders. This effort is achieved through the routine actions of monitoring meeting agendas for hazard mitigation related initiatives, coordinating on the topic at meetings, and promoting a safe, sustainable community. Additional mitigation strategies could include consistent and ongoing enforcement of existing policies and vigilant review of programs for coordination and multi-objective opportunities. **Mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development.**

Simultaneous to these efforts, it is important to maintain a constant monitoring of funding opportunities that can be leveraged to implement some of the costlier recommended actions. This will include creating and maintaining a bank of ideas on how to meet local match or participation requirements. When funding does become available, the County and municipalities will be in a

position to capitalize on the opportunity. Funding opportunities to be monitored include special pre- and post-disaster funds, state and federal earmarked funds, benefit assessments, and other grant programs, including those that can serve or support multi-objective applications.

### **6.2.1 Role of Hazard Mitigation Planning Committee in Implementation and Maintenance**

With adoption of this plan, the County will be responsible for the plan implementation and maintenance. The County, led by Emergency Management, will reconvene its HMPC for plan implementation and maintenance. This HMPC will be the same committee (in form and function, if not actual individuals) that developed this HMP and will also be responsible for the next formal update to the plan in five years.

The County's HMPC will:

- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of high-priority, low/no-cost recommended actions;
- Ensure hazard mitigation remains a consideration for community decision makers;
- Maintain a vigilant monitoring of multi-objective cost-share opportunities to help the community implement the plan's recommended actions for which no current funding exists;
- Monitor and assist in implementation and update of this plan;
- Report on plan progress and recommended changes to county and municipal officials; and
- Inform and solicit input from the public.

The HMPC will not have any powers over respective County staff; it will be purely an advisory body. The primary duty is to see the plan successfully carried out and to report to the county commissioners, municipal boards, and the public on the status of plan implementation and mitigation opportunities. Other duties include reviewing and promoting mitigation proposals, considering stakeholder concerns about hazard mitigation, passing concerns on to appropriate entities, and posting relevant information on county websites (and others as appropriate).

## **6.3 Maintenance**

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Plan maintenance implies an ongoing effort to monitor and evaluate plan implementation and to update the plan as progress, roadblocks, or changing circumstances are recognized.

### **6.3.1 Maintenance Schedule**

The emergency management coordinator is responsible for initiating plan reviews and consulting with the heads of participating departments in the County. In order to monitor progress and update the mitigation strategies identified in the action plan, the county and the standing HMPC will conduct an annual review of this plan and/or conduct a review following a hazard event. An annual

mitigation action progress report may be prepared by the HMPC and kept on file to assist with for future updates.

This plan will be updated, approved and adopted within a five-year cycle as per Requirement §201.6(c)(4)(i) of the Disaster Mitigation Act of 2000 unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule. The County will inquire with WOHS and FEMA for funds to assist with the update. Funding sources may include Emergency Management Performance Grants, Pre- Disaster Mitigation, Hazard Mitigation Grant Program (if a presidential disaster has been declared), and Flood Mitigation Assistance grant funds. The next plan update should be completed and reapproved by WOHS and FEMA Region VIII within five years of the FEMA final approval date. The planning process to prepare the update should begin no later than 12 months prior to that date.

### **6.3.2 Maintenance Evaluation Process**

Evaluation of progress can be achieved by monitoring changes in vulnerabilities identified in the plan. Changes in vulnerability can be identified by noting:

- Decreased vulnerability as a result of implementing recommended actions;
- Increased vulnerability as a result of new or altered hazards
- Increased vulnerability as a result of new development.

Updates to this plan will:

- Consider changes in vulnerability due to action implementation;
- Document success stories where mitigation efforts have proven effective;
- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Incorporate new data or studies on hazards and risks;
- Incorporate new capabilities or changes in capabilities;
- Incorporate growth and development-related changes to infrastructure inventories; and
- Incorporate new action recommendations or changes in action prioritization.

In order to best evaluate any changes in vulnerability as a result of plan implementation, the County will adhere to the following process:

- A representative from the responsible office identified in each mitigation measure will be responsible for tracking and reporting on an annual basis to the department lead on action status and provide input on whether the action as implemented meets the defined objectives and is likely to be successful in reducing vulnerabilities.

Updating of the plan will be by written changes and submissions, as the HMPC deems appropriate and necessary, and as approved by the respective participating agencies. In keeping with the five-

year update process, the HMPC will convene public meetings to solicit public input on the plan and its routine maintenance and the final product will be adopted by the governing council.

### **6.3.3 Incorporation into Existing Planning Mechanisms**

Another important implementation mechanism that is highly effective and low-cost is incorporation of the hazard mitigation plan recommendations and their underlying principles into other existing plans and mechanisms. Where possible, plan participants will use existing plans and/or programs to implement hazard mitigation actions. As described in the capability assessment, the participating jurisdictions already implement policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms. Where applicable, these existing mechanisms could include:

- Converse County Land Use Plan 2015
- Community comprehensive plans
- County or community land development codes
- County or community emergency operations plans
- Threat and Hazard Identification and Risk Assessments (THIRA)
- Community Wildfire Protection Plans (CWPP)
- Transportation plans
- Capital improvement plans and budgets
- Recovery planning efforts
- Watershed planning efforts
- Wildfire planning efforts on adjacent public lands
- Other master planning efforts
- Other plans, regulations, and practices with a mitigation aspect

HMPC members involved in these other planning mechanisms will be responsible for integrating the findings and recommendations of this plan with these other plans, programs, etc., as appropriate. As an action step to ensure integration with other planning mechanisms the County Emergency Manager will discuss this topic at the annual meeting of the HMPC previously described in the Maintenance Schedule. The HMPC will discuss if there are opportunities to incorporate the plan into other planning mechanisms and who would be responsible for leveraging those opportunities. As described in Section 6.2, incorporation into existing planning mechanisms will be done through the process of:

- Monitoring other planning/program agendas;
- Attending other planning/program meetings;
- Participating in other planning processes;
- Ensuring that the related planning process cross-references the hazard mitigation plan, where appropriate, and

- Monitoring community budget meetings for other community program opportunities.

The successful implementation of this mitigation strategy will require constant and vigilant review of existing plans and programs for coordination and multi-objective opportunities that promote a safe, sustainable community.

Efforts should continuously be made to monitor the progress of mitigation actions implemented through these other planning mechanisms and, where appropriate, their priority actions should be incorporated into updates of this hazard mitigation plan.

### **6.3.4 Continued Public Involvement**

Continued public involvement is imperative to the overall success of the plan's implementation. The update process provides an opportunity to solicit participation from new and existing stakeholders and to publicize success stories from the plan implementation and seek additional public comment. The plan maintenance and update process will include continued public and stakeholder involvement and input through attendance at designated committee meetings, web postings, press releases to local media, and through public hearings.

When the HMPC reconvenes for the update, they will coordinate with all stakeholders participating in the planning process—including those that joined the committee since the planning process began—to update and revise the plan. Public notice will be posted and public participation will be invited, at a minimum, through available website postings and press releases to the local media outlets, primarily newspapers, or through public surveys. As part of this effort, at least one public meeting will be held (or a public survey developed) and public comments will be solicited on the plan update draft.

# APPENDIX A: PLANNING PROCESS DOCUMENTATION

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### SIGN-IN SHEET

## Converse County Hazard Mitigation Plan Update Project Meeting #1 (Kickoff), & THIRA REVIEW, September 14, 2017, 1:00 – 3:00 PM Webinar

Name	Email Address	Phone	Jurisdiction/ Department/ Organization/Affiliation	Title
Kew King	KKing@CASPER.WY.GOV	267-9103	BEAT II	DIRECTION
DAN HIRSWOLD	dghirswold@casper.wy.gov	233-6661	REPT II	OPS. CHIEF
Jim Cobb	Jcobb@ccsd1.org	358-5671	converse city School #1	Maint. Director
Jeff Kastle	jkastle@ccsd1.org	358-5671	" "	Maintenance
Rick Andrews	randrews@aqi.wy.com	359-1756	Douglas fire Dept	Fire Chief
Carlos Mesa	cmesa@mhcc.wyo.org	359 9093	MHCC, Douglas FD	
James Brown	jbrown@mhccwyo.org	357-3656	MHCC, <del>to</del>	Paramedic
Todd Matthews	tmatthews@cityofdouglas.org	<del>358-311</del>	Douglas Police Dept	Lieutenant
Joe Perko	jperko@g.com	262-6857	Town of Rolling Hills	Chief water op
Terri Sherman	terri.sherman@ccjcc.us	359-0049	Converse County Joint Communications Center	Comm's Manager
Adam Alvarado	alv@sheriff.conversecounty.org	358-7700	Converse County Sheriff's office	Deputy
Mary Schell	mary.schell@conversecounty.wy.gov	358-6880	C.C. Emergency Management	Admin Assistant
Russ Dalgain	russ.dalgain@conversecounty.wy.gov	358-6880	CCEMA	Coordinator

**SIGN-IN SHEET**  
**Converse County Hazard Mitigation Plan Update Project**  
**Meeting #2 Risk and Goals Meeting, October 24, 2017, 1:00 pm – 3:00 pm**  
**Converse County Courthouse, Douglas, WY**

Name	Email Address	Phone	Jurisdiction/ Department/ Organization/Affiliation	Title
Trig Ralphreiter	Ralptr@concountymt.com	358-3397	Newman Lodge Douglas Fire Center	Admin. Worker AD, Safety
Marshal Wickett	Hummer-L@msn.com	307-432-8853	Glenrock Fire Dept Hartree-Converse-Midway	President
Scott Cornell	Scott001@unw.edu	307-835-9400	UNW Spherosin	WR Director POC
Ken Lutz	klutz@capecounty.wy.gov		PEM T II	DIRECTOR
Suzanne Stoldt	stoltsuz@earthlink.net	307-333-3061	Town of Rolling Hills	Councilperson
Kelsey Drummond	kdrummond@qimrock.org	307-436-9294	Town of Glenrock	Com Dev Director
Him Gullikson	conversefire mitigation@yuba	307-351-1388 (307) 359-8796	CC Firewise	Fire of Mitig Coord
Clara Craffn	ccraffn@cityofdouglas.wy.gov		City of Douglas	Com. Dev Director
Russ Ortgers	russ.dalgarno@conversecounty.wy.gov	307-358-6660	Converse EMA	Coordinator
Mary Schell	Mary.Schell@conversecounty.wy.gov	307-358-6880	Converse EMA	Admin



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**SIGN-IN SHEET**  
**Converse County Hazard Mitigation Plan Update Project**  
**Meeting #3 (Mitigation Strategy), January 31, 2018, 12:00 – 3:00 PM**

Name	Email Address	Phone	Jurisdiction/ Department/ Organization/Affiliation	Title
Calvin Goddard	calvin.goddard@wyo.gov	307-473-3200	WYDOT	District Maint. Eng.
Mary Schell	maryschell@conversecounty.wy.gov	358-4880	CCSMA	At-Large Assst
Russ Dalgren	russ.dalgren@conversecounty.gov	358-6880	CC EMA	Asst Eng
Nick Laramendy	NICKLARAMENDY@WYOGOV	797-1878	CCPIT	Publ. Health Response
TERRI SHERMAN	terri.sherman@ccie.us	359-0049	CCSC	PSM Manager
Marie Glinkski	McGlinkski@glennrockhealth.com	486-9206	Glennrock Health Center	Administrator
Shaw Lindsey	glennrockfire@glennrock.com	307-797-4503	Glennrock FD	Captain & FD
CLINT RECKER	clint@becke@sheriff.conversecounty.org	307-351-0487	CONVERSE COUNTY SHERIFFS OFFICE	SHERIFF
Steve Livingston	stev@conversecounty.org	307-558-9750	City of Douglas	Supervisor

### SIGN-IN SHEET

## Converse County Hazard Mitigation Plan Update Project Meeting #3 (Mitigation Strategy), January 31, 2018, 12:00 – 3:00 PM

Name	Email Address	Phone	Jurisdiction/ Department/ Organization/Affiliation	Title
GERARD CARR	JOEY.CARR@WYDOT	307-358-7180	WYDOT	AMS
Anber Pritchard	anber.pritchard@redcross.org	307-247-6483	American Red Cross	DRS
Clara Chaffin	cchaffin@cityofdouglas.org	307-358-2132	City of Douglas	Community Development Director
Aden Alvarado	ala@sheriff.conversecounty.org	307-358-4700	Converse County Sheriff's Office	Patrol Deputy
WATT SCHMIDT	NSCHMIDT@CITYOFDOUGLAS.WY	307 358-3311	DOUGLAS PD	PATROL SGT
Kim Gullikson	conversefiremitigation@yahoo.com	307-351-1388	Converse County Firewise	Coordinator
Melissa Peterson	melissa@dawes-budget.com	307-358-2965	Dawes Budget New River Bar	Reporter
BOB FEURON	bob.feuron@tallegresseenergy.com	2324413	Tallegresse Energy	Sponsor
Jerome Fumas	jfumas@securusor.com	(307) 380-6337	Securum Trans. Co.	Sherrif + Reg. Conference.
Leda Price	lostsprings@hughes.net	(307) 334-3215	Town of Lost Springs	Mayor
Joe Renko	joerenko@q.com	307-262-6857 430-9294XS	Town of Rolling Hills	Chief voter op
Kasey Drummond	Kdrummond@qlenark.org		Town of Glenrock	Com. Dev. Director
Jacque Stoldt	jacquestoldt@gmail.com	307-333-3061	Town of Rolling Hills	Council person
Chika-Nia Ries	douglasfiredept@gmail.com	307-3513310	DOUGLAS FD	FIRE DEPARTMENTAL COORDINATOR
Rick Andrews	randrews@aeienergy.com	307-359-1756	Dawes Fire Dept	Five Chief



# Multi-Hazard Mitigation Plan Update

## Converse County, Wyoming

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Kick-Off Meeting and Hazard ID

### Meeting Objectives:

- ▶ Introduce the project
- ▶ Introduce purpose, process and requirements
- ▶ Formally kick off planning process
- ▶ Review hazards to address in the plan update
- ▶ Schedule future meetings, plan for stakeholder and public involvement
- ▶ Begin data collection effort



# Multi-Hazard Mitigation Planning

## Converse County

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Workshop #2: Risk Assessment and Goals

### Meeting Objectives:

- ▶ Review purpose, process and requirements
- ▶ Review of Identified Hazards
- ▶ Vulnerability Assessment Overview by Hazard
- ▶ Capability Assessment
- ▶ Update Goals for the Mitigation Plan
- ▶ Update on Public Involvement Activities

# Converse County

## Multi-Jurisdictional Hazard Mitigation Plan Update

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Meeting #3 - Mitigation Strategy



### Agenda

- ▶ Opening remarks and introductions
- ▶ Review of the planning process and requirements
- ▶ Update the mitigation strategy
- ▶ Discuss plan implementation and maintenance
- ▶ Next steps
- ▶ Regionalization
- ▶ Questions and Answers/Adjourn



# Minutes from Converse County Mitigation Plan Update Initial Coordination Conference Call held on 8/10/2017

This document is a record of attendance and a summary of the topics discussed at the above meeting including the following:

- 1. Planning Area and Process
- 2. GIS Resources
- 3. Public Notification Process
- 4. Politically Sensitive Issues

The meeting began at 2:00 pm and concluded at 3:00 pm CST.

## Attendees

Name	Title	Agency/Department
Russ Dalgarn	Emergency Management Coordinator	Converse County
Mary Schell	Administrative Assistant	Converse County
Kyle Karsjen	Senior Emergency Management Specialist	Amec Foster Wheeler
Jeff Brislaw	Hazard Mitigation Lead	Amec Foster Wheeler

## Planning Process

### Jurisdictions/Contacts to Invite and Invitations

The jurisdictions that will be invited to participate as official participants in the Converse County Multi-jurisdictional Hazard Mitigation Plan Update will include the following:

- Unincorporated Converse County
- City of Douglas
- Town of Glenrock
- Town of Rolling Hills
- Town of Lost Springs

Additional stakeholders may also be invited to include private businesses, community groups, and private non-profit entities.

The County will work on developing a contact list, including e-mail addresses where available. Kyle will provide a blank spreadsheet to record the names and contact info for members of the Hazard Mitigation Planning Committee (HMPC). A list of potential HMPC members was included in the presentation.

Kyle will provide sample invite text to the County for the HMPC kickoff meeting. Once the county has sent out the initial invitation to participate in the process, Kyle will follow up with a calendar invite.

## Project Schedule and Meeting Dates/Locations

Tentative meeting dates, times, and locations have been established as follows:

Converse County	Meeting 1 (Remote)	Meeting 2	Meeting 3
Date	September 13	Mid-October	Late November
Time	1-3 PM MST	TBD	TBD
Location	N/A	TBD	TBD

The county suggested 1-3 PM as a good time for the meetings; dates and locations for meetings 2 and 3 are still to be determined.

## List of Hazards to Include/Naming of Hazards

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For the purposes of the plan update, the list of hazards will mirror the hazards in the old plan.

Those hazards are:

- Dam Failure
- Drought
- Earthquakes
- Floods
- Hail
- Hazardous Materials
- Landslides and Subsidence
- Tornadoes and Windstorms
- Wildland Fires
- Winter Storms

The Wyoming State Hazard Mitigation Plan includes the following additional hazards:

- Avalanche
- Expansive Soils
- Landslide
- Lightning
- Mine Subsidence

While these hazards may not receive a full profile in the plan, it is recommended to at least identify these hazards in the Converse County plan and explain why they didn't receive a full profile.

## GIS Resources

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A preliminary list of GIS needs will be provided. The County noted that there is not a full-time GIS person on staff, and that most of the County's GIS information is hosted online.

## Public Notification Process

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For the first public comment opportunity, Amec Foster Wheeler will facilitate development of a public survey. This survey will be distributed through a link to an online SurveyMonkey survey. Additionally, during the Kickoff meeting, Amec Foster Wheeler will ask the participating jurisdictions to identify locations such as city halls or post offices where hard copy surveys can be made available. Amec Foster Wheeler will also ask jurisdictions to identify other outreach tools that can be used to disseminate information on the availability of the public survey.

For the final public comment, the County website will be utilized to post the draft plan during the final public comment period. The Cities and school districts will be encouraged to include a link on their websites to the County website as well.

Amec Foster wheeler will provide sample text for two public notifications that the County will distribute through various media outlets such as the County website, Facebook, and Twitter. The first public notification release will provide the online survey link as well as locations where hard copy surveys can be completed. The second public notification release will provide information on the availability of the final draft for public review and comment.

## **Politically Sensitive Issues**

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The group discussed whether or not there were currently politically sensitive issues in Converse County. Zoning was mentioned as a possible issue.

**Summary of Converse County Hazard Mitigation Plan Update  
 Kick-Off Meeting Conference Call/Webinar  
 Converse County Courthouse Meeting Room  
 107 N 5<sup>th</sup> Street, Douglas  
 September 14, 1:00 – 2:00 PM**

**Opening Remarks and Introductions**

Kyle Karsjen, the project manager from Amec Foster Wheeler began the webinar presentation and asked everyone in the room to make sure they signed in to the meeting. Present on-site were 13 participants, documented in a sign-in sheet. A mix of people representing the County, municipalities, and stakeholders were present including:

<b>Name</b>	<b>Title</b>	<b>Agency</b>	<b>Jurisdiction</b>
Kevin King	Director	RERT II	RERT
Dan Grizwold	Ops Chief	RERT II	RERT
Jim Cobb	Maintenance Director	Converse County School #1	Converse County
Jeff Kastle	Maintenance	Converse County School #1	Converse County
Rick Andrews	Fire Chief	Douglas Fire Department	Douglas
Carlos Mesa		MHCC Douglas Fire Department	Douglas Converse County
James Brown	Paramedic	MHCC	Converse County
Todd Matthews	Lieutenant	Douglas Police Department	Douglas
Joe Perko	Chief Water Operator	Town of Rolling Hills	Rolling Hills
Terri Sherman	Communications Manager	Converse County Joint Communications Center	Converse County
Adam Alvarado	Deputy	Converse County Sheriff's Office	Converse County
Mary Schell	Admin Assistant	Emergency Management	Converse County
Russ Dalgarn	Coordinator	Emergency Management	Converse County

**Mitigation, Mitigation Planning, and Disaster Mitigation Act (DMA) Requirements**

A PowerPoint presentation was presented via Skype by Kyle Karsjen. The presentation described the importance of mitigation planning and the process thereof, including the 9 step planning process that will be followed to ensure compliance with the Disaster Mitigation Act of 2000. The plan is intended to identify hazards, assets at risk, and ways to reduce impacts through long-term, sustainable mitigation projects. The plan will also maintain eligibility for FEMA mitigation grant funding.

**Objectives and Schedule for Plan Development**

All municipalities within Converse County that participate in the plan will maintain or create eligibility for FEMA mitigation funds. The participating jurisdictions in the process are:

- Unincorporated Converse County
- City of Douglas
- Town of Glenrock
- Town of Rolling Hills
- Town of Lost Springs

This meeting is the first meeting of a committee formed to provide input to the plan update process. A definition of participation in the planning process was provided that includes:

- Attend and participate in planning meetings/workshops
- Provide available data requested of the County Emergency Management coordinator and Amec Foster Wheeler
- Provide input on local mitigation strategy (actions/projects)
- Advertise and assist with public input process
- Review and comment on plan drafts
- Coordinate formal adoption

It was discussed how each jurisdiction needs to commit to the above elements to receive full credit for participation in the plan.

### **Hazard Mitigation Planning Committee Organization and Roles**

The Hazard Mitigation Planning Committee (HMPC) will include members of appropriate county departments, e.g., Building, Planning, Public Works, Police/Fire/Public Safety, and Emergency Management and include municipalities and special districts (fire and school).

Goals of the process include:

- Thoroughly update the plan per most current FEMA planning guidance
- Revisit and update risk assessment
- Update the mitigation strategies
- Note implementation progress of loss reduction activities

The plan will be developed over the next six months. There will be two planning workshops. The meetings will occur in late October and December. An email group has been developed for the HMPC for sharing information on upcoming meetings. Amec Foster Wheeler will be drafting the updated risk assessment in the next couple of months. A complete draft for FEMA review is targeted to be complete by mid-February 2018. The final approved plan is anticipated to be ready for adoption sometime in April 2017.

### **Review of Identified Hazards**

A list of natural hazards was discussed, based on the hazards in the 2011 HMP, to start a discussion about what hazards should formally profiled and analyzed in the plan update. Kyle compared the list in the existing plan with hazard profiled in the State Hazard Mitigation Plan, and then the group had a quick discussion on any hazards to be added; the new plan will include expansive soils as the HMPC had indicated some recent history in the county. The hazards discussed to be profiled in the plan update included:

<b>Converse HMP Hazards 2011</b>	<b>State HMP Hazards 2016</b>	<b>Recommended Converse Hazards List for 2017 Plan Update</b>
	Avalanche	
Dam Failure	Dam Failure	Dam Failure
Drought	Drought	Drought
Earthquake	Earthquake	Earthquake
	Expansive Soil	Expansive Soil
Flood	Flood	Flood
Hail	Hail	Severe Thunderstorm (Lightning and Hail)
Hazardous Materials		Hazardous Materials

Landslide and Subsidence	Landslide	Landslide and Subsidence
	Lightning	
	Mine Subsidence	
Tornado and Wind	Tornado	Tornado and Wind
Wildland Fire	Wildfire	Wildland Fire
	Wind	
Winter Storm	Winter Storm	Winter Storm

### Planning for Stakeholder and Public Involvement

The planning team was encouraged to involve the public and stakeholders in the planning process. Techniques discussed included:

- Develop an online survey
- Social media or email blasts
- Mentioning the planning efforts and ‘piggybacking’ at other public forums

A public survey has been developed; a hard copy of the survey will be sent to committee members so that they can see it. The public survey can be found at <https://www.surveymonkey.com/r/ConverseCountyWY>.

Jurisdictions are encouraged to provide the link to the survey to their citizens, using whatever platforms they normally use to share information. The survey will close November 17<sup>th</sup>.

### Coordinating with Other Agencies / Related Planning Efforts / Recent Studies

A discussion was held on how to coordinate this planning process with other planning processes, agencies and departments in order to meet DMA planning requirements. The group identified that Glenrock, Rolling Hills and possibly Douglas were currently going through the process to develop a master plan. Kyle noted the importance of including hazard mitigation information in the master plan, as well as other plans and documents. The group also identified the WYOWARN network as a potential partner during the hazard mitigation process.

### Next Steps/Next Meeting Timing

Amec Foster Wheeler HIRA update	Late October
HMPC meeting to discuss HIRA and Goals	Late October
HMPC meeting to update mitigation actions	Early December
First draft of HMP for HMPC review	Early January
HMPC comments by	Mid-January
Public/State review draft	Late January
Public comments due	Mid-February
Plan to FEMA	Mid-February

The group agreed to hold the next hazard mitigation meeting from 1-3 pm on October 25. The meeting will be held in the Converse County Courthouse in Douglas. An email group has been established to provide information.

### Questions and Answers/Adjourn

The presentation concluded at 2:00 pm.

**Summary of the Converse County Risk Assessment and Goals Meeting  
2017 Hazard Mitigation Plan Update  
October 25, 2017  
1:00pm – 3:00 pm  
Douglas City Hall  
Douglas, WY**

**Introductions and Opening Remarks**

Russ Dalgarn, emergency manager of Converse County began with calling the LEPC meeting to session. After reviewing the minutes from the last LEPC meeting and attending to some admin tasks, the LEPC meeting shifted to the agenda for the hazard mitigation planning committee. Kyle Karsjen of Amec Foster Wheeler, the consulting firm hired by the County to facilitate the plan update process, began with welcoming remarks. Kyle asked everyone around the room to introduce themselves. Twenty-six persons representing a mix of County agencies and the municipalities of Douglas, Glenrock, and Rolling Hills along with local stakeholders were present and documented on a sign in sheet. Representatives from the WYDOT, the Converse County Sheriff’s Department, the LaPrele Irrigation District, Douglas Schools, Tallgrass Energy and the Red Cross were also present.

<b>Last</b>	<b>First</b>	<b>Title</b>	<b>Agency</b>
Larramendy	Nick	PHRC	Public Health
Flores	Jerome	Safety and Reg. Comp.	Sinclair Transportation Company
Wills	Travis		Converse County Rural Fire
Alvarado	Adam	Patrol Deputy	Sheriff’s Office
Hughes	Nathan	Undersheriff	Sheriff’s Office
Heger	John	Vista	Red Cross Casper
Pritchard	Amber	Vista	Red Cross Casper
Good	Kaleigh	Disaster Program Manager	Red Cross
Cobb	Jim	Maintenance Director	CCSD 1
Fenton	Bob	Supervisor	Tallgrass Energy
Sherman	Terri	Communications Manager	Converse County Joint Communications
Andrews	Rick	Chief	Douglas Fire Department
Horr	Amanda	Secretary	Converse County Rural Fire
McClure	Anna	Secretary	LaPrele Irrigation
Matthews	Todd	Lieutenant	Douglas Police
McCoy	Shane	B & G Supervisor	CCSD 2
Martinez	Steve	Supervisor	City of Douglas
Perko	Joe	Chief Water Operator	Rolling Hills
Rothlaetner	Tonja	Administrator AP, Safety	Mountain Lodge Douglas Care Center
Wickett	Hershel	President	Glenrock Fire Department
Cotton	Scott	Wyoming Disaster POC	Natrona-Converse-Niobrara VW Extension
King	Ken	Director	RERT II
Stoldt	Jacque	Councilperson	Town Rolling Hills
Drummond	Kasey	Community Development Director	Town of Glenrock
Gullickson	Kim	Firewise	Converse County
Chaffin	Clara	Community Development Director	City of Douglas
Schell	Mary	Administrative Assistant	Converse County Emergency Management
Dalgarn	Russ	Coordinator	Converse County Emergency Management
Pluss	Madi	Associate	Amec Foster Wheeler
Karsjen	Kyle	Project Manager	Amec Foster Wheeler

## Review of Mitigation, Disaster Mitigation Act (DMA) Requirements, and the Planning Process

A PowerPoint presentation was presented by Kyle Karsjen and Madi Pluss, project manager and project associate from AMEC Foster Wheeler. Kyle outlined the nine-step planning process being followed and discussed the project status. The update of the 2011 Hazard Mitigation Plan (HMP) will allow the County and participating municipalities to remain eligible for FEMA mitigation grants.

## Risk Assessment Presentation and Discussion

Kyle outlined the general risk assessment requirements before beginning a detailed discussion of each hazard. He presented details on each hazard that will be included in the draft updated risk assessment chapter. Refer to the PowerPoint presentation and draft Hazard Identification and Risk Assessment (HIRA - forthcoming) chapter for specific details on each hazard. Several valuable details were learned during the risk assessment conversation among participants. The group discussed several hazard incidents that have occurred in the county. Highlights of the discussion are noted by hazard in the table below.

Hazard or Topic	Meeting Discussion
Dam Failure	<ul style="list-style-type: none"> <li>Only one dam failure event to note has occurred in the County since 1983. The HMPC could not remember the exact instance or specific dam associated with the overtopping event, however, some quick online research indicates that the dam in question was related to the LaPrele Range Drainage Basin. HMPC members confirmed that the impact of the dam failure was isolated to one ranch.</li> </ul>
Drought	<ul style="list-style-type: none"> <li>The most significant impacts of drought for Converse county are associated with wildfire and agriculture. HMPC members noted that in the past, there have been issues with crops coming to maturity and overall agricultural production during dry years. Discussion also focused on how drought exacerbates wildfire risk in already increasingly prone areas.</li> </ul>
Earthquake	<ul style="list-style-type: none"> <li>The 3.8 earthquake of 2004 occurred in the middle of the unincorporated county. There weren't any structures of infrastructure near the epicenter which is why there was no damage reported.</li> <li>An earthquake damaged the foundation of a city administration building and cracked the foundation.</li> </ul>
Expansive Soils	<ul style="list-style-type: none"> <li>Structural cracks in Douglas schools.</li> <li>Building code requires soil testing in both Douglas and Glenrock.</li> <li>Rolling Hills identified sand dunes as an issue.</li> </ul>
Hazardous Materials	<ul style="list-style-type: none"> <li>Challenging to fully monitor hazardous materials transportation due to proprietary restrictions on releasing information</li> <li>On April 25, 2015, there was a well blowout east of Douglas</li> <li>Highway 59 pipeline rupture in 2016</li> <li>In 2015 there was a gas plant blow up, 22 miles north of Douglas</li> </ul>
Landslide (Subsidence)	<ul style="list-style-type: none"> <li>More of an issue than data indicates. The existing landslide susceptibility maps do not accurately reflect geologic conditions in various areas of the County.</li> <li>Glenrock is especially vulnerable to subsidence, and an HMPC member indicated that over 60% of the City is impacted. One pertinent issue facing Glenrock is subsidence as it relates to the mines. Though federal reclamation programs have been</li> </ul>

	<p>instituted, the mines surrounding the Glenrock community are subsiding and prone to flooding. AML Wyoming is now in the area, with one company responsible for roads and another responsible for buildings.</p>
Flood	<ul style="list-style-type: none"> <li>• Estherbrook Road South of Douglas was washed out recently</li> </ul>
Hail	<ul style="list-style-type: none"> <li>• Notable hail events not listed in NCDC include '96 (Glenrock), as well as August '07 (entire county), and June '17 (entire county).</li> <li>• It was recommended to look at USDA farm claims to determine crop damages and losses resulting from hail storms in the county.</li> <li>• One HMPC member commented that in '07, the hailstorm left 3" holes in his hot tub.</li> </ul>
Lightning	<ul style="list-style-type: none"> <li>• Though no fatalities noted in NCDC, livestock fatalities are common in Converse County. There have been multiple instances where lightning caused death to cattle and herds of sheep.</li> <li>• Lightning also effects wells and has blown out the power grid on numerous occasions.</li> <li>• Wildfire is a major concern in Converse County, and annually, numerous tree fires are ignited from lightning. The HIRA chapter should utilize the HSIP data to determine the exact number of fires linked to lightning.</li> </ul>
Tornado	<ul style="list-style-type: none"> <li>• The HMPC noted an event in June 2017 where a small tornado, accompanied by hail, ripped off the roof of an old homestead cabin off of Cold Springs Rd.</li> </ul>
Wind	<ul style="list-style-type: none"> <li>• No property damage was reported by NCDC, though wind frequently causes damage to structures in Converse County by spreading and catalyzing fire.</li> <li>• In 2014, high winds resulted in trees falling and shingles flying off the roofs across the County.</li> <li>• On October 25, 2017 the winds were so strong that a pickup truck was blown over.</li> </ul>
Winter Storms	<ul style="list-style-type: none"> <li>• Interstate (I-25) is frequently closed in Converse County. Multiple gates along the roadway. Road is closed due to inclement driving conditions (snow and ice), however, road is also blocked when there is not enough sheltering capacity to contain travelers from nearby Counties.</li> <li>• Livestock can be frozen.</li> <li>• In 2014, the natural gas switch was frozen in Glenrock, and residents were without heat for over 20 hours. The problem has been remedied and should not be reoccurring.</li> <li>• Winter storms can also lead to increased home fires caused by electric blankets in mobile homes.</li> </ul>
Wildfire	<ul style="list-style-type: none"> <li>• Exacerbated by the high winds in the County.</li> <li>• Orpha- A fire truck got stuck and 3 fire fighters were injured.</li> <li>• 1 cabin lost in Esterbrook</li> <li>• Box Elder Canyon Fire '14, critical facility infrastructure at the ½ point between Douglas and Glenrock was damaged. However, it has been completely retrofitted and is now more resilient.</li> </ul>

## Capability Assessment Review

Kyle briefly reviewed highlights of existing capabilities in the county to mitigate hazards, including the emergency management program, jurisdiction Comprehensive Plans, and the county Community Wildfire Protection Plan.

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## **Coordination and Integration with Other Plans**

Kyle asked the group if other plans reference or integrate aspects of the HMP within the past five years. The group noted that the EOP mentions the HMP. An HMPC member commented that the County Hazard Mitigation Plan will be cross referenced by the Douglas Comprehensive Plan, which is currently undergoing review and update. The Glenrock Comprehensive Plan was updated in 2016 and is reviewed on a yearly basis. The CWPP is also being updated.

## **Plan Goals Update**

Kyle presented a slide with the goals and objectives from the 2011 HMP. The update presents an opportunity to revisit the goals and adjust if necessary. The previous goals were tailored to individual hazard needs and Kyle suggested that the HMPC consider using the 2016 Wyoming State HMP goals as a template for the goals outlined in the updated Converse County plan. The committee agreed that the state goals were more comprehensive and aligned with the interests of the County and participating jurisdictions. Kyle offered to make any necessary changes to the language of the State goals, and the HMPC will have an opportunity to make any comments. The new Plan goals are:

- Goal 1:** Strengthen public infrastructure
- Goal 2:** Improve local mitigation capabilities
- Goal 3:** Reduce economic losses due to hazard events
- Goal 4:** Reduce local costs of response and recovery

Changes, if any, will be finalized at the next planning workshop.

## **Planning for Public Involvement**

Kyle noted that public involvement will include advertisement of the draft updated plan for review and comment. The survey is currently available and can be easily shared via email or social media. The group noted that the survey is on the County website and has been shared through Facebook. So far 131 responses have been received. The PowerPoint included the current results, highlighting the public's perception of hazards in Converse County. Kyle requested that the group give the survey one more push before it closes. The survey can be found at:

<https://www.surveymonkey.com/r/ConverseCountyWY>.

## **Mitigation Action Strategy Update**

Kyle noted the next step in the process is updating the hazard mitigation strategy. As a starting point the group will need to provide a status on the existing actions from the 2011 plan. A handout was provided which will be discussed further in the next meeting. Kyle encouraged the participating entities to review prior to the next meeting.

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## Plan Timeline/Next steps

Kyle summarized the next steps in the process.

- HMPC homework:
  - Review the handout on the mitigation strategy and note status of actions; return to [kyle.karsjen@amecfw.com](mailto:kyle.karsjen@amecfw.com) by **November 10<sup>th</sup>**
  - Return the data collection guide to [kyle.karsjen@amecfw.com](mailto:kyle.karsjen@amecfw.com) by **November 10<sup>th</sup>**
  - Provide any more information to inform the HIRA and review the draft HIRA once it is released (target is **November 8<sup>th</sup>** for release; review period will be at least two weeks)
  - Start formulating ideas for new mitigation projects based on hazard analysis and vulnerability assessment

The next and final HMPC planning meeting will be held in early January, and will focus on updating mitigation actions for the plan. Kyle emphasized that this is an important meeting and will form the basis for the mitigation action plan. A calendar update will be sent out to save the date. The meeting materials will also be shared electronically, including the presentation and worksheets.

# Converse County Mitigation Strategy Meeting 2018 Hazard Mitigation Plan Update

January 31, 2018

12:00 – 3:00 PM

Converse County Courthouse, Douglas, WY

## Introduction and Opening Remarks

Russ Dalgarn, emergency manager of Converse County began with calling the LEPC meeting to session. After reviewing the minutes from the last LEPC meeting and conducting LEPC business, the LEPC meeting shifted to the agenda for the hazard mitigation planning committee. Kyle Karsjen, project manager with Amec Foster Wheeler, began with welcoming remarks. Kyle asked everyone around the room to introduce themselves. Attendance was documented on the sign-in sheet and includes 24 persons from various departments in Douglas, Glenrock, Rolling Hills, and Lost Springs. Participants included Converse County Emergency management, Converse County Sheriff's Department, Converse County Public Health, Douglas Fire Department, Tallgrass Energy, Douglas Budget Newspaper, and WYDOT. Handout materials were provided.

Kyle and Madi Pluss of Amec Foster Wheeler presented the PowerPoint slide deck that outlined the meeting agenda and topics.

## Review of the Planning Process

Kyle reviewed the planning process that has taken place so far. The process is currently in Phase III – Develop a Mitigation Plan and this meeting is the last formally facilitated meeting of the Hazard Mitigation Planning Committee (HMPC). Kyle noted the results of the online-public survey, that had 172 responses at the time of this meeting. Amongst other results, the primary findings of the survey relate to the public's belief on what is considered the highest natural threat to the community, as well as the perception of who should be responsible for hazard mitigation. Madi reviewed the findings of the process up to the point of the meeting, including the draft hazard identification and risk assessment. Two committee members asked questions about the FEMA grant application process. There was a discussion about how funding is determined, distributed, and the responsibilities of the County.

## Plan Goals

Madi reviewed the mitigation goals with some modifications that were suggested at the previous meeting. The group did not express any need to alter the goals. The revised goals will be included in the updated plan for review by the HMPC, during which there will be opportunity for final review and comment.

## Review of Possible Mitigation Activities and Alternatives

Madi presented information on typical mitigation activities and alternatives, and referred to handouts with further details and guidance. Madi outlined potential project criteria and action requirements, including the requirements of the Disaster Mitigation Act of 2000. Each hazard must have at least one true mitigation action (not preparedness) pertaining to them. Another

reference document titled “Mitigation Ideas” developed by FEMA was suggested at the meeting, which can be found online at <https://www.fema.gov/media-library/assets/documents/30627>.

This reference discusses the common alternatives and best practices for mitigation by hazard.

### **Action Prioritization**

The group was provided with decision-making tools to consider when prioritizing the actions. This including FEMA’s recommended criteria, STAPLE/E (which considers social, technical, administrative, political, legal, economic, and environmental constraints and benefits). Other criteria used to recommend what actions might be more important, more effective, or more likely to be implemented than another included:

- Does action protect lives?
- Does action address hazards or areas with the highest risk?
- Does action protect critical facilities, infrastructure or community assets?
- Does action meet multiple objectives (Multiple Objective Management)?

Actions continuing from the 2011 plan will need to be reviewed for relative priority (high, medium, low). Any new actions developed will also need a relative prioritization based on these criteria.

### **Review of progress on 2011 Plan actions and identification of new actions**

At the last meeting, jurisdictions were provided a handout with the mitigation action table from the 2011 plan. Kyle reminded the committee to report action statuses if it had not already done so. Half of the participating jurisdictions had already submitted their comments, and some actions were determined to still be relevant and should continue in the updated plan. Others were recommended to be deleted; some progress details were still outstanding. Action priorities were revisited and modified in some cases. Completed and deleted actions will be moved to separate tables in the updated plan. The continuing, deferred and new actions will be grouped together in an updated action strategy table.

Kyle introduced an exercise to initiate a discussion about new actions. Using hazard summaries compiled from the draft risk assessment, Kyle wrote the hazards on a white board and asked the committee to brainstorm potential actions for each hazard. The FEMA “Mitigation Ideas” document provided additional support. Most relevant and feasible mitigation actions associated with each hazard were already in place, but the committee encouraged the continuation of these strategies. The table below presents the various mitigation action ideas sorted by hazard, as discussed by the HMPC.

Hazard	Ideas for Mitigation Actions
Dam failure	<ul style="list-style-type: none"> <li>• Public education</li> </ul>
Drought	<ul style="list-style-type: none"> <li>• Public information/education</li> <li>• Water restrictions</li> <li>• Citizen drought projects</li> <li>• Fire breaks—Douglas</li> </ul>
Earthquake	<ul style="list-style-type: none"> <li>• Building codes</li> <li>• Continuing utilization of International Building Code</li> </ul>
Expansive Soil	<ul style="list-style-type: none"> <li>• Engineering reports</li> <li>• Restrict structural development</li> <li>• Restrict irrigation</li> <li>• Educate contractors</li> <li>• No finished basements</li> </ul>
Hazardous Materials	<ul style="list-style-type: none"> <li>• Pipeline education for First Responders</li> <li>• Public education on regulated pipelines</li> </ul>
High Wind/Downburst	<ul style="list-style-type: none"> <li>• Infrastructure projects</li> <li>• Tree pruning</li> <li>• Bury powerlines</li> </ul>
Landslide	<ul style="list-style-type: none"> <li>• Support AML projects</li> </ul>
Thunderstorm (lightning and hail)	<ul style="list-style-type: none"> <li>• Insurance</li> <li>• Saferoom construction</li> <li>• Public education</li> <li>• Lightning rods</li> <li>• Storm spotters</li> </ul>
Tornado	<ul style="list-style-type: none"> <li>• Saferoom construction</li> <li>• Public education</li> <li>• Warning systems</li> <li>• Storm spotters</li> </ul>
Wildfire	<ul style="list-style-type: none"> <li>• Fuel management</li> <li>• Tie to CWPP</li> <li>• Update CWPP</li> <li>• FireWise</li> </ul>
Winter Weather	<ul style="list-style-type: none"> <li>• Sheltering</li> <li>• Public education</li> <li>• Snow fencing</li> <li>• Snow road/closure and danger warnings</li> </ul>

### Next Steps

Kyle provided a new action worksheet for participants to flesh out the details of proposed actions. He then walked through the worksheet and showed the committee members how to fill out each section using a Tornado Shelter Room mock idea. New action worksheets are due to

[kyle.karsjen@amecfw.com](mailto:kyle.karsjen@amecfw.com) by February 23rd. These will be compiled by Madi into the mitigation action table and shared with the committee for further refinement and prioritization when the draft plan is made available for review.

The meeting adjourned at 3:00 PM.

# Converse County

## Hazard Risk Assessment Summaries

### Dam Failure

Overall, dam failure significance ranges from **high to low** dependent upon location in the County. The probability of such an event is low, but impacts could be significant depending upon the dam involved and where it occurred in the region.

### Drought

Drought is considered a **high** significance hazard for Converse County due to the potential for extensive economic and environmental impacts. Drought can be widespread and pervasive for several years.

### Earthquake

Converse County is at **moderate** risk due to the closer proximity of potentially active faults within and near the County and the history of having experienced one of the strongest earthquakes in central Wyoming. It is estimated that if a worst-case event occurred in Converse County, \$268 million in combined capital stock and income losses could occur. Though the probability is low, WSGS studies indicate the possibility of a 6.5 magnitude could occur anywhere in the state.

### Expansive Soils

Overall, expansive soils are a **medium** significance hazard for the County. Expansive soils are estimated to affect a limited portion of the planning area. Most land coverage Converse County falls under the category of moderate potential for swelling, with a significant portion of land (primarily in the southern area) considered to be low potential for swelling. Areas of concern are located in the central/south-eastern County where a belt of high potential soil flows through the County from the north-east.

### Flood

Overall, flooding presents a **medium** risk for Converse County. Flooding has damaged homes, infrastructure (roads and bridges), and caused agricultural losses in the planning area in the past. Flood risk varies by jurisdiction.

### Hazardous Materials

Converse County is at **moderate** risk to hazardous materials spills. Due to proprietary restrictions, it is difficult to monitor the transportation of hazardous materials. Loss estimations indicate that the seven facilities in Converse County would produce a damage estimate of \$9,345,777 in property damage over a five-year period. With 40 hazardous materials incidents occurring between 2008 and 2017, it should be expected that there would be four events each year.

### High Winds and Downbursts

Many areas of the United States are prone to damaging wind events, and while Converse County may not be counted in a high category for occurrences across the nation, it does have a history of such episodes which should be anticipated for the future, resulting in a **moderate** significance rating for this hazard. Primary damage is structural and utility-borne. Although minimal deaths and injuries have been reported, the frequency of occurrence is due consideration, as well as the hazard to rural citizens and town populations from falling trees, power poles, and flying debris.

## **Landslide, Debris Flow, Rockfall**

Overall, landslides, rockfalls and debris flows range from **low** to **medium** significance hazards in the County. Landslides have the potential for direct property impacts including residential structures but more likely infrastructure corridors including roads and highways, power line corridors, and gas lines.

## **Severe Thunderstorms (including Hail and Lightning)**

Converse County experiences heavy rains and severe thunderstorms during the spring and summer on an annual basis. Both global and regional climate patterns determine the potential severity of these storms from year to year. The entire planning area is equally at risk; it is a matter of chance as to which drainage area a slow-moving storm might linger over. Based on historical information, the primary effect of these storms has not resulted in significant injury or damage to people or property. Hail damage to property is expected to be highest in the municipalities; much of the damage to both property and crops is covered under insurance policies. The most salient threat associated with lightning is the threat of igniting a wildfire. Given the lightning statistics for Wyoming, the County remains at **moderate** risk and is vulnerable to the effects of lightning.

## **Tornado**

Though risk is **low**, tornadoes are a credible threat, and will continue to occur in Converse County. While the County has been relatively lucky in its tornado history in its past, it is not immune to the threat of a much larger and more ferocious tornado. Depending on a tornado's size, ferocity and path, it can cause devastating damage to people, property and infrastructure.

## **Severe Winter Weather**

Winter Storms are a **medium** significance hazard in the County. While the percent of the planning area directly affected ranges depending on the specific circumstances, if any area near Converse County is impacted by the storm, then the entire County suffers indirect impacts. Sheltering of stranded travelers on I-25 can be an issue, even from storms affecting Colorado. Glenrock and Douglas can quickly be overwhelmed with shelter needs when I-25 is closed to Casper.

## **Wildfire**

Wildfires occur within the county on generally an annual basis. Based on GIS analysis, the planning area has over \$143 million in building and content value, as well as 1,230 people potentially at risk to wildland fires in the Redzone. Though it is not likely that the areas at risk will simultaneously face a completely destructive event, this figure provides the upper end of what could be affected.

Overall, wildfire is a **high** significance hazard in Converse County.

**Example Mitigation Actions by FEMA categories with Hazards Identified in the Converse County Hazard Mitigation Plan 2018**

Alternative Mitigation Actions	Dam Failure	Floods	Hazardous Materials	Landslides/ Debris Flows/ Rockfalls; soil hazards; subsidence	Weather Extremes (Tornado, hail, lightning, wind, temps, drought)	Earth quakes	Wildfires	Severe Winter Storm
<b>PLANS and REGULATIONS</b>								
Building codes and enforcement		■	■	■	■	■	■	■
Comprehensive Watershed Tax		■						
Density controls	■	■	■	■			■	
Design review standards		■	■	■		■	■	
Easements		■	■	■			■	
Environmental review standards		■	■	■		■	■	
Floodplain development regulations	■	■	■					
Hazard mapping	■	■	■	■			■	
Floodplain zoning	■	■	■					
Forest fire fuel reduction							■	
Housing/landlord codes			■		■			
Slide-prone area/grading/hillside development regulations				■			■	
Manufactured home guidelines/regulations		■			■	■		
Minimize hazardous materials waste generation			■					
Multi-Jurisdiction Cooperation within watershed	■	■						
Open space preservation	■	■		■			■	
Performance standards	■	■		■	■	■	■	■
Periodically contain/remove wastes for disposal			■					
Pesticide/herbicide management regulations			■					
Special use permits	■	■	■	■			■	
Stormwater management regulations		■	■					
Subdivision and development regulations	■	■	■	■		■	■	
Surge protectors and lightning protection					■			

Alternative Mitigation Actions	Dam Failure	Floods	Hazardous Materials	Landslides/ Debris Flows/ Rockfalls; soil hazards; subsidence	Weather Extremes (Tornado, hail, lightning, wind, temps, drought)	Earth quakes	Wildfires	Severe Winter Storm
Tree Management					■		■	■
Transfer of development rights		■		■			■	
Utility location			■	■	■			■
<b>STRUCTURE AND INFRASTRUCTRE PROJECTS</b>								
Acquisition of hazard prone structures	■	■		■			■	
Facility inspections/reporting	■	■	■			■		
Construction of barriers around structures	■	■	■					
Elevation of structures	■	■						
Relocation out of hazard areas	■	■	■	■			■	
Structural retrofits (e.g., reinforcement, floodproofing, bracing, etc.)		■	■	■	■	■	■	■
Channel maintenance		■		■				
Dams/reservoirs (including maintenance)	■	■						
Isolate hazardous materials waste storage sties			■					
Levees and floodwalls (including maintenance)		■						
Safe room/shelter					■	■		■
Secondary containment system			■					
Site reclamation/restoration/revegetation		■		■				
Snow fences								■
Water supply augmentation					■			
Debris Control		■		■				
Defensible Space							■	
Stream stabilization		■		■				
<b>EDUCATION AND AWARENESS</b>								
Flood Insurance	■	■						
Hazard information centers	■	■	■	■	■	■	■	■

Alternative Mitigation Actions	Dam Failure	Floods	Hazardous Materials	Landslides/ Debris Flows/ Rockfalls; soil hazards; subsidence	Weather Extremes (Tornado, hail, lightning, wind, temps, drought)	Earth quakes	Wildfires	Severe Winter Storm
Public education and outreach programs	■	■	■	■	■	■	■	■
Real estate disclosure	■	■	■	■	■	■	■	■
Crop Insurance					■	■		
Lightning detectors in public areas					■			
<b>NATURAL SYSTEMS PROTECTION</b>								
Best Management Practices (BMPs)		■	■	■	■		■	
Forest and vegetation management	■	■		■	■		■	■
Hydrological Monitoring	■	■	■	■	■			
Sediment and erosion control regulations	■	■	■	■				
Stream corridor restoration		■		■				
Stream dumping regulations		■	■					
Urban forestry and landscape management		■		■	■		■	■
Wetlands development regulations		■	■	■			■	
<b>EMERGENCY SERVICES</b>								
Critical facilities protection	■	■	■	■	■	■	■	■
Emergency response services	■	■	■	■	■	■	■	■
Facility employee safety training programs	■	■	■	■	■	■	■	■
Hazard threat recognition	■	■	■	■	■	■	■	■
Hazard warning systems (community sirens, NOAA weather radio)	■	■	■	■	■	■	■	■
Health and safety maintenance	■	■	■	■	■	■	■	■
Post-disaster mitigation	■	■	■	■	■	■	■	■
Evacuation planning	■	■	■	■			■	

# Mitigation Action Selection and Prioritization Criteria

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Does the proposed action protect lives?

Does the proposed action address hazards or areas with the highest risk?

Does the proposed action protect critical facilities, infrastructure, or community assets?

Does the proposed action meet multiple objectives (multi-objective management)?

## **STAPLE/E**

Developed by FEMA, this method of applying evaluation criteria enables the planning team to consider in a systematic way the social, technical, administrative, political, legal, economic, and environmental opportunities and constraints of implementing a particular mitigation action. For each action, the HMPC should ask, and consider the answers to, the following questions:

### **Social**

Does the measure treat people fairly (different groups, different generations)?

### **Technical**

Will it work? (Does it solve the problem? Is it feasible?)

### **Aministrative**

Is there capacity to implement and manage project?

### **Political**

Who are the stakeholders? Did they get to participate? Is there public support? Is political leadership willing to support it?

### **Legal**

Does your organization have the authority to implement? Is it legal? Are there liability implications?

### **Economic**

Is it cost-beneficial? Is there funding? Does it contribute to the local economy or economic development? Does it reduce direct property losses or indirect economic losses?

### **Environmental**

Does it comply with environmental regulations or have adverse environmental impacts?

Name of Jurisdiction:

Completed by:

Phone #:

Email:

**How was mitigation plan incorporated into other planning mechanisms over the last 5 years?** If incorporation did not occur, please just state that...there is no "grade" given for this. It is simply to inform the plan maintenance section.

**How will mitigation plan be incorporated into other planning mechanisms going forward?** For example, mitigation actions could be reviewed when planning future capital improvement / infrastructure projects and/or risk assessment could be reviewed when determining future growth areas.

Indicate plans / planning process below that hazard mitigation plan will be incorporated into:

- Comprehensive Plan
- Capital Improvement Plan
- City / County Infrastructure Plan
- School Infrastructure Plan
- School Emergency Plan
- Other (please specify) \_\_\_\_\_

Converse County Hazard Mitigation Committee (HMPC),

The link to the online survey is now active and included below. Each jurisdiction is encouraged to share the survey broadly through whatever channels possible (email lists, social media, post link on web etc.). Please document how this is distributed (an email, screenshot or a link to a website) and forward to [kyle.karsjen@amecfw.com](mailto:kyle.karsjen@amecfw.com).

Here is some text that can be used with the notice about the survey link:

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**Converse County Hazard Mitigation Plan Update 2017 Public Survey**

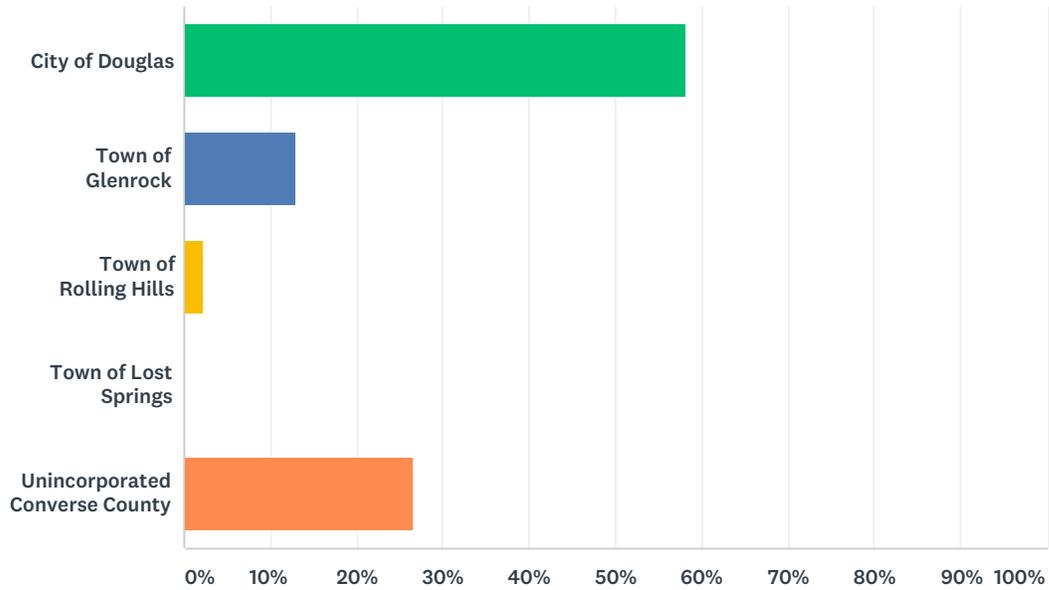
Provide feedback to the multi-jurisdictional Hazard Mitigation Planning Committee to inform the update of the Converse County Hazard Mitigation Plan. The survey is intended to gather public feedback on concerns about floods, wildfires, winter storms and other hazards and strategies to reduce their impacts. Take a quick survey and let your concerns and ideas be heard. Please complete the survey by **October 24, 2017**.

Click the link below to start the survey:

<https://www.surveymonkey.com/r/ConverseCountyWY>

## Q1 Indicate the jurisdiction you reside in:

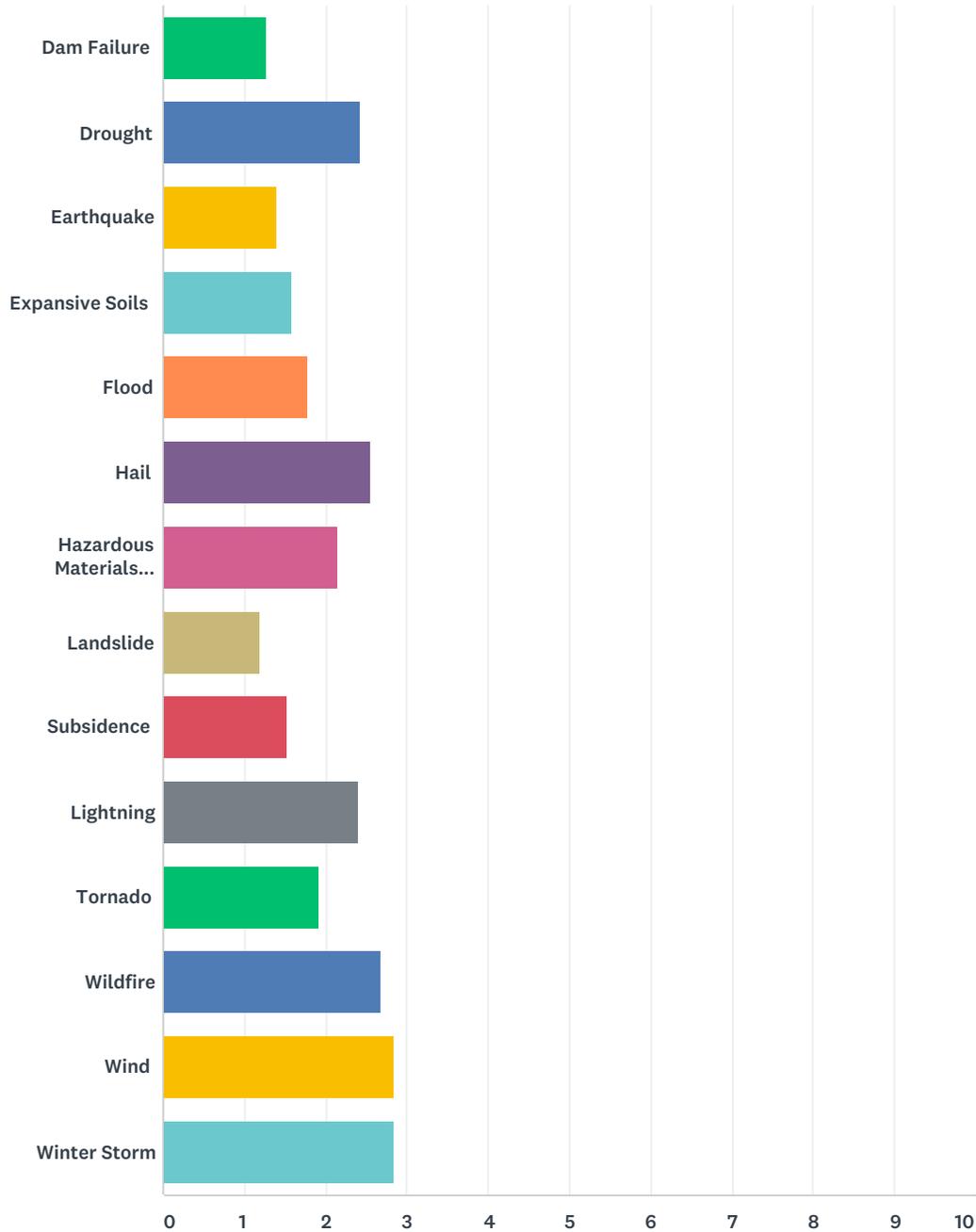
Answered: 170 Skipped: 2



ANSWER CHOICES	RESPONSES	
City of Douglas	58.24%	99
Town of Glenrock	12.94%	22
Town of Rolling Hills	2.35%	4
Town of Lost Springs	0.00%	0
Unincorporated Converse County	26.47%	45
<b>TOTAL</b>		<b>170</b>

Q2 The hazards addressed in the Multi-Jurisdictional Hazard Mitigation Plan are listed below. Please indicate the level of significance in your county that you perceive for each hazard. Please rate these hazards 1 through 3 as follows: 1=low, 2=moderate, 3=high.

Answered: 172 Skipped: 0



	1 = LOW	2 = MODERATE	3 = HIGH	TOTAL	WEIGHTED AVERAGE
Dam Failure	77.33% 133	16.86% 29	5.81% 10	172	1.28

## Converse County Hazard Mitigation Plan - Public Survey

Drought	10.47% 18	37.21% 64	52.33% 90	172	2.42
Earthquake	62.94% 107	34.12% 58	2.94% 5	170	1.40
Expansive Soils	47.37% 81	45.61% 78	7.02% 12	171	1.60
Flood	35.09% 60	52.05% 89	12.87% 22	171	1.78
Hail	2.96% 5	39.05% 66	57.99% 98	169	2.55
Hazardous Materials Incident	24.42% 42	36.05% 62	39.53% 68	172	2.15
Landslide	82.56% 142	15.12% 26	2.33% 4	172	1.20
Subsidence	58.28% 95	31.90% 52	9.82% 16	163	1.52
Lightning	6.98% 12	45.35% 78	47.67% 82	172	2.41
Tornado	23.98% 41	60.23% 103	15.79% 27	171	1.92
Wildfire	5.23% 9	22.09% 38	72.67% 125	172	2.67
Wind	0.58% 1	14.04% 24	85.38% 146	171	2.85
Winter Storm	0.58% 1	15.12% 26	84.30% 145	172	2.84

**Q3 Do you have information on specific hazard issues/problem areas that you would like the planning committee to consider? Please note the jurisdiction in your response.**

Answered: 81 Skipped: 91

**Q4 Please comment on any other pre-disaster strategies that the planning committee should consider for reducing future losses caused by natural disasters.**

Answered: 64 Skipped: 108

Q5 The following types of mitigation action items may be considered in the multi-jurisdictional plan. Please identify the types of mitigation action items that you think should have the highest priority in the plan.

Answered: 168 Skipped: 4



	PRIORITY ACTION	TOTAL
Indoor/Outdoor Warning	100.00%	110

## Converse County Hazard Mitigation Plan - Public Survey

Wildfire Fuels Treatment Projects	100.00%	94	94
Wildfire Defensible Space Projects	100.00%	97	97
Critical Facilities Protection	100.00%	80	80
Planning/Zoning	100.00%	48	48
Public Education/Awareness	100.00%	109	109
Evacuation Route Development	100.00%	81	81
Flood Reduction/Drainage Improvement	100.00%	44	44
Floodprone Property Buyout	100.00%	17	17
Education and Discounts on Flood Insurance	100.00%	48	48
Participation in the National Flood Insurance Program	100.00%	38	38
Landslide/Mudslide Mitigation	100.00%	9	9
Rockfall Mitigation	100.00%	10	10
Earthquake Mitigation	100.00%	25	25

**Q6 Please provide your name and email address if you would like to be added to a distribution list for upcoming activities related to the planning process:**

Answered: 50 Skipped: 122

## Q7 How did you hear about this survey?

Answered: 125 Skipped: 47

**American Red Cross**

American Red Cross

home

Gehrig.Haberst  
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s.org

home

318 West B  
Street  
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Wyoming  
82601**American Red Cross**

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@redcross.org**Anadarko -Midstream**

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Pipeline Forman

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Staff HSE Representative

Anadarko Petroleum

Corporation

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other

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Manager of Community and Gov Affairs  
Black Hills Energy/Source Gas Pipeline

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Casper Safety

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**Chaffin Clara**

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**Converse County  
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Commissioner  
Converse County Commissioner

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Dave Johnson Power Plant/  
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Douglas Boys & Girls Club

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Independant Glenrock  
Independant Budget**

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Douglas Police Dept

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Douglas Rec Center Shelter

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*Council person  
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of  
managed Douglas Rec  
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**Douglas School High**

Vice Principal  
Douglas School High

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EPA Region 8

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Genesis Energy, LP

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**Sinclair Pipeline Company**

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# Appendix B ADOPTION RESOLUTION

**Note to Reviewers:** When this plan has been reviewed and approved pending adoption by FEMA Region VIII, the adoption resolutions will be signed by the participating jurisdictions and added to this appendix. A model resolution is provided below:

Resolution # \_\_\_\_\_

## **Adopting the Converse County Hazard Mitigation Plan**

**WHEREAS** Converse County has historically experienced severe damage from natural and human-caused hazards such as flooding, wildfire, earthquake, drought, thunderstorms/high winds, and hazardous materials incidents on many occasions in the past century, resulting in loss of property and life, economic hardship, and threats to public health and safety;

**WHEREAS** Converse County has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its All Hazard Mitigation Plan under the requirements of 44 CFR 201.7;

**WHEREAS** the Plan specifically addresses hazard mitigation strategies and plan maintenance procedures for Converse County;

**WHEREAS** the Plan recommends several hazard mitigation actions/projects that will provide mitigation for specific natural and human caused hazards that impact Converse County, with the effect of protecting people and property from loss associated with those hazards;

**WHEREAS**, adoption of this plan will make Converse County eligible for funding to alleviate the impacts of future hazards,

**NOW THEREFORE BE IT RESOLVED** by the [insert appropriate official titles] of Converse County that:

- 1) The Plan is hereby adopted as an official plan of Converse County.
- 2) The respective officials identified in the mitigation strategy of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them.
- 3) Future revisions and Plan maintenance required by 44 CFR 201.7 and FEMA, are hereby adopted as a part of this resolution for a period of five (5) years from the date of this resolution.
- 4) An annual report on the progress of the implementation elements of the Plan shall be presented to the [insert appropriate official titles such as Mayor, Town Council, Board of Supervisors, etc.] by [insert date] of each calendar year.
- 5) Converse County will comply with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding, in compliance with 44 CFR 13.11 (c); and will amend our Plan whenever necessary to reflect applicable changes in Tribe, State or Federal laws and statutes as required in 44 CFR 13.11. (d).

**PASSED** by Converse County, this \_\_\_ day of \_\_\_ (month), \_\_\_ (year).

\_\_\_\_\_  
Certifying Official