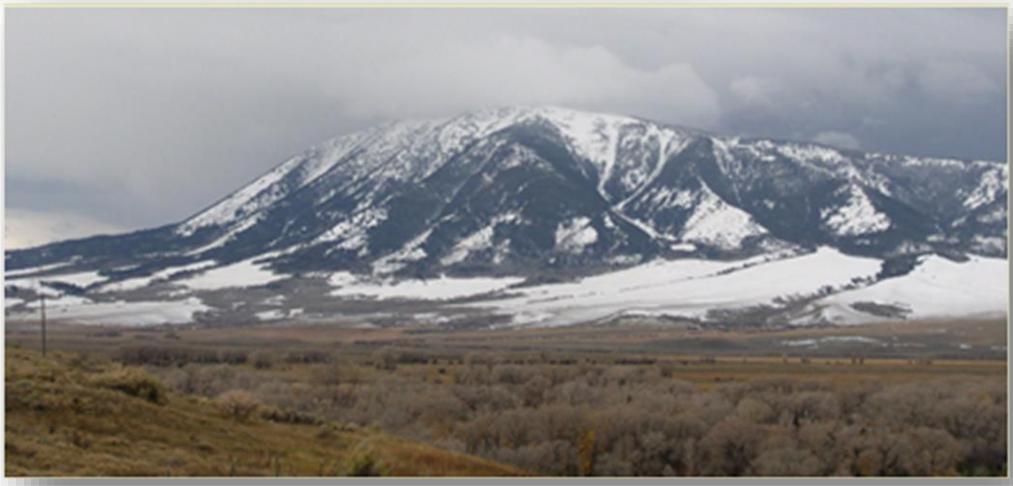
2019 Wyoming Region 3 Hazard Mitigation Plan

Albany & Carbon Counties



Prepared by Albany & Carbon Counties Emergency Management Agencies in conjunction with the Wyoming Office of Homeland Security

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1. Introduction

1.1. Purpose

The State of Wyoming's Office of Homeland Security (WOHS) coordinated with Wyoming Region Counties to create a cross-regional Hazard Mitigation Plan (HMP). This Plan covers Region 3, to include Albany and Carbon Counties and their incorporated jurisdictions. The Federal Emergency Management Agency (FEMA) and the WOHS define Hazard Mitigation as any sustained action taken to reduce or eliminate long-term risk to people and property. Mitigation efforts undertaken by communities will help to minimize damages to buildings and infrastructure as well as protect public safety.

The objective of the Region 3 Hazard Mitigation Plan is to protect citizens, critical facilities, infrastructure, private property, and the surrounding environment from natural and human-caused hazards. This objective can be achieved by identifying potential hazards in the Region and establishing procedures that will mitigate the effects of hazards. This plan provides a framework for planning against hazards in the Region.

1.2. Authority

This updated plan complies with all requirements set forth by the Wyoming Office of Emergency Management and the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Section 104 of the Disaster Mitigation of 2000. In addition, it complies with all of FEMA's Final Rule 44 CFR Part 201, which outlines criteria for approval of hazard mitigation plans.

1.3. Scope

This plan identifies natural and human-caused hazards that pose a threat to Albany and Carbon Counties, Wyoming, including incorporated and unincorporated areas, and provides a plan of action for mitigating these hazards.

1.4. Multi-Jurisdictional Planning

A participatory, community-based planning approach contributed heavily to the development of this multijurisdictional plan. The hazard mitigation planning process included all of the Wyoming State's Region 3 communities, which is comprised of two counties; Albany and Carbon. Both counties and their respective jurisdictions were invited to participate throughout the planning process. All the participating communities for the 2019 Region 3 Hazard Mitigation Plan process are listed below. These jurisdictions governing bodies will/have individually formally adopted the final Plan.

- Albany County
  - Albany County
  - City of Laramie
  - Town of Rock River
- Carbon County
  - Carbon County
  - Town of Baggs
  - Town of Dixon
  - Town of Elk Mountain
  - Town of Encampment

- Town of Hanna
- Town of Medicine Bow
- City of Rawlins
- Town of Riverside
- Town of Saratoga
- Town of Sinclair

1.5. Plan Organization

This Plan is a new regional Plan, combining elements from both the 2015 Albany County Hazard Mitigation Plan and the 2016 Carbon County Hazard Mitigation Plan. Information that was able to be consolidated for the Region was, while maintaining individual mitigation strategies for each County. The Plan is organized as follows:

- Chapter 1: Introduction
- Chapter 2: Community Profile
- Chapter 3: Planning Process
- Chapter 4: Hazard Identification and Risk Assessment (HIRA)
- Chapter 5: Mitigation Strategy
- Chapter 6: Plan Maintenance, Revision, and Integration
- Appendix A: Meeting Sign-in Sheets and Agendas
- Appendix B: Public Involvement
- Appendix C: HIRA Appendix
- Appendix D: Jurisdictional Plan Adoptions
- Appendix E (for official use only): Critical Facilities Appendix

2. Community Profiles

2.1. Albany County

2.1.1. County History and Geography

On December 16th, 1868 the 8th Legislative Assembly of the Dakota Territory formed Albany County from a western portion of what was then Laramie County, WY. The City of Laramie was incorporated in 1873 and became the county seat. The other incorporated area of the county, the Town of Rock River, was formed when the Union Pacific Railroad routed through the region in 1898.

Albany County encompasses a total area of 4,309 square miles, with 4,273 square miles being land and 36 square miles being water. It is considered frontier land and is sparsely developed (a majority of the population resides in the City of Laramie, home to University of Wyoming). There are several water sources in the County. The county's major water source is the Laramie River, which does result in flooding. There are also tributaries and dams. There are dams located at Rob Roy Reservoir, Lake Owen Reservoir, Lake Hattie Reservoir, Wheatland Reservoir #2 and #3, and Twin Buttes Reservoir.

The County is at the tip of the Colorado Front Range, generally referred to as foothills of the Rocky Mountains, extending north to south from Pikes Peak to the Colorado/Wyoming state line. Albany County is located in a broad basin that forms the Laramie Plains in the southeast corner of Wyoming, just across the Colorado state line. Two mountain ranges rise from both sides of the Laramie Plains: the northern extension of the Rocky Mountain chain (the Medicine Bow Mountains – including the Snowy Range) on the western border and the Laramie Mountains on the east. This gives Albany County its diverse geographical make-up. These mountain ranges result in the county's high elevation.

The topography ranges from open, high elevation basins and desert land to pine covered mountains. The mean elevation of the county is 6,500 feet above sea level. However, the highest peak in the county, Medicine Bow Peak in the Snowy Range, rises over 12,000 feet. The Laramie Peak in the Laramie Range is over 10,200 feet.

Albany County also contains numerous local, state, and national parks and recreation areas, including Medicine Bow National Forest, Hutton Lake National Wildlife Refuge, and Bamforth National Wildlife Refuge. The county also has 41 properties and districts listed on the National Register of Historic Places. These outdoor, cultural, and historic facilities offer an abundance of recreational opportunities to area residents, and visitors alike.

Interstate 80 passes through the county running east-west. State Highway 287 runs from the south into Colorado and US 30 runs north into Carbon County, Wyoming. The Union Pacific Railroad runs North and South with US 30 and US 287. Several underground pipelines that transport various products including natural gas, diesel fuel, fuel oil, gasoline, and crude oil can be found across the county.

Albany County includes two incorporated jurisdictions (Laramie and Rock River) and several unincorporated communities. An Albany County base map is shown in Figure 2-1 below, and Albany County communities are shown in Table 2-1.

Figure 2-1 Albany County Basemap

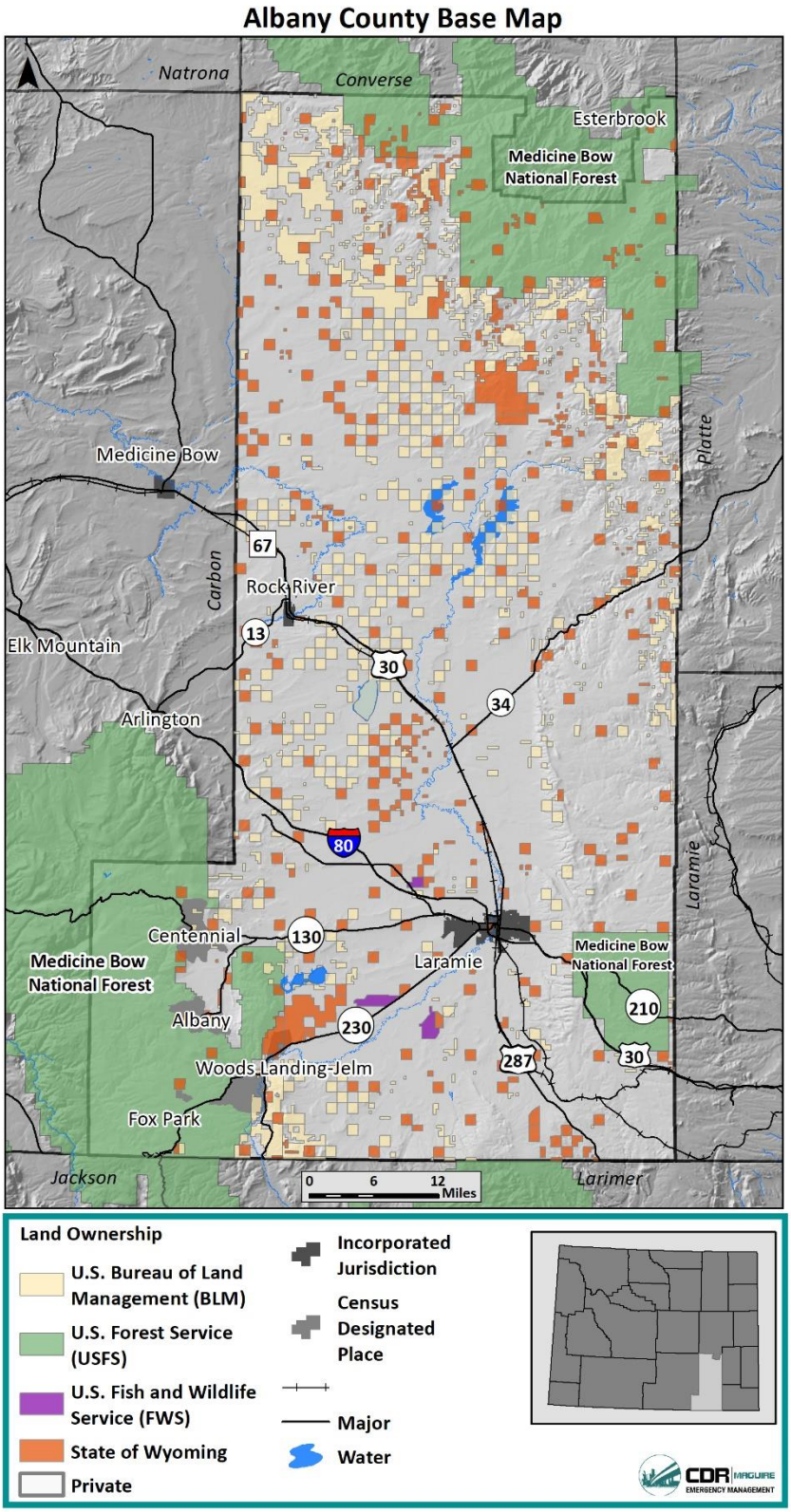

Table 2-1 Albany County Communities

Incorporated Jurisdictions	Unincorporated Communities
City of Laramie	Albany*
Town of Rock River	Arlington
	Bosler
	Centennial*
	Fox Park*
	Harmony
	PhinDeli Town Buford (formerly known as Buford)[1]
	Garret
	Sybille
	Tie Siding
	Woods Landing-Jelm*
	WyColo
** denotes Census Designated Place*	

2.1.2. Population and Demographics

From 2010 to 2017, the State of Wyoming Department of Administration & Information, Economic Analysis Division estimated the population in Albany County grew by 2,033 people, from 36,299 to 38,332, equating to a 5.6% percent increase. This compares to a statewide population growth of 2.8% over the same period. The 2020 population projection for the county is 39,290 people, an increase of 8.2% from 2010, and the 2030 population projection for the county is 42,000, an increase of 15.7% percent from 2010. The unincorporated areas of the county and the municipalities are projected to grow at a similar rate.[2] Table 2-2 describes the County's population statistics.

From 2010 to 2017, the City of Laramie grew by an estimated 1,490 people, from 30,816 to 32,306, equating to a 4.8% increase. The 2020 population projection for the City is 33,355 people, an increase of 8.2% from 2010, and the 2030 population projection for the City is 35,656, an increase of 15.7% from 2010. The state's only four-year university, the University of Wyoming, is located in Laramie and has an approximate student population of 14,000. Other universities in Laramie include Laramie County Community College and the Wyoming Technical Institute (WyoTech), a two-year college.

During this same time period the Town of Rock River's population increased by an estimated four people, from 245 people in 2010 to 249 people in 2017. This equates to 1.6% increase in population. The 2020 population projection for the Town is 265 people, an increase of 8.2% from 2010, and the 2030 population projection for the Town is 283, an increase of 15.7% from 2010.

From 2010 to 2017, the unincorporated areas of the County grew by an estimated 539 people, from 5,238 people in 2010 to 5,777 people in 2017. This equates to a 10.3% increase in population. The 2020 population projection for the unincorporated communities is 5,670, an increase of 8.2% from 2010, and the 2030 population projection is 6,061, an increase of 15.7% from 2010.

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[1] Name change occurred in 2013: ttp://www.wyomingnews.com/articles/2013/09/04/news/01top_09-04-13.txt#.U9KQjfldV8E
[2] http://eadiv.state.wy.us/pop/

It is evident that overall the county is growing in population, and is expected to continue to grow at a similar rate across all jurisdictions through 2030. Overall, the City of Laramie experienced the most population growth since 2010, however, the unincorporated areas of the county grew at a higher rate. The Town of Rock River experienced the least amount of population growth since 2010.

Table 2-2 Population of Albany County Communities

Location	2010 Population	July 1, 2017 Population Estimate	% Change 2010-2017	2020 Population Projection	% Change 2010-2020	2030 Population Projection	% Change 2010-2030
Laramie	30,816	32,306	4.8%	33,355	8.2%	35,656	15.7%
Rock River	245	249	1.6%	265	8.2%	283	15.5%
Unincorporated Area	5,238	5,777	10.3%	5,670	8.2%	6,061	15.7%
County Total	**36,299**	**38,332**	**5.6%**	**39,290**	**8.2%**	**42,000**	**15.7%**

According to the 2010 Census, there were 15,691 households and 7,430 families residing in the County. The average household size was 2.17 persons. The median age was 26.8, lower than the national average of 37.2. According to the 2017 American Community Survey (ACS), the median household income was $45,816. In 2017, 23% of individuals were below the poverty level.

In the City of Laramie, according to the 2010 Census there were 13,394 households and 5,843 families. The average household size was 2.14 persons. The median age was 25.4 years, slightly lower than the County median. According to the 2017 ACS, the median household income was $43,191 and 26% of people lived below the poverty level over the past 12 months.

In the Town of Rock River there were 94 households and 72 families according to the 2010 Census. The average household size was 2.61 persons, which is slightly higher than the County average as well as the City of Laramie average. The median age was 46.8 years, which is significantly higher than the County and the City of Laramie. This is likely due to the fact that the City of Laramie's population is heavily influenced by the University of Wyoming student population. According to the 2017 ACS, the median household income was $27,917, and 4.7% of people lived below the poverty level over the past 12 months.

In addition, data indicates that gender is fairly evenly distributed, with a slightly higher percentage of males. A majority of the population is Caucasian, with African American, Asian or another race comprising about 10 percent. Additionally, across the County, approximately 90% of people are English speakers, with 100% of Rock River residents being English speakers, and 88% of Laramie residents. Very few residents speak English less than "very well." Over 90% of population in incorporated areas has an education at high school level or higher. Education information for unincorporated areas is not currently available.

Table 2-3 shows the breakdown number of people per income range for the County and jurisdictions, and Table 2-4 shows a summary of selected Albany County demographics. [3, 4]

Table 2-3 Income Distribution in Albany County

	City of Laramie		Town of Rock River		Unincorporated County		County Total	
Household Income	#	%	#	%	#	%	#	%
Less than $10,000	1,627	12.1%	6	9.5%	54	2.2%	1,687	10.50%
$10,000 to $14,999	934	6.9%	0	0.0%	92	3.7%	1,026	6.40%
$15,000 to $24,999	1,762	13.1%	23	36.5%	182	7.3%	1,967	12.30%
$25,000 to $34,999	1,613	12.0%	5	7.9%	316	12.8%	1,934	12.10%
$35,000 to $49,999	1,738	12.9%	9	14.3%	294	11.9%	2,041	12.70%
$50,000 to $74,999	2,268	16.8%	9	14.3%	464	18.7%	2,741	17.10%
$75,000 to $99,999	1,313	9.7%	9	14.3%	425	17.2%	1,747	10.90%
$100,000 to $149,999	1,534	11.4%	2	3.2%	361	14.6%	1,897	11.80%
$150,000 to $199,999	496	3.7%	0	0.0%	95	3.8%	591	3.70%
$200,000 or more	183	1.4%	0	0.0%	195	7.9%	378	2.40%

Table 2-4 Demographics of Albany County

Jurisdiction	Households*	Families*	Household Size*	Median Age*	Median Household Income^	% Below Poverty^	% Male/ % Female^	High School Education or Higher (%)^	Bachelor's Degree or Higher (%)^
City of Laramie	13,394	5,843	2.14	25.4	$43,191	26%	52%/ 48%	95.9%	51%
Town of Rock River	94	72	2.61	46.8	$27,917	4.70%	48%/ 52%	100%	9.3%

[3] U.S. Census 2017 ACS
[4] * denotes 2010 U.S. Census; ^ denotes 2017 U.S. Census ACS

Jurisdiction	Households*	Families*	Household Size*	Median Age*	Median Household Income^	% Below Poverty^	% Male/ % Female^	High School Education or Higher (%)^	Bachelor's Degree or Higher (%)^
Unincorporated County	2,203	1,515	NA	NA	NA	NA	NA	NA	NA
County Totals	15,691	7,430	2.17	26.8	$45,816	23%	52%/ 48%	96.2%	49.80%

Overall, a higher percent of Albany County residents are 20 to 29 years in age. The young overall population can partially be attributed to the University of Wyoming student population in Laramie. The City of Laramie's age distribution follows a similar pattern as the County. However, the Town of Rock River has a higher portion of residents from 15 to 19 years old, as well as high percentage of residents from 50 to 74 years old. Table 2-5 describes the age distributions of Albany County. [5]

Table 2-5 Albany County Age Distribution

	City of Laramie		Town of Rock River		Unincorporated County		County Total	
Age	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Under 5 Years	1,668	5.2%	5	3.9%	232	4%	1,905	5%
5 to 9	1,493	4.7%	0	0%	318	6%	1,811	4.8%
10 to 14	1,276	4%	0	0%	325	6%	1,601	4.2%
15 to 19	3,017	9.4%	14	10.9%	242	4%	3,273	8.6%
20 to 24	8,043	25.1%	2	1.6%	404	7%	8,449	22.3%
25 to 29	3,510	10.9%	2	1.6%	220	4%	3,732	9.8%
30 to 34	2,288	7.1%	2	1.6%	246	4%	2,536	6.7%
35 to 39	1,701	5.3%	0	0%	277	5%	1,978	5.2%
40 to 44	1,333	4.2%	4	3.1%	340	6%	1,677	4.4%
45 to 49	1,182	3.7%	0	0%	410	7%	1,592	4.2%
50 to 54	1,206	3.8%	21	16.4%	435	8%	1,662	4.4%
55 to 59	1,386	4.3%	14	10.9%	441	8%	1,841	4.9%
60 to 64	1,397	4.4%	24	18.8%	555	10%	1,976	5.2%
65 to 69	855	2.7%	20	15.6%	535	9%	1,410	3.7%
70 to 74	617	1.9%	11	8.6%	335	6%	963	2.5%
75 to 79	380	1.2%	6	4.7%	232	4%	618	1.6%
80 to 84	371	1.2%	3	2.3%	70	1%	444	1.2%
85 and over	381	1.2%	0	0%	95	2%	476	1.3%

[5] U.S. Census 2017 ACS

Factors such as age, income, race/language, and population growth all contribute to a community's vulnerability to hazard events. Typically, factors such as poverty, very young or elderly age, and ability to speak English can increase a community's vulnerability to hazard events. However, it should be noted that a strong community ties, as is common in smaller communities, can also help reduce vulnerability, regardless of other factors. Overall, the County is above the national (14.6%) and State of Wyoming (11.1%) averages of people living below the poverty level, at 26%. This average is much lower in Rock River than the rest of the County (4.7%). The County's average age is lower than the national average (37 years), at 26.8. However, as mentioned previously, Rock River has a higher percent of its population above 50, which may increase the vulnerability to some hazards such as communicable/infectious diseases. There are very few non-English speakers across the County.

2.1.3. Land Use and Development

Albany County is a largely rural county and, according to the 2008 Albany County Master Plan, residents would like it to remain rural. However, the County is experiencing an increase in population, and low-density development in the rural areas of the County can cause challenges such as increased road maintenance and cost for emergency services. Currently, as mentioned in the previous section, the unincorporated areas of Albany County are growing at a faster rate than the municipalities. Factors that could increase population growth include progress in energy development in Wyoming (especially wind farms and natural gas) and the development extending northward along the Colorado Front Range. This growth has reached Fort Collins, approximately an hour away from Albany County.

The majority of the County is classified as agricultural land (62%), 4% is classified as residential use, and commercial and industrial uses occupy less than 1% of the County's land area. The remaining 34% is public land.[6] Public land ownership includes land managed by the U.S. Forest Service (USFS), U.S. Bureau of Land Management (BLM), U.S. Fish and Wildlife Service (FWS), State of Wyoming, University of Wyoming, and the City of Laramie (see Figure 2-1). Public lands are used heavily for recreation in the County, and play a large part in tourism. The economy of the community of Centennial is largely dependent on tourism associated with recreation.

Figure 2-2 shows existing land uses in Albany County as of the 2008 Albany County Mater Plan, and Figure 2-3 shows growth efficiency for future development for the County. Overall, it is more efficient in terms of providing roads and services to areas that are already within a shorter distance to established communities.

[6] http://www.co.albany.wy.us/SharedFiles/Download.aspx?pageid=189&mid=519&fileid=4676

Figure 2-2 Existing Land Uses in Albany County

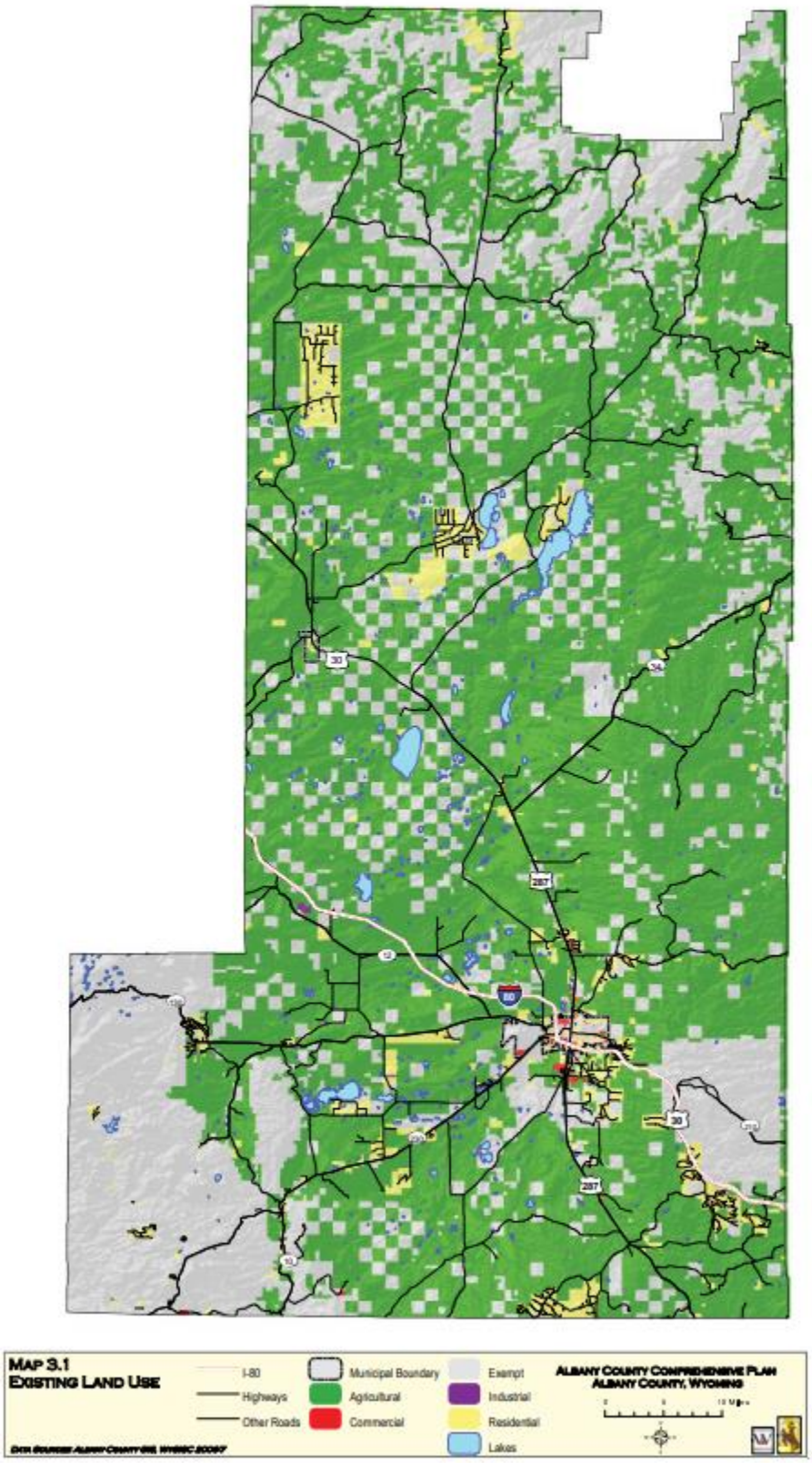
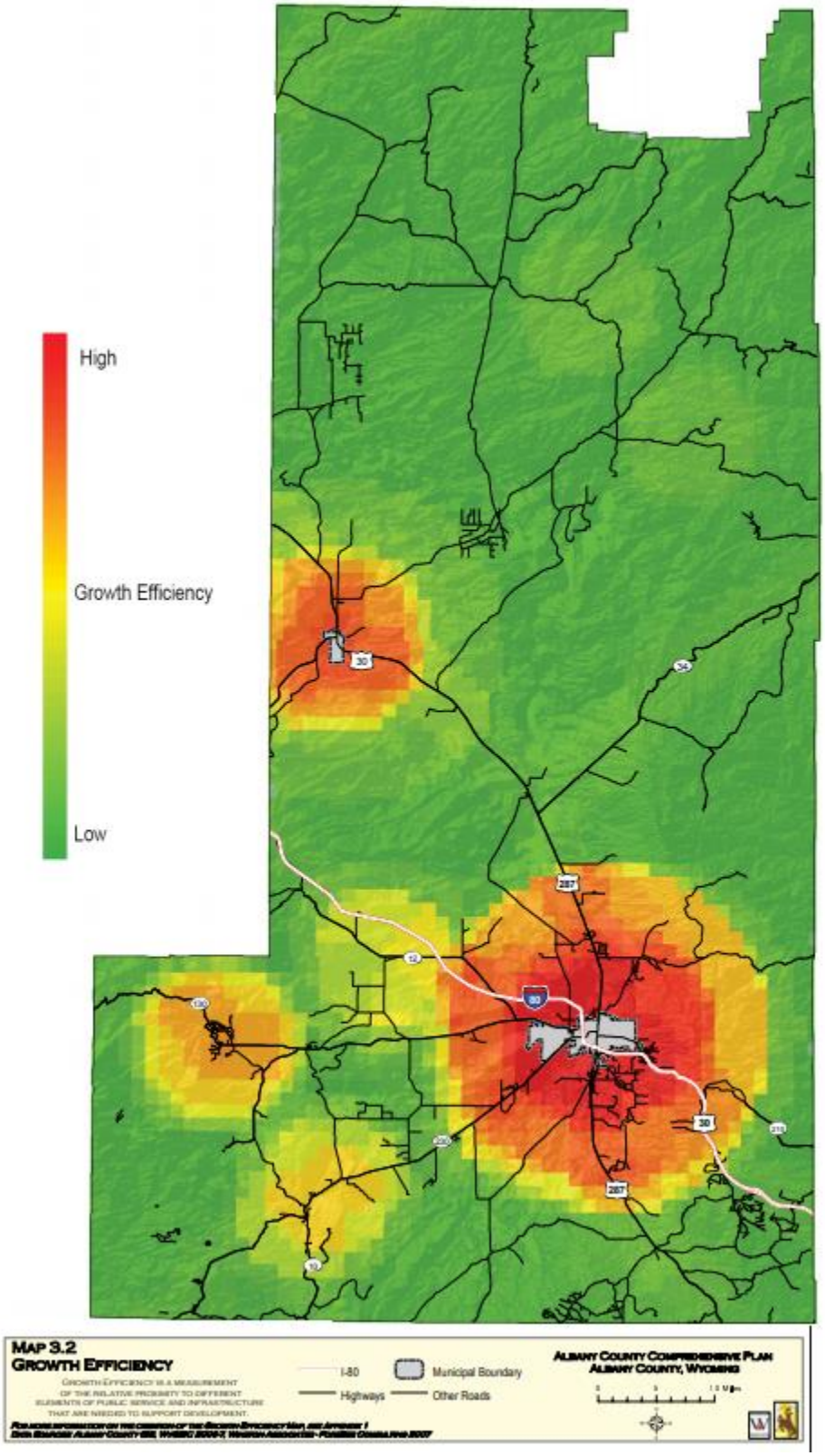


Figure 2-3 Future Development in Albany County



2.2. Carbon County

2.2.1. County History and Geography

Carbon County encompasses approximately 7,897 square miles in south central Wyoming. The southern portion of the County shares its border with Colorado.

The entire county sits at relatively high elevation. The Continental Divide winds through the heart of the county in a generally north-south orientation. Peaks of 11,000 are found in the southern and eastern areas of the county and the county is home to the Pedro, Park, Ferris, Shirley, Seminoe, Sierra Madre, and Medicine Bow Mountain Ranges. The lowest area of the county is in the northwest, with elevations around 6,200 feet.

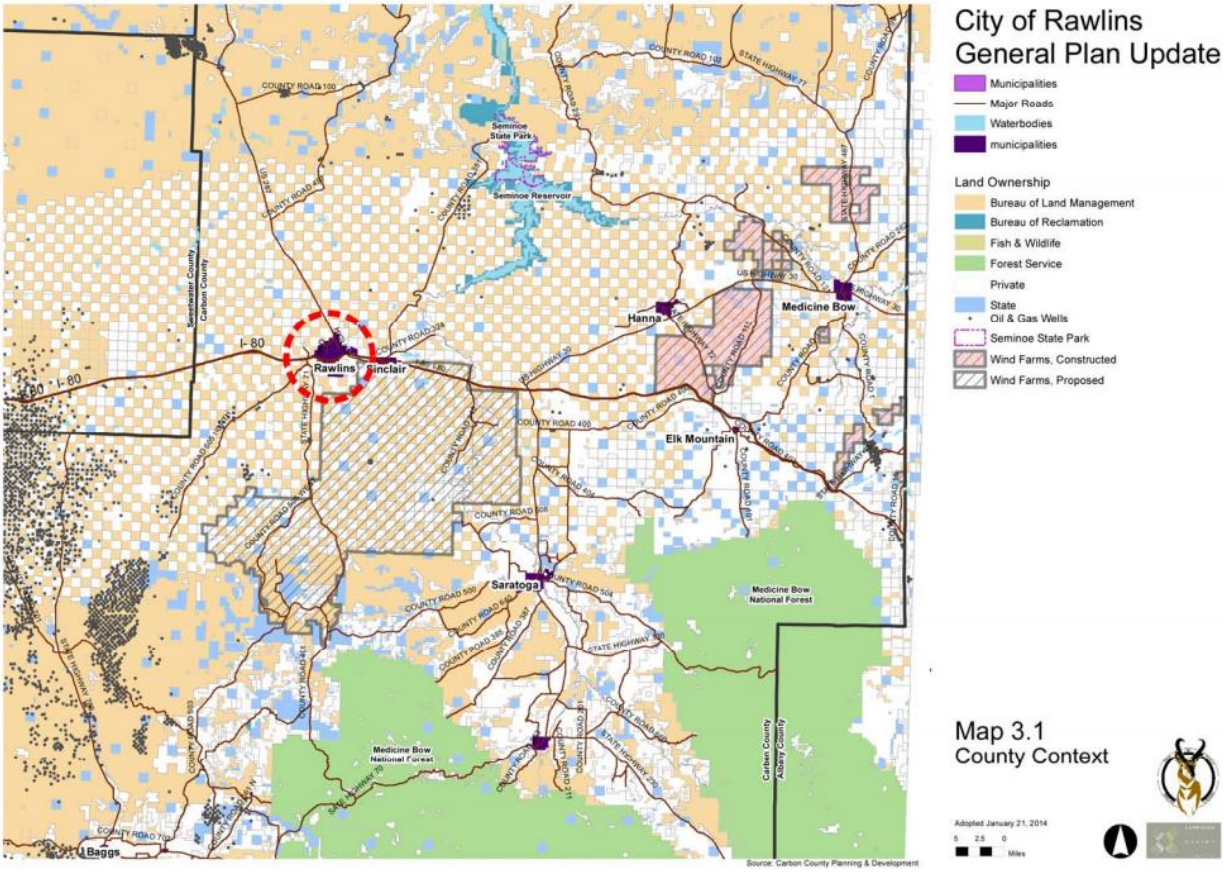
The county includes three hydrologic basins: the North Platte River Basin (including flows from the Encampment and Medicine Bow Rivers), the Little Snake Basin (including flows from Muddy Creek) in the southwest corner of the county, and the Great Divide Basin in the north and central western areas of the county. (Carbon County Land Use Plan, 1988)

Interstate 80 (I-80) passes through the county running east-west. State Highway 287 runs from the northwest corner of the county in a southerly direction turning east and south at Rawlins. Secondary Highway 789 runs south across the western portion of the county through Baggs and into Colorado. The Union Pacific has track paralleling I-80 from Rock Springs through Rawlins and east to Walcott. The mainline then leaves the Interstate corridor and follows Highway 30/287 east through Hanna and Medicine Bow.

The Bureau of Land Management (BLM) is the largest land owner in the county with 2,028,314 acres. The BLM manages their surface acres plus mineral rights of all federally-owned lands. An additional 700,094 acres of federal lands are managed by the U.S. Forest Service, Bureau of Reclamation, and the Fish and Wildlife Service. Other lands in the county are deeded private individual and corporate ownership and owned by the state. Land ownership is distributed in a checker board pattern as a remnant of federal land grants to railroads in the 1800's. Figure 2-4 describes land ownership in Carbon County. [7]

[7] 2014 City of Rawlins Mater Plan

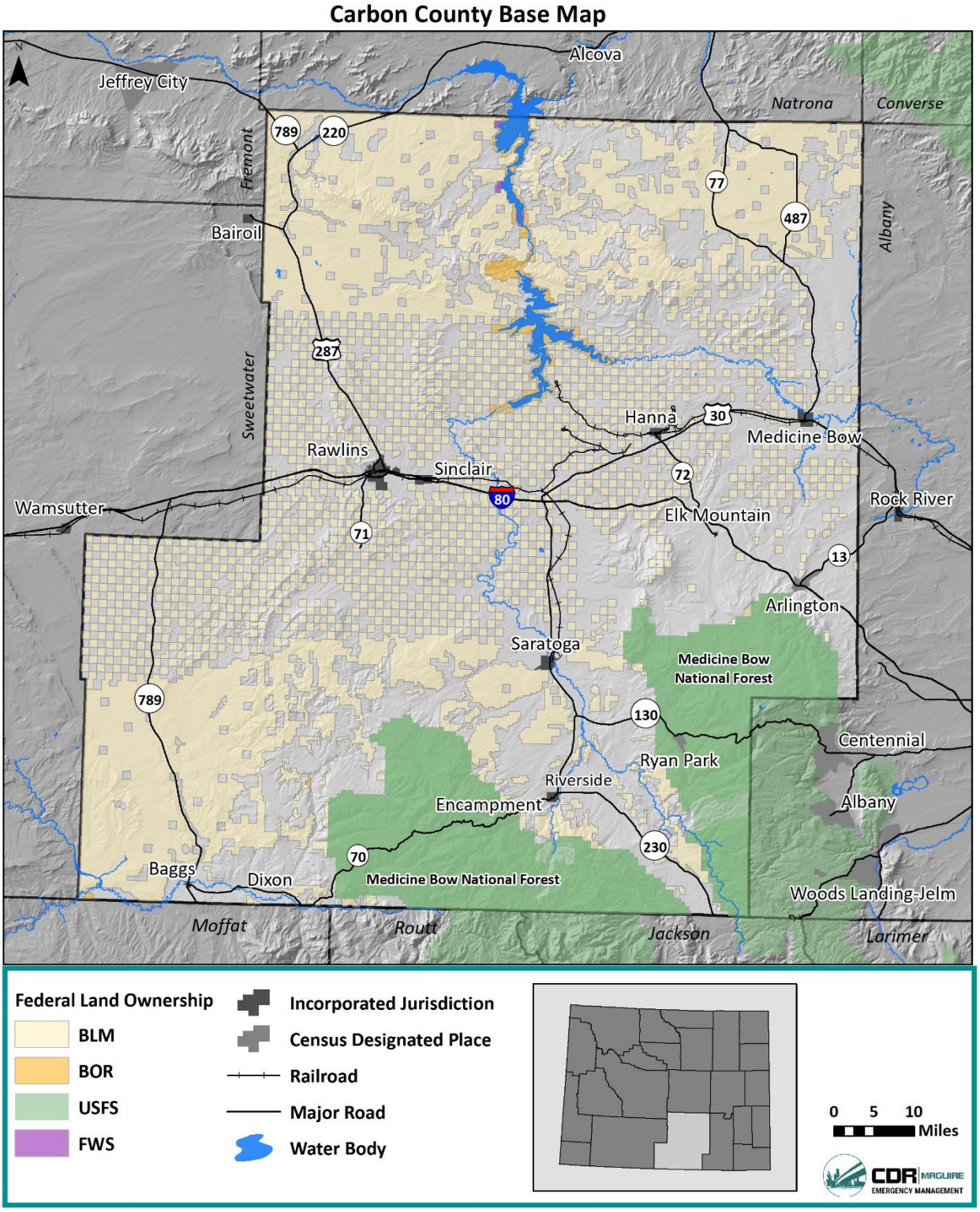
Figure 2-4 Carbon County Land Ownership



The topography ranges from open, high elevation basins and desert land to pine covered mountains. Pine stands in the mountains continue to experience beetle kill which has increased the wildfire hazard and affected the hydrology and runoff patterns. The county is drained primarily by the North Platte River which runs northerly across the county. The North Platte and the Seminoe Rivers fill the Seminoe Reservoir and then flow downstream to the north into the Pathfinder Reservoir.

The incorporated communities of Baggs, Dixon, Elk Mountain, Encampment, Hanna, Medicine Bow, Rawlins, Riverside, Saratoga, and Sinclair are situated within Carbon County. Figure 2-5 shows a base map of Carbon County.

Figure 2-5 Carbon County Basemap



2.2.2. Population and Demographics

The population of Carbon County during the last census on April 1, 2010, was 15,885. The State of Wyoming Department of Administration & Information, Economic Analysis Division produces population estimates since the 2010 Census. The July 1, 2017 county population estimate was 15,303. This is a decrease of 582 individuals, or -3.7%, from the 2010 census. By contrast, from the 2000 to 2010 Census, the population of the County increased from 15,639 to 15,885. According to the State of Wyoming estimates, population in the County continued to increase until 2014, at a peak of 15,907 people.

Populations of the nine incorporated towns (see Table 2-6 below) mostly declined or remained relatively constant from 2010 to 2017. Medicine Bow and Sinclair saw the greatest declines in terms of percent of population. However, population projections estimate that the population across the county will rebound to 2010 levels in 2020, and see a modest increase by 2030. The percent changes from 2010 to 2020 as well as 2010 to 2030 are relatively consistent across all jurisdictions.

Rawlins is the only community in the county with a population large enough to be designated a city. Rawlins, the county seat is located near the Interstate, has land available for development within the incorporated city limits, and offers a variety of businesses and services. The 2014 Rawlins Master Plan used four scenarios to project population change. According to these scenarios, the range of population increase in Rawlins is expected to be from 224 to 3,747 additional individuals by 2030.

It is noted that population projection in areas with significant energy sectors is complex because large numbers of construction workers are needed on the front end of major projects (processing plants, wind farms, transmission lines, etc.) Once these projects are completed, fewer workers are needed to operate and maintain the project. This can cause fluctuation in population numbers and difficulty in planning for their needs.

Table 2-6 Carbon County Population[8]

Location	2010 Population	July 1, 2017 Population Estimate	% Change 2010-2017	2020 Population Projection	% Change 2010-2020	2030 Population Projection	% Change 2010-2030
Baggs	440	428	-2.7%	440	0.0%	448	2.1%
Dixon	97	97	0%	97	0.0%	99	1.6%
Elk Mountain	191	189	-1.0%	191	0.0%	194	1.8%
Encampment	450	436	-3.1%	450	-0.1%	458	1.8%
Hanna	841	793	-5.7%	840	0.0%	856	1.8%
Medicine Bow	284	267	-6.0%	284	-0.1%	289	1.8%
Rawlins	9,259	8,858	-4.3%	9,250	0.0%	9,425	1.9%
Riverside	52	53	1.9%	52	-0.1%	53	1.8%
Saratoga	1,690	1,655	-2.1%	1,688	0.0%	1,720	1.8%
Sinclair	433	407	-6.0%	433	-0.1%	441	1.8%
Unincorporated County	2,148	2,120	-1.3%	2,145	-0.1%	2,187	1.8%
County Totals	**15,885**	**15,303**	**-3.7%**	**15,870**	**0.0%**	**16,170**	**2.1%**

[8] http://eadiv.state.wy.us/pop/

According to the Census, the county had a total 8,576 housing units in 2010. Almost half (46%) of these housing units, 3,960 units, are located in Rawlins. The 2014 Rawlins Master Plan projected the need for an additional 20 to 335 acres for residential housing. Current housing in Rawlins is inadequate—additional units of almost all types are needed and general condition of single-family housing is aged and poor. Both the county policy and the Rawlins Master Plan encourage infill rather than expansion of the city boundaries. Occupied housing units in the county numbered 6,388 in 2010 with a third of the total, 2,188, unoccupied.

While the economy of the county has a basic level of stability with some diversity, both the economy and population continue to be subject to fluctuations related to national energy demands and policies. The county contains all forms of carbon-based energy including subsurface and strippable coal, methane gas, and oil and natural gas. The county also has uranium. Wind power has been developed in the county and additional wind development is proposed. In addition to the energy industry, the economy is also supported by ranching and tourism. Two of the major employers in the county include the Wyoming State Prison in Rawlins and the Sinclair Refinery, in Sinclair. The county contains a significant amount of federal public land--BLM and Forest Service. The government sector also provides many jobs.

The U.S. Census 2017 ACS reports that the unemployment rate in Carbon County in 2017 was 3.4%. This is less than the rate for Wyoming at this same time which was 4.7%. The median income for households in Carbon County according to the 2017 ACS was $57,644. In the past 12 months, 13.3% of people in the County lived below the poverty level, slightly above 11.1% in Wyoming.

The average household size in 2010 was 2.36 persons. The median age was 38.2 years as of the 2017 ACS. Males made up 54% of the population and females 46% in 2017. The population reported itself as 92.9% white with 17.9% Hispanic or Latino.

Table 2-7,

Table 2-8, and Table 2-9 show select demographic information for the county and jurisdictions. There are some notable differences between communities. The median age varies widely, ranging from 30.7 in Baggs to 66.1 in Riverside. Riverside, Medicine Bow, and Encampment have a median age distinctly higher than the county median of 38.2. the elderly population may be more vulnerable to certain hazards, such as communicable/infectious disease. They may also be more severely impacted by hazards if they do not have the means to evacuate or are cut off from necessary medications after a disaster event. Additionally, the percent living below poverty in the past 12 months varies widely across jurisdictions. Dixon, Encampment, Hanna, and Medicine Bow have a higher percent of people living below poverty than the county, at 13%. People living below poverty may be more vulnerable to hazards.

Table 2-7 Carbon County Select Demographics[9]

Jurisdiction	Households*	Families*	Household Size*	Median Age*	Median Household Income^	% Below Poverty^	% Male^	% Female^	High School Education or Higher (%)	Bachelor's Degree or Higher (%)
Baggs	183	114	2.4	30.7	58,281	7%	48%	52%	83.1%	25.8%
Dixon	43	27	2.26	36.9	$30,417	28.60%	55%	45%	89.7%	27.6%
Elk Mountain	76	58	2.51	41.9	55,000	0.00%	49%	51%	100%	27.2%
Encampment	227	128	1.98	54.9	$37,083	25%	51%	49%	98.3%	31.9%
Hanna	346	232	2.43	46.1	47,847	17.90%	49%	51%	90.7%	14.2%
Medicine Bow	125	81	2.27	59.2	33,646	22.00%	47%	53%	90.9%	9.1%
Rawlins	3,443	2,206	2.47	33.9	60,550	13.80%	56%	44%	88.2%	19.2%
Riverside	34	15	1.53	66.1	53,125	0.00%	65%	35%	100%	41.9%
Saratoga	802	474	2.07	45.9	73,476	9.80%	52%	48%	96%	22%
Sinclair	170	123	2.25	37.5	85,588	4.10%	46%	54%	90.4%	23.9%
Unincorporated County	939	651	NA	NA	NA	NA	53%	47%	NA	NA
County Totals	**6,388**	**4,109**	**2.36**	**38.2**	**$57,644**	**13.30%**	**54%**	**46%**	**90.9%**	**20.9%**

[9] * denotes 2010 U.S. Census; ^ denotes 2017 U.S. Census ACS

Table 2-8 Carbon County Age Distribution[10]

	Age (% of total population)																	
Jurisdiction	<5	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	50-84	>85
County Totals	**6.7**	**8.1**	**5.3**	**5.5**	**6.6**	**6.6**	**6.7**	**6.5**	**6.1**	**5.8**	**6.4**	**8**	**6.9**	**4.6**	**4.2**	**2.2**	**2.4**	**1.4**
Baggs	10.8	10.1	8.3	10.1	4	5.8	8.1	7.6	3.5	9.3	4.3	6	2.5	1.5	2	3.5	2.5	0
Dixon	15.6	3.9	2.6	2.6	0	6.5	9.1	10.4	2.6	6.5	2.6	9.1	6.5	9.1	6.5	2.6	0	3.9
Elk Mountain	2.6	5.2	7.3	9.8	4.7	4.1	6.7	4.1	7.8	10.4	4.1	10.9	2.6	3.6	7.8	1.6	6.7	0
Encampment	4.9	5.5	5.9	6.7	6.5	3.9	2.7	4.3	2.5	2	5.3	12.7	8.4	9.8	6.7	9.6	2.2	0.6
Hanna	2.6	3.8	11.7	7.2	6.6	1.9	1.2	4.6	8.2	8.7	10.7	4.5	10.4	7.8	6.2	2.6	0.4	1
Medicine Bow	2.2	8.6	5.8	9.5	0	2.2	3.1	3.9	6.4	0	4.2	6.4	13.4	7.8	11.4	6.4	7.2	1.4
Rawlins	8.3	8.5	4.4	4.6	9	8.3	7.9	7.1	6.2	6.6	4.4	7.6	6.5	3.4	2.8	1.5	1.7	1.3
Riverside	0	0	0	0	0	0	0	0	0	11.6	11.6	2.3	23.3	16.3	34.9	0	0	0
Saratoga	2.6	6	6.6	9	3.8	7	5	1.9	7.3	6.6	8.9	9.7	5.3	5.6	4.8	3.9	4.3	1.5
Sinclair	9.7	5.6	4.1	5.1	2.7	11.9	4.6	7.7	4.8	3.9	5.1	9.4	9.2	6.3	5.1	1.9	2.7	0.2
Unincorporated County	4.4	10.4	5.1	4.0	2.0	1.8	6.1	9.1	5.3	2.0	12.7	8.7	8.0	6.1	6.7	1.3	3.9	2.4

[10] 2017 U.S Census ACS

Table 2-9 Carbon County Income Distribution[11]

	Income (% of total population)									
Jurisdiction	< $10,000	$10,000 to $14,999	$15,000 to $24,999	$25,000 to $34,999	$35,000 to $49,999	$50,000 to $74,999	$75,000 to $99,999	$100,000 to $149,999	$150,000 to $199,999	> $200,000
County Totals	**6.3**	**5.4**	**8.7**	**9.9**	**12.4**	**20**	**12.8**	**17.8**	**4.2**	**2.5**
Baggs	6	2.6	7.9	7.3	17.9	23.2	21.9	11.9	0	1.3
Dixon	0	28.6	14.3	14.3	20	8.6	0	5.7	8.6	0
Elk Mountain	0	0	7.7	0	33.3	34.6	15.4	9	0	0
Encampment	5.4	9.9	17.8	14.9	14.5	7	16.9	4.5	6.6	2.5
Hanna	9.1	8.1	10.4	6.4	21.2	15.8	12.8	9.4	3.4	3.4
Medicine Bow	9	5.4	24.6	15	18.6	10.2	4.8	6.6	6	0
Rawlins	5.1	3.6	9.2	7.6	14.3	22.7	12.9	18.1	4.3	2
Riverside	0	0	0	28.6	17.9	28.6	0	21.4	3.6	0
Saratoga	4.4	8	8.5	11.8	4	16.8	14.6	25.5	4.8	1.6
Sinclair	4.7	11	5.8	1.7	10.5	5.8	23.3	26.7	7.6	2.9
Unincorporated County	11.9	7.0	1.7	18.0	4.9	20.5	8.2	18.7	3.0	6.0

[11] 2017 U.S Census ACS

2.2.3. Land Use and Development

The population of Carbon County has remained relatively stable over time although energy booms have and continue to exert influence. In general, development occurring on lands under county authority is driven either by energy activities or by recreation opportunities (depending on location in the county.) For example, new development in the Riverside area is likely to be associated with recreation while development near Medicine Bow is likely to be energy related.

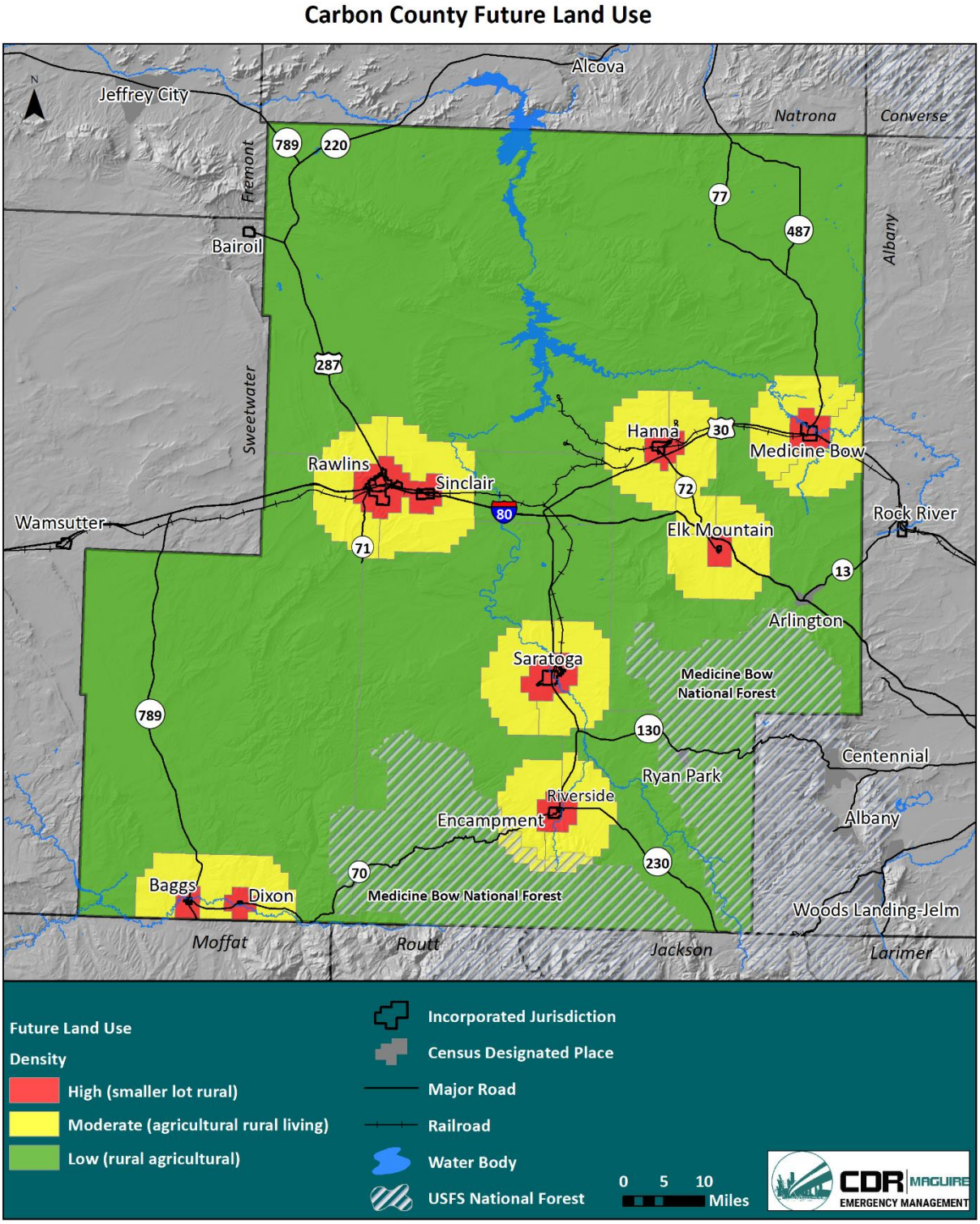
According to the City of Rawlins Master Plan, estimating population associated with the energy industry is complex because many energy workers "live" temporarily in hotels and are not counted. Lack of housing in Rawlins may exacerbate this discrepancy.

Associated with energy production is the need to transport the product (oil, gas, electricity, etc.) to market. The county is home to many miles of underground pipelines and many miles of overhead transmission lines.

Carbon County will likely experience population fluctuations--rapid increases in population could occur during construction of major projects and then decrease upon completion when projects become operational. The difficulty is projecting the timing and magnitude of these population changes. The population changes related to the energy sector are most likely to occur in and around Baggs, Elk Mountain, Hanna, Medicine Bow, Rawlins, and Sinclair. Smaller population changes associated with recreation are more likely to occur around Encampment, Dixon, and Riverside. The Saratoga area could experience population change related to both energy development and recreation.

Overall, according to the Carbon County 2010 Comprehensive Land Use Plan, a goal of the county is to balance energy development, agriculture, the environment, and the rural nature of the county when directing growth. Figure 2-6 shows land use growth potential areas according to the County Planning & Development Department. Development is encouraged near incorporated jurisdictions. Moving farther away from jurisdictions, the future land use is directed to remain rural.

Figure 2-6 Carbon County Future Land Use



In summary, predicting development trends for Carbon County, Wyoming, is a complex undertaking. Both land use and population change are strongly correlated to the national and global demand for carbon-based and other forms of energy--and the movement of energy products from source to market.

3. Planning Process

3.1. Introduction

This section provides an overview of the planning process used to create the Region 3 Hazard Mitigation Plan to include Albany and Carbon Counties and their incorporated jurisdictions. It includes how the plan was prepared, who was involved in preparing the plan, how the public and stakeholders were involved, and the review and incorporation of existing plans and studies.

3.2. Background on Hazard Mitigation Planning in Region 3

3.2.1. Albany County

Albany County developed its first hazard mitigation plan in 2003, which was led by Albany County Emergency Management Agency (EMA). The Local Emergency Planning Committee (LEPC) served as the Planning Team. The 2003 plan was then updated between 2009 and 2010, and finalized in March 2010. Albany County EMA led the update, with involvement from the City of Laramie and the Town of Rock River. The 2010 plan was then updated in 2015. Albany County EMA lead the Hazard Mitigation Plan 2015 Update for the county and jurisdictions within. The plan update process lasted approximately nine months beginning in June 2014. In addition, a consultant was hired to help draft plan (Louis Berger). The consultant team was led by a Stantec Project Manager, who is a professional planner and member of the American Institute of Certified Planners.

3.2.2. Carbon County

Carbon County developed its first hazard mitigation plan in 2009. The Wyoming Office of Homeland Security (WOHS) originally identified the hazards to which the county and its residents are vulnerable. These are the hazards that were analyzed in the 2009 plan. This plan was updated in 2015 with the help of a consultant team. AMEC Foster Wheeler and Beck Consulting.

3.2.3. Region 3

In Wyoming, the Wyoming Office of Homeland Security (WOHS) utilizes a regional support structure to assist the counties with all aspects of emergency management, including planning. Region 3 comprises of Albany and Carbon Counties. In 2016, the WOHS began the process of initiating the development of regional hazard mitigation plans statewide. This initiative recognized that the process of facilitating and developing or updating multi-jurisdictional hazard mitigation plans compliant with the Disaster Mitigation Act of 2000 is often beyond local capabilities and expertise. Instead of each county hiring consultants, the WOHS took the lead in procuring and funding a professional hazard mitigation planning consultant through a competitive bid process. CDR Maguire of Louisville, Colorado was selected in 2018 to provide assistance to the Region.

3.3. The Planning Process

The planning process was organized in four phases, including:

- Phase I: Organize resources/planning process
- Phase II: Assess risks
- Phase III: Develop the mitigation strategy
- Phase IV: Implement the plan and monitor progress

The following sections detail each phase of the planning process.

3.3.1. Phase I: Organize Resources

Hazard Mitigation Planning Steering Committee Kickoff Webinar

This phase started with a commitment to creating a regional hazard mitigation plan from each county and their participating jurisdictions. Efforts such as refining the scope of the plan and the schedule; discussing coordination with participating departments and individuals who should be invited to serve on the local planning teams, per county; establishing clear participation standards for all plan participants; gathering and review of initial data and documents relative to the planning process; clearly defining roles and responsibilities of CDR Maguire, the State, and all adopting jurisdictions and entities; discussion of an initial public involvement strategy; and setting dates for the kick-off meetings with the local planning teams (one per county) were all identified as important initial planning steps.

Obtaining this information was accomplished by coordination between CDR Maguire, the WOHS, and the county's emergency managers. A kickoff webinar was held on November 19, 2018 with the Hazard Mitigation Planning Steering Committee (Steering Committee), consisting of Aimee Binning (Albany County), John Zieger (Carbon County), Melinda Gibson (WOHS), and Mike Garner (CDR Maguire). A copy of the agenda can be found in Appendix A. It should be noted that approximately midway through the planning process, the Carbon County Steering Committee representative changed from John Zieger to Ron Brown.

Major outcomes of the kickoff webinar were a discussion of what went well and what could be improved from the counties' previous plans; discussion of how to conduct outreach to the planning team, stakeholders, and the public; communication preferences between the Steering Committee; initial conversation about hazards and major events since the previous plans; and participation standards. It was agreed that there would be three in-person workshops during the planning process to include a planning team kickoff, review of the Hazard Identification and Risk Assessment Results, and a Mitigation Strategy workshop for each county. The planning team kickoff meetings were scheduled for mid-January for both counties. In between in-person meetings, CDR Maguire and each county's Emergency Manager would communicate weekly, or on an as-needed basis. The agreed-upon participation standards were as follows:

CDR Maguire:

- Facilitate the planning process to ensure tasks are being completed in agreement with the project timeline.
- Provide overall planning guidance and plan organization in close coordination with participating jurisdictions.
- Guide the public participation process.
- Overall plan writing and data analysis with input from participating jurisdictions and planning team.
- Ensure the plan meets all FEMA requirements.

Hazard Mitigation Planning Steering Committee:

- Work closely with CDR Maguire to ensure data requests are being fulfilled and plan moves forward on schedule.
- Aids with communication between the planning team, the public, stakeholders, and CDR Maguire.

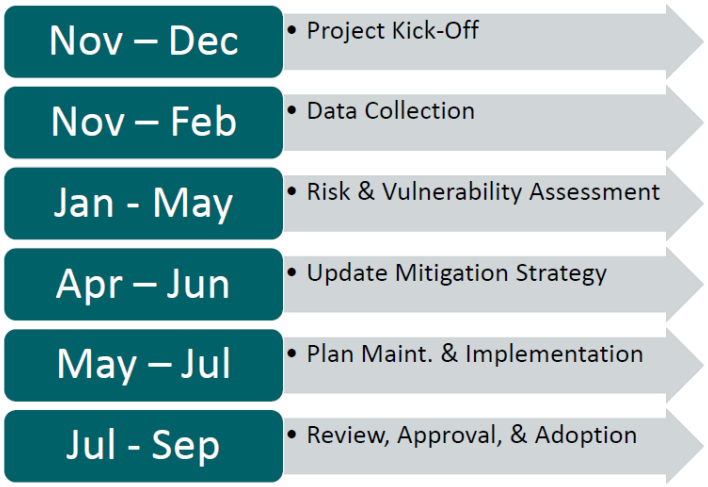
- Participates in planning team meetings.

Planning Team

- Meeting attendance and participation.
- Providing requested information and data.
- Participation across jurisdictional staff.
- Community and stakeholder involvement and education.
- Review draft plan sections
- Adopt plan as participating jurisdictions.

Figure 3-1 shows the schedule for the planning process.

Figure 3-1 Planning Process Schedule



Planning Team Kickoff Meetings

Albany County

The Albany County planning team kickoff meeting was held on January 14, 2019 at the Albany County Fairgrounds in Laramie. The meeting was also offered as a webinar for participants that couldn't attend in-person. Additionally, the meeting was open to the public. In preparation for the kickoff, CDR Maguire coordinated with Albany County to create a local planning team representing the County, the City of Laramie, the Town of Rock River, local stakeholders, and neighboring entities to be invited to the kickoff meeting. The planning team was formed based on the previous Hazard Mitigation Plan planning team, the current Local Emergency Planning Committee (LEPC), and additional input from CDR Maguire and the Steering Committee. Participants were invited through email. The local planning team is presented in Table 3-1.

Table 3-1 Albany County Local Planning Team (LPT)

First Name	Last Name	Title	Department	Division
Albany County				
Carson	Anderson	Chief	Albany County Volunteer Fire Department	Garrett Fire Zone

First Name	Last Name	Title	Department	Division
Aimee	Binning	Emergency Management Coordinator	Albany County	Homeland Security Emergency Management
Harold	Colby	Volunteer/ EOC Deputy	Albany County	Homeland Security Emergency Management
Josh	DeBree	Under Sheriff	Albany County	Sheriff
Chad	Dinges	Fire Warden	Albany County	Fire Warden
Jon	Essley	Chief	Albany County Fire District	Tie Siding VFD
Rob	Fisher	Superintendent	Albany County	Road and Bridge
Alan	Frank	GIS Director	Albany County	GIS
David	Gertsch	County Planner	Albany County	Planning Office
Eric	Gregory	Fire District Finance	Albany County Fire District	Finance
Teri	Jones	Commissioner	Albany County	Commissioners
Tom	Kern	Chief	Albany County Fire District	Centennial VFD
Richard	Parrish	Chief	Albany County Fire District	Big Laramie VFD
Cyrus	Rahman	Chief	Albany County Volunteer Fire Department	Laramie Peak Zone
Heber	Richardson	Commissioner	Albany County	Commissioners
Steve	Shivy	Chief	Albany County Volunteer Fire Department	Garrett Fire Zone
Robert	Shoemaker	Chief	Albany County Volunteer Fire Department	Laramie Peak Fire Zone
Nick	Speiser	President	Albany County	Fair Board
Brett	Wadsworth	Chief	Albany County Fire District	Vedauwoo Volunteer Fire Department
Lindsey	Wheat	Contact	Albany County	Weed & Pest
Dylan	Whitmer	Fire Chief	Albany County Fire District	Central Area
Randy	Wilkinson	Director	Albany County School District	Transportation and Facilities
John	Wilson	Chief	Albany County Volunteer Fire Department	Sybille Fire Zone
Mary	Wood	County Extension Officer	Albany County	Extension Office
Tai	Wright	Grants Manager	Albany County	Grants Department
City of Laramie				
Malea	Brown	Director	City of Laramie	Administrative Services
Mark	Doyle	Fire Marshall	City of Laramie	Fire Department / EMS
Todd	Feezer	Manager	City of Laramie	Parks and Recreation
Eric	Jaap	City Engineer	City of Laramie	City Engineer
Dan	Johnson	Fire Chief	City of Laramie	Fire Department / EMS
Shane	Johnson	Street and Fleet Manager	City of Laramie	Public Works

First Name	Last Name	Title	Department	Division
Jonathan	Rhoades	Manager	City of Laramie	City IT
Earl	Smith	Public Works Director	City of Laramie	Public Works
Dale	Stalder	Police Chief	City of Laramie	Police Department
Andi	Summervill	Mayor	City of Laramie	City Council
Cal	Van Zee	Utility Division Manager	City of Laramie	Public Works
Town of Rock River				
Eric	Clark	Maintenance Man	Town of Rock River	Town Public Works
Cathy	Leslie	Mayor	Town of Rock River	Town Council
Rick	Stricklin	Fire Chief	Town of Rock River	Town Fire Department
Additional Stakeholders				
Susan	Adler	Chairman	South of Laramie Water & Sewer District	
Harold	Babbitt	Regional Business Manager	Rocky Mountain Power	Community Account Manager
Laura	Betzold	Chief Risk Officer	University of Wyoming	UW Risk Management & Safety
Bre	Bockstahler		US EPA Region 8	Emergency Preparedness Unit
Bill	Brinegar	Game Warden	Wyoming Game & Fish	Enforcement
Rebecca	Broussard		US EPA Region 8	Emergency Preparedness Unit
Kim	Buckner	President	valley View Drive Community Improvement & Service District	
Jessica	Buenger	DVM	Veterinarians	Animal Health Center
Dennis	Carpenter	Field Manager	US Bureau of Land Management	Rawlins Field Office
Info	Contact	Non Emergency Contact	Black Hills Power Gas	Distribution
Info	Contact	Non Emergency Contact	Black Hills Power Gas	Transmission
Ronald	Copenhaver	Chairman	Centennial Water & Sewer District	
Graham	Crews	Colorado System Operator	Walden, Town of	Gas Line
Jim	Crosby	Campus Safety Director	Laramie County Community College Albany Co. Campus	Campus Security
Madeline	Dalrymple	Safety Specialist	Wyoming State Vet Lab	Risk & Safety Office
John	Davis	Director	University of Wyoming	UW Operations Physical Plant

First Name	Last Name	Title	Department	Division
Scott	Davis	Safety Officer	Volunteer	EOC
Tom	DeHoff	District Engineer	Wyoming Dept. of Transportation	Engineering
Lee	Erickson	Mx Operations	Wold Improvement & Service District	MX Team
Rhen	Etzelmiller	Acting Field Manager	US Bureau of Land Management	Casper Field Office
Dr Dave	Evertson	Regional Coordinator	Wyoming State Veterinary & Live Stock Board	
Bob	Fenton	Supervisor	Rockies Express Pipeline	
Tye	Fix	Area Maintenance Supervisor	Wyoming Dept. of Transportation	Highway Maintenance
Jerome	Flores	Coordinator	Sinclair Pipeline	
Hayden	Fuchs	Plant Manager	Pete Lein & Sons	
Crystal	Gill	Owner/DVM	Veterinarians	Gem City Veterinarian Services
Tom	Glause	Insurance Commissioner	Wyoming Insurance Commission	
Pete	Gossar	Executive Director	Downtown Clinic	
Jake	Hammer	Manager Hazardous Materials	Union Pacific Railroad	Hazmat
Stephan	Hartley	Area Operator	Sinclair Pipeline	Cheyenne Area
Paul	Heimer	Director	United Way	
Tony	Hoch	Director	Laramie Rivers Conservation District	Staff
Wanda	Hulit	Coordinator	Ivinson Memorial Hospital	Emergency Preparedness
Sheryl	Hunter	County Executive Director	US Department of Agriculture	Farm Services Agency
Brent	Huston	Regional Disability Integration Specialist	US Department of Homeland Security	FEMA
Daryl	Jensen	Chairmen	Sherman Hill Road Improvement & Special District	
Andrea	Kern	Executive Director	Epson Center for Seniors	Management
Rick	King	Supervisor	Wyoming Game & Fish	Management
John	Koger	DVM	Veterinarians	Laramie Peak Veterinary Associates

First Name	Last Name	Title	Department	Division
Will	Laegreid	Head Vet Lab	Wyoming State Vet Lab	
Jeremy	Lewis	Albany County Field Tech	Williams Pipeline	Overland Pass Pipeline
Dan	McGregor	President	Seven Mile Water & Sewer District	
Brian	McNutt	State Ares officer	ARES/RACES	State ARES
Paul	Naylon	Manager of Track Maintenance	Union Pacific Railroad	Local Contact
Roger	Newkirk	Brand Inspector Rock River Area	Wyoming State Veterinary & Live Stock Board	Brand Inspection
Belinda	Power	Emergency Contact	Walden Gas	
Belinda	Power	REsponder for Walden Gas/Pinedale Natural Gas	Walden Gas	Response
Lori	Reed		US EPA Region 8	Emergency Preparedness Unit
Debbie	Reichert	Non Emergency Contact	Carbon Light & Power	
Robert (Bob)	Rodekohr	President	Wold Improvement & Service District	
Frank	Romero	District Ranger	US Forest Service	
Michael	Samp	Chief	University of Wyoming	University Police
Ruth	Shepherd	Chairman	Laramie Rivers Conservation District	Board of Supervisors
Trey	Sherwood		Laramie Main Street Alliance	
Steven	Shute	Non Emergency Contact	Walden Gas	
Mike	Simmons	Lt. Division J Supervisor	Wyoming Highway Patrol	Highway Patrol
Shanon	Sims	President	Albany County StockGrowers	
Jack	Skinner	Manager	Laramie Regional Airport	
Dob	Smith	Emergency Contact	Wheatland Rural Electric Association	
Jessica	Stanbury	Program Director	Wyoming VOAD	Wyoming VOAD Administration
James	Stine	President	Nine Mile Water & Sewer District	
Jared	Strucbe	President	The Paddocks Improvement District	
Dallas	Talbott	Chairman	Centennial Water & Sewer District	

First Name	Last Name	Title	Department	Division
Ralph	Tarango	District Maintenance Engineer	Wyoming Dept. of Transportation	Highway Maintenance
Mike	Vercauteren	Director	Interfaith Good Samaritan	
Judith	Wagner	Chairman	Rainbow Valley Special Road District	
Britney	Wallesch		Black Dog Animal Rescue	
David	Walrath	President	Sage Drive Community Improvement & Service District	
Joe	Whitely		Army National Guard	
Casey	Whitman	Source of Supply Supervisor	Cheyenne Board of Public Utilities	
James	Wilkinson	President	ARES/RACES	

Major goals of the kickoff meeting were for the planning team members to understand the process and importance of hazard mitigation planning; understand their roles and responsibilities as members of the planning team; review the stage of the planning process the County was at currently; go over data requests; review public involvement strategy; and review next steps in the planning process. The full agenda and sign-in sheets can be found in Appendix A.

Major outcomes of the planning team meeting include the planning team ranking of hazards (discussed further in the HIRA chapter of this plan). Additionally, the planning team expressed the need to add communicable diseases to the list of profiled hazards. The planning team also provided input on additional hazard events since the last plan. Another important discussion was for the public involvement strategy. It was determined that the following tools and resources work the best for public involvement in Albany County:

- Utility bills
- Good social media presence with the City of Laramie and the Police Department
- Quarterly newsletters
- Email/newsletters in smaller/rural communities

The timeline for public involvement was also discussed, and CDR Maguire used this information to further refine the public involvement plan. Data requests, such as critical facilities, were once again reviewed and the planning team provided input on other relevant plans. The following post-meeting action items were discussed for the local planning team:

- Relay suggestions for additional planning team members
- Identify and relay any relevant data or contacts applicable to this plan

- Begin local coordination / discussions *(Municipality / Agency / Organizational Leads)*
  - Summary of project
  - Mitigation Actions
  - Plan integration opportunities
- Public Involvement Strategy
  - Request any public involvement material needs
  - Provide your thoughts on your community's specific strategy *(Municipality / Agency / Organizational Leads)*
  - Request any public involvement support needs *(Municipality / Agency / Organizational Leads)*

Carbon County

CDR Maguire was planned to review the hazard mitigation planning process with the Carbon County Council of Governments meeting on January 16, 2019, however, due to multiple highway closures, CDR Maguire was not able to attend the meeting. The Carbon County planning team kickoff meeting was held on January 17, 2019. The meeting was originally planned as in-person at Fire Station 2 in Rawlins, however, due to the road closures the meeting was conducted over webinar. In preparation for the kickoff, CDR Maguire coordinated with Carbon County to create a local planning team representing the County; the Towns of Baggs, Dixon, Elk Mountain, Encampment, Hanna, Medicine Bow, Riverside, Saratoga, and Sinclair; the City of Rawlins; local stakeholders; and neighboring entities to be invited to the kickoff meeting. The planning team was formed based on the previous Hazard Mitigation Plan planning team, the current Local Emergency Planning Committee (LEPC), and additional input from CDR Maguire and the Steering Committee. Participants were invited through email. The local planning team is presented in Table 3-2.

Table 3-2 Carbon County Local Planning Team (LPT)

First Name	Last Name	Agency	Title
Carbon County			
Ranae	Johnston	Carbon County Public Health	
Emily	Kaluzny	Carbon County Public Health	Response Coordinator
John	Zeiger	CC Emergency Management	Emergency Manager
Archie	Roybal	Carbon County Sherrifs Office	Sheriff
Amanda	Brown	Carbon County Public Health	Nurse Manager
Jim	Piche	Carbon County	Buildings Manager
Sally	Patton	Carbon County Prevention Network	Prevention Specialist
Toni	Rietveld	Carbon County Public Health	Nurse
Brittany	Nyman	Carbon County Coroners Office	Deputy Coroner
Paul	Zamora	Carbon County Coroners Office	Coroner
John	Rutherford	Carbon County Fire Department	Fire Warden
Ashley	Mayfield	Carbon County Attorneys Office	County Attorney
Bill	Nation	Carbon County Road and Bridge	
Sarah	Hutchins	CCPDD	Planner/GIS
Travis	Moore	CCSD #1/Commission	Principal/Commissioner
Gwynn	Bartlett	Carbon County Clerks Office	County Clerk

First Name	Last Name	Agency	Title
Ron	Brown	Carbon County Fire Department	Deputy Warden
Sue	Jones	Carbon County	Commissioner
Elizabeth	Ridgeway	CCSD #1	School Community Liason
Byron	Barkhurst	Carbon County Board of Commissioners	
Travis	Moore	Carbon County	
Sid	Fox	Carbon County Planning	
Town of Baggs			
Alex	Foster	Town of Baggs EMS/Fire Department	
Town of Dixon			
Brandee	Forster	Town of Dixon	Town Clerk
Town of Elk Mountain			
Morgan	Irene	Elk Mountain	
Town of Encampment			
Doreen	Harvey	Town of Encampment	Town Clerk
Town of Hanna			
Bob	Patton	Town of Hanna	Town of Hanna
Jeff	Neimark	Town of Hanna	
Town of Medicine Bow			
Karen	Heath	Town of Medicine Bow	Town Clerk
City of Rawlins			
Rick	Hooper	Rawlins Police Department	
Aaron	Zent	Rawlins Fire Department	
Troy	Palmer	Rawlins Police Department	Chief of Police
Steve	Nicholson	Rawlins	
Patty	Bentsen	Rawlins	
Debbi	Matthews	Rawlins	
Amy	Bach	City of Rawlins	
Jacquelin	Wells	City of Rawlins	
Town of Riverside			
Leroy	Stephenson	Town of Riverside	Mayor
Town of Saratoga			
John	Nelson	Saratoga Town Council	
Mandy	Cooper	Saratoga Care Center/Clinic	Nurse
Jon	Winter	Town of Saratoga	DPW - Director
Dan	Ferrin	Town of Saratoga	Zoning
Town of Sinclair			
Asa	Meeks	Town of Sinclair	Mayor
Stakeholders			

First Name	Last Name	Agency	Title
Melinda	Gibson	Wyoming Office of Homeland Security	
Joe	Parsons	SER CD	
Jackie	Wells	State of Wyoming	Regional Nurse Supervisor
Kaleigh	Good	Central Wyoming Healthcare Coalition	Regional Director
Melisa	Sikes	South Central Wyoming	Director
Bob	Clark	Sinclair Oil	
RJ	Griffiths	Sinclair Oil	
Lisa	Wood	Memorial Hospital of Carbon County	
Wess	Trapp	Sinclair Oil	
Christina	Baugh	Memorial Hospital of Carbon County	
Tyler	Chapman	WITP	LT-Rawlins
Ryan	Wells	Sinclair Oil	Emergency Manager
Kara	Choquette	PCW/Transwest	
Asa	Meeks	Sinclair	
George	Hruska	OFTEDAL Construction	

The Carbon County meeting was set up very similarly to Albany County. Major goals of the planning team kickoff meeting were for the planning team members to understand the process and importance of hazard mitigation planning; understand their roles and responsibilities as members of the planning team; review the stage of the planning process the County was at currently; go over data requests; review public involvement strategy; and review next steps in the planning process. The full agenda and sign-in sheets can be found in Appendix A.

Major outcomes of the planning team meeting include the planning team ranking of hazards (discussed further in the HIRA section of this plan). Additionally, the planning team agreed with Albany County for the need to add communicable diseases to the list of profiled hazards. The planning team also provided input on additional hazard events since the last plan. Another important discussion was for the public involvement strategy. It was determined that the following tools and resources work the best for public involvement in Carbon County:

- Utility bills
- Email/newsletters in smaller/rural communities
- Survey Monkey and Facebook

The timeline for public involvement was also discussed, and CDR Maguire used this information to further refine the public involvement plan. Data requests, such as critical facilities, were once again reviewed and the planning team provided input on other relevant plans. The following post-meeting action items were discussed for the local planning team:

- Relay suggestions for additional planning team members
- Identify and relay any relevant data or contacts applicable to this plan
- Begin local coordination / discussions *(Municipality / Agency / Organizational Leads)*
    - Summary of project
    - Mitigation Actions

    - Plan integration opportunities
- Public Involvement Strategy
    - Request any public involvement material needs
    - Provide your thoughts on your community's specific strategy *(Municipality / Agency / Organizational Leads)*
    - Request any public involvement support needs *(Municipality / Agency / Organizational Leads)*

Public Involvement

Based on feedback from the Steering Committee and the planning team kickoff meetings, a Public Involvement Plan (PIP) was developed for each county in February 2019. The Steering Committee helped disseminate the PIPs to the Albany County and Carbon County planning team members for their input on public involvement tools and the timeline to utilize each tool for outreach to the public. Examples of public outreach tools for Albany County include online/print media through entities such as Laramie Live and the Laramie Boomerang; social media pages for municipalities and organizations throughout the county; and community and education programs such as through the Albany County School District. Examples of public outreach tools for Carbon County include existing town social media pages. The completed PIPs are provided in Appendix B. With input from the planning teams, CDR Maguire helped develop the public outreach material and disseminate it in accordance with the PIP timeline. The timeline also ensured outreach would be utilized in each phase of the planning process for the public remained involved and informed.

In addition to the PIPs, two surveys were distributed to the public during the planning process. The first was the Hazard Risk Perception Survey, distributed in April 2019. This survey was sent out to both counties to gain an understanding of public knowledge of hazards in their communities, and their perception of what poses the most risk. Overall, the survey gathered 97 responses, with 86% of the responses from Carbon County and 14% from Albany County. In Albany County, 69% of responses came from Laramie, 23% from unincorporated County, and 8% from Rock River. In Carbon County, 40% of the responses came from Saratoga, 38% from Rawlins, 2% from Riverside, 2% from Sinclair, 2% from Baggs, 1% from Dixon, 2% from Elk Mountain, 5% from Encampment, 2% from Hanna, and 6% from unincorporated County.

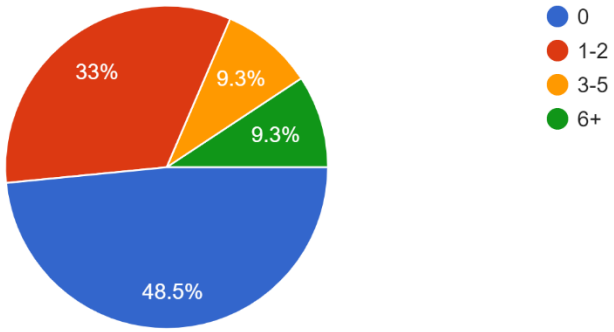
The results are portrayed in the figures below. These results are summarized at the regional level. Key takeaways from this survey are:

- Over 50% of the respondents have been majorly impacted by at least one natural hazard in the past five years.
- Only 35% of respondents consider themselves "very informed" on how various hazards can impact their community.
- Respondents ranked winter storm/blizzard as their highest risk hazard, followed by wind. Avalanche ranked the least risk hazard.
- Not having access to clean water, not having access to medications or medical equipment, and not understanding/hearing warning sirens or messages were the top concerns following disasters (all three ranked very closely). Not having transportation ranked the lowest of concerns.
- Over half of the respondents have an emergency kit, and over half have taken action to make their home or neighborhood more resistant to hazards.

- Social media is by far the most effective way to receive information about hazards by respondents (72%), followed by TV/radio (39%).

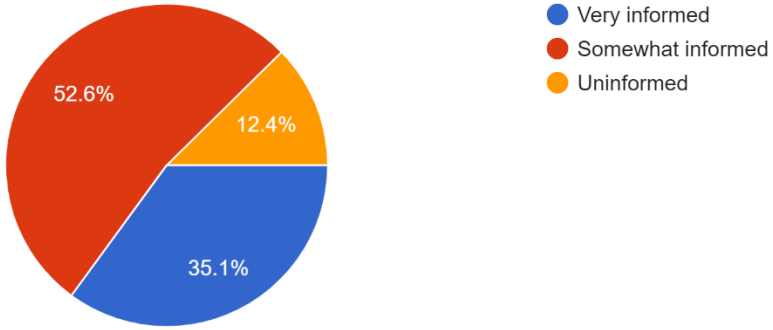
How many times has a natural hazard MAJORLY impacted your daily life in the last five years?

97 responses

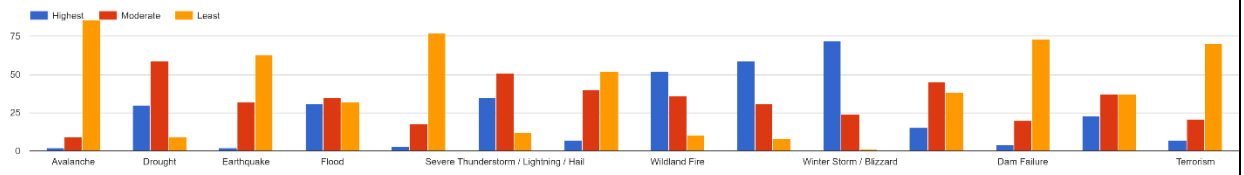


What is your understanding of the various hazards that can impact your community and the risks from each?

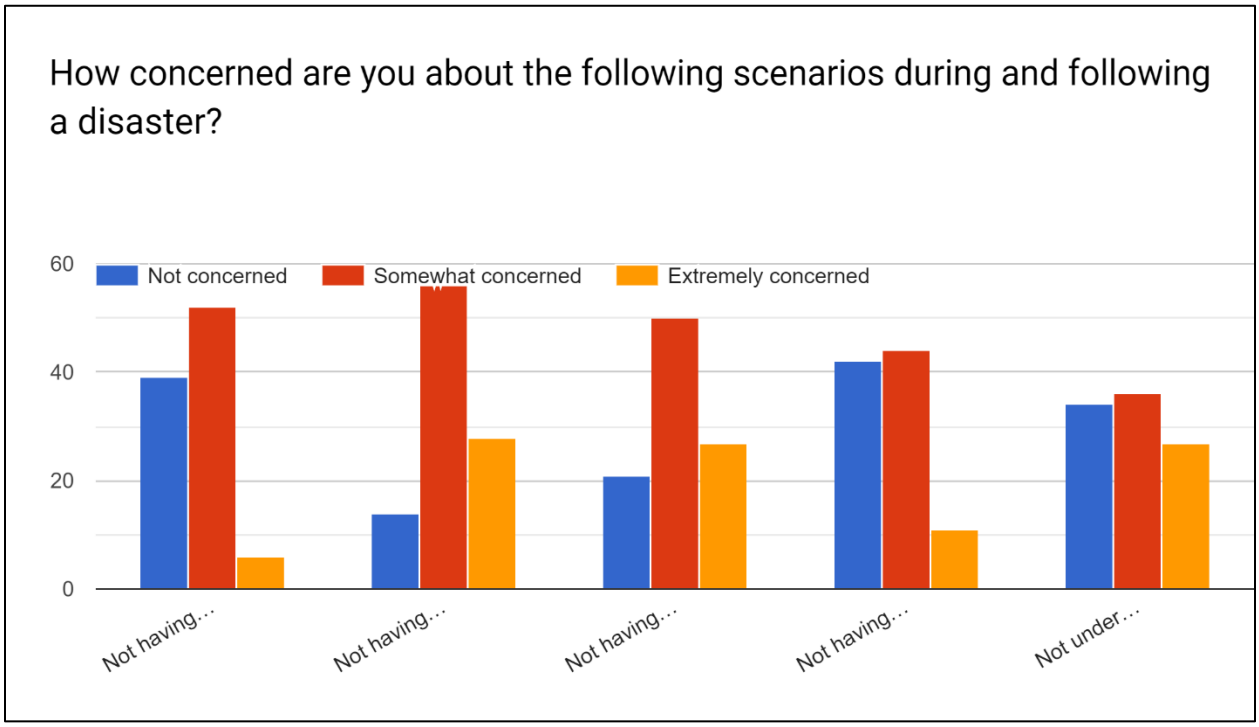
97 responses

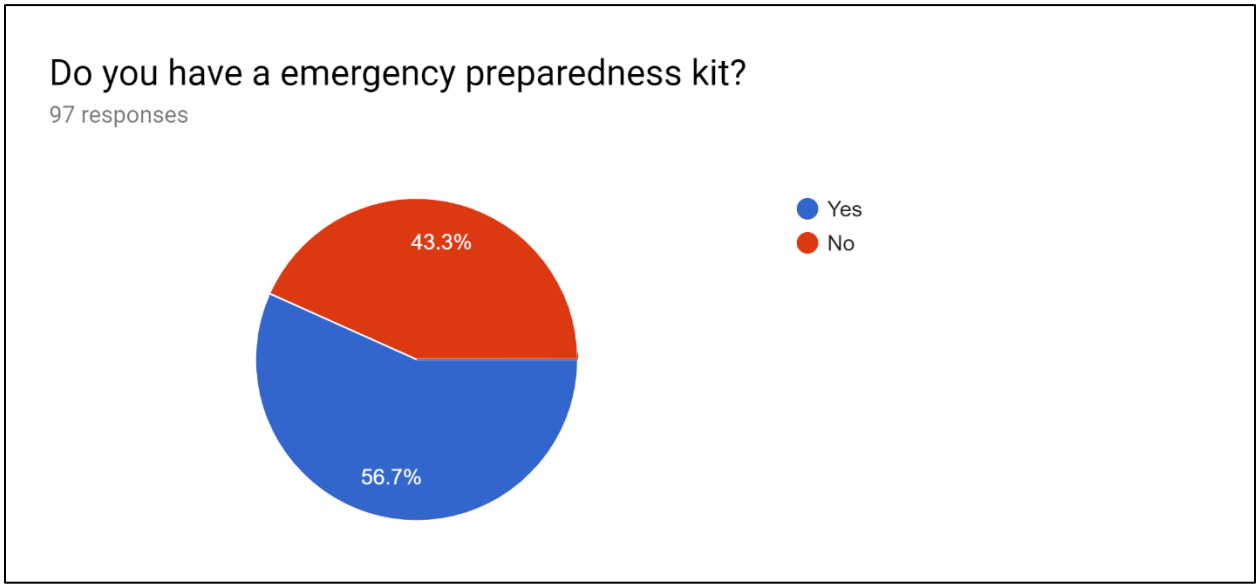


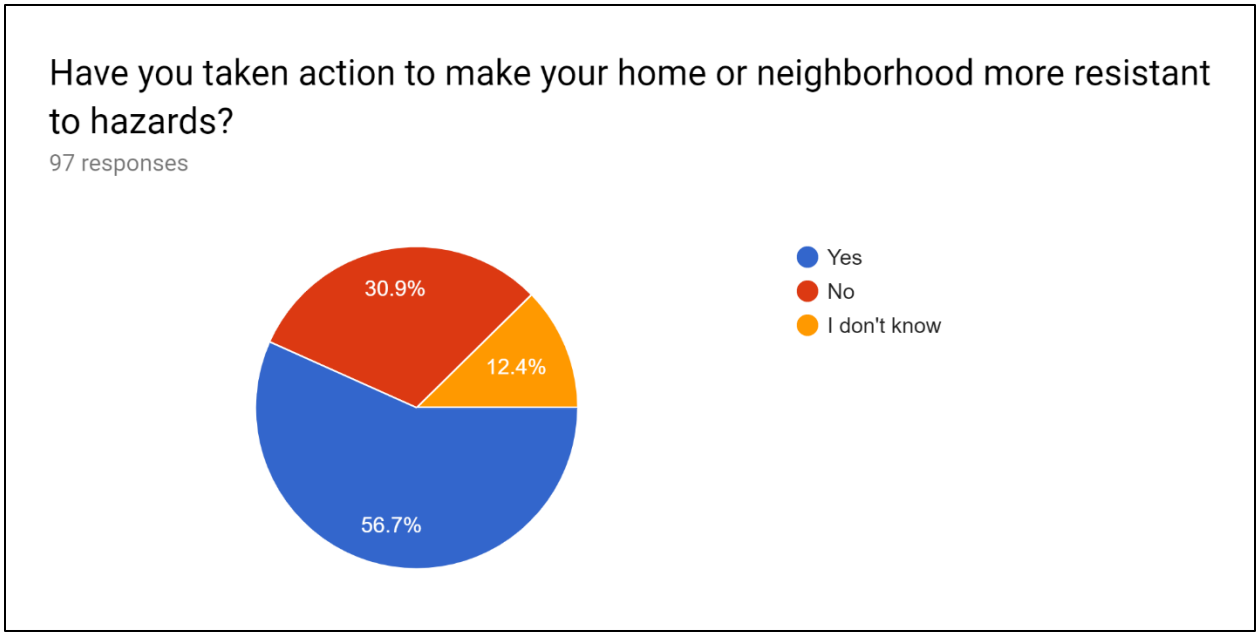
Please rank the following hazards based on the risk that they present to you and your community:

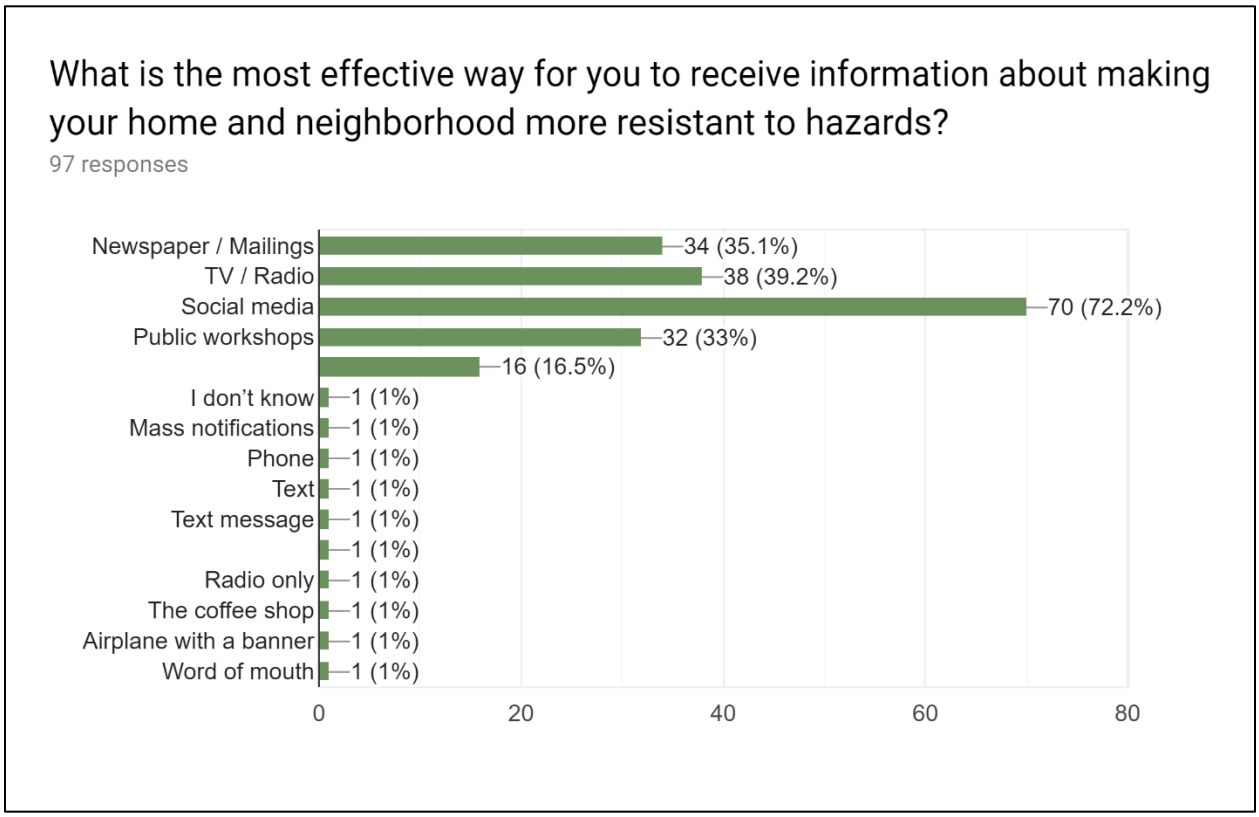


The categories for the below chart read from left to right: not having enough food, not having access to clean water, not having access to medication or medical equipment, not having transportation, not understanding/hearing warning sirens or other warning messages.





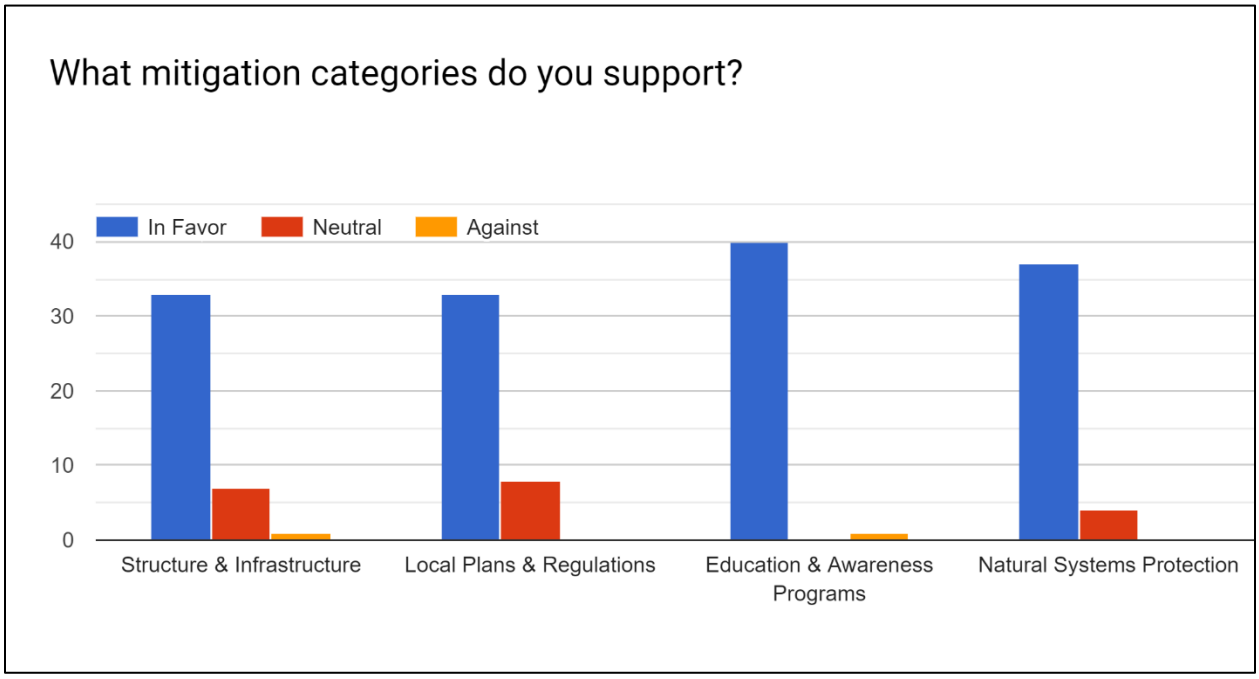


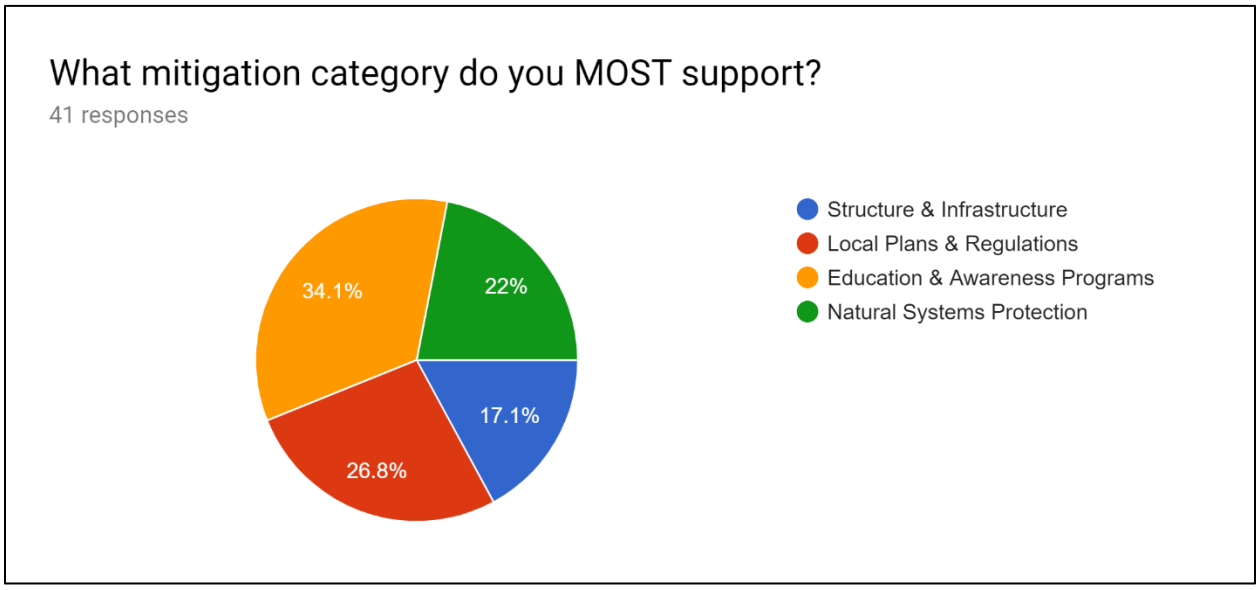


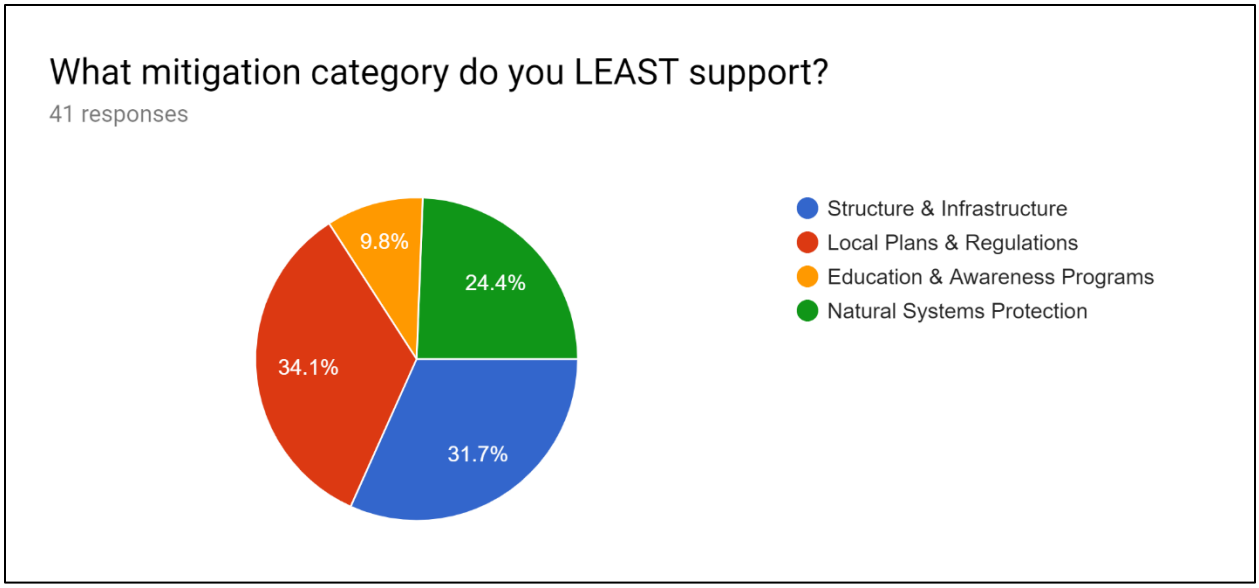
The second survey distributed to the public was the Public Hazard Mitigation Survey, distributed in June 2019. This survey was sent out to both counties to educate the public on mitigation actions, gain an understanding what types of mitigation strategies the public supports, and give the public an opportunity to contribute potential mitigation actions. Overall, the survey gathered 41 responses, with 54% of the responses from Carbon County and 46% from Albany County.

The results are portrayed in the figures below. These results are summarized at the regional level. Key takeaways from this survey are:

- Overall, the vast majority of respondents are in favor of all types of mitigation actions.
- The most supported type of mitigation action is education and awareness.
- The least supported type of mitigation is local plans and regulations.
- Many of the comments discussed wildfire, flooding, hazardous materials, and public education/involvement.







Lastly, the public was given the opportunity to review and comment on the draft plan during a two-week period between 10/18/2019 and 11/4/2019. Digital copies of the final draft plan were distributed in accordance with the counties' public involvement plans. No comments were received during this time.

Review and Incorporation of Existing Planning Mechanisms

Over the course of the planning process, numerous other plans, studies, reports, and technical information were obtained and reviewed for incorporation or reference purposes. The majority of sources referenced and researched pertain to the risk assessment and the capabilities assessment. To a lesser extent, the mitigation strategy also includes some technical information research. The following list shows the primary documents and technical resources reviewed and used for incorporation into this HMP.

Region

- State of Wyoming Hazard Mitigation Plan (2016)

Albany County

- Albany County Debris Management Plan (2017)
- Albany County Commodity Flow Study (2017)
- Albany County THIRA (2014)
- Albany County CWPP (2013)
- Albany County/City of Laramie/Town of Rock River Emergency Operations Plan (2018)
- Laramie Utilities Water Master Plan (2015)
- Albany County Multi-Hazard Mitigation Plan Update (2015)
- Albany County Comprehensive Plan (2008)
- City of Laramie Comprehensive Plan (2015)
- Albany County Casper Aquifer Protection Plan (2017)

Carbon County

- Carbon County CWPP (2016)
- Carbon County Multi-Jurisdictional Emergency Operations Plan (2012)
- Carbon County Multi-Hazard Mitigation Plan (2016)
- City of Rawlins Master Plan (2014)
- Town of Saratoga Master Plan (2016)
- Riverside Master Plan (2010)
- SERCD Long Range Land Use and Natural Resource Management Plan (2017)
- Carbon County Comprehensive Land Use Plan (2012)

3.3.2. Phase II: Assess Risks

The Hazard Identification and Risk Assessment (HIRA) process began almost immediately. Data were gathered from other planning resources (see above), the planning team, the Steering Committee, the State of Wyoming, and other publicly available data sources. Sources of data are discussed in the text and as footnotes throughout the HIRA chapter. The Steering Committee and planning team were instrumental in supplying jurisdictional-specific data to CDR Maguire, who performed the analysis and writing of the HIRA. As data requests were needed, CDR Maguire reached out to the Steering Committee, who would direct CDR Maguire to the correct person on the planning team for the data. Data were collected and incorporated into the HIRA through March 2019, and the draft results of the HIRA were presented to the planning teams during the Risk and Vulnerability Assessment Workshops, which were the second in-person meeting for each county. Additionally, the results of the public Hazard Risk Perception Survey were incorporated into the HIRA. The draft HIRA was sent for planning team review in May 2019 and finalized in July 2019 after all comments were incorporated.

Planning Team Risk and Vulnerability Assessment Workshops

Albany County

The Albany County planning team risk and vulnerability assessment workshop was held on April 1, 2019 at Fire Station #3 in Laramie. The meeting was also held as a webinar for participants that couldn't attend in-person. Additionally, this meeting was open to the public.

Major goals of this workshop were for the results of the HIRA to be presented to the planning team and to receive any feedback on the results and hazard rankings, review critical facility analysis results, review remaining data requests, continue with the public involvement strategy, and to finalize mitigation goals as well as start gathering ideas for objectives. The full agenda and sign-in sheets can be found in Appendix A.

Outcomes of the workshop included final input on the HIRA results, including adjustment of the hazmat, geologic, and terrorism hazard rankings. Remaining data requests were provided to finalize the HIRA. Additionally, the Albany County Museum Coalition was added to the public involvement plan. It was determined that an additional goal specific to reducing property and structural damage would be beneficial. The following post-meeting action items were discussed for the local planning team:

- Continue local discussions relating to this project
- Begin identifying new mitigation actions
- Critical facility assessment review
- Capability assessment survey – per jurisdiction
- Historical input on communicable disease

- Public survey / involvement
- Review of Risk Assessment chapter

Carbon County

The Carbon County planning team risk and vulnerability assessment workshop was held on April 2, 2019 at Fire Station #2 in Rawlins. The meeting was also held as a webinar for participants that couldn't attend in-person. Additionally, this meeting was open to the public.

Similar to the first planning team meeting, the second Carbon County workshop was structured similarly to the Albany County workshop. Major goals of this workshop were for the results of the HIRA to be presented to the planning team and to receive any feedback on the results and hazard rankings, review remaining data requests, continue with the public involvement strategy, and to finalize mitigation goals as well as start gathering ideas for objectives. The full agenda and sign-in sheets can be found in Appendix A.

Outcomes of the workshop included final input on the HIRA results, including adjustment of the geologic and hazmat hazards for some jurisdictions. It was also determined that community Facebook pages should be utilized for public outreach. For mitigation goals, participants agreed with the input from Albany County to add an additional goal focused on reducing structural and property damages from hazards. Ideas for mitigation objectives were presented for the planning team to begin considering. Lastly, some ongoing projects were discussed for inclusion in the mitigation strategy. The following post-meeting action items were discussed for the local planning team:

- Continue local discussions relating to this project
- Begin identifying new mitigation actions
- Critical facility assessment review
- Capability assessment survey – per jurisdiction
- Historical input on communicable disease
- Public survey / involvement
- Review of Risk Assessment chapter
- Finalize critical facilities GIS data

3.3.3. Phase III: Develop the Mitigation Strategy

Mitigation strategy development was initiated by reviewing goals from the counties' previous plans. New goals were drafted and finalized after the planning team risk and vulnerability assessment workshops. The previous mitigation actions were reviewed, and new actions were developed based on planning team input, the results of the HIRA, other planning documents, and the public mitigation strategy survey. All mitigation actions were incorporated into a database for easy tracking and updating by the Counties.

Planning Team Mitigation Strategy Workshop

Albany County

The Albany County planning team mitigation strategy workshop was held on July 1, 2019 at Fire Station #3 in Laramie. The meeting was also held as a webinar for participants that couldn't attend in-person. Additionally, this meeting was open to the public.

Major goals of this workshop were to review goals/potential objectives, review the results of the capability assessment, obtain status updates on past high priority mitigation actions, review the results of the public mitigation strategy survey, discuss plan maintenance and integration, and create new mitigation actions. The full agenda and sign-in sheets can be found in Appendix A.

Major outcomes of the workshop were to not include mitigation objects since the actions themselves have measurable components (timeline, funding source, etc). The planning team was able to provide status updates to all of the 2015 high priority actions and the remaining were sent to the planning team to review after the meeting. Significant time was spent brainstorming new mitigation actions. A mitigation action project sheet was provided to all participants for the creation of mitigation actions. Additionally, it was determined to use a high/medium/low ranking to prioritize mitigation actions. It was decided to follow a similar maintenance schedule as the 2015 Plan, utilizing the LEPC to review the Plan annually. The following post-meeting action items were discussed for the local planning team:

- Finalize new Mitigation Actions / Projects
- Review draft updated Plan
- Public Review and Comment

Additionally, the Laramie Boomerang was in attendance at this meeting and shared an article about the Plan and planning process. The article can be found here.

The final draft plan was distributed for a final review by the planning team during the two-week time period of 9/27/2019 to 10/11/2019. Comments were reviewed and incorporated prior to sending the Plan for the final public comment period on 10/15/2019.

Carbon County

The Carbon County planning team mitigation strategy workshop was held on July 2, 2019 at Fire Station #2 in Rawlins. The meeting was also held as a webinar for participants that couldn't attend in-person.

Similar to Albany County, major goals of this workshop were to review goals/potential objectives, review the results of the capability assessment, obtain status updates on past high priority mitigation actions, review the results of the public mitigation strategy survey, discuss plan maintenance and integration, and create new mitigation actions. The full agenda and sign-in sheets can be found in Appendix A. Additionally, the results of updated FEMA floodplain mapping were shared during this meeting to help inform mitigation actions. The Town of Hanna also shared these results at the Hanna Town Council Meeting on July 9th and was shared in an article by the Saratoga Sun. The article can be found here.

Major outcomes of the workshop were to not include mitigation objects since the actions themselves have measurable components (timeline, funding source, etc). The planning team reviewed the high priority actions from the previous Plan and the full spreadsheet was sent to the planning team to review after the meeting. Significant time was spent brainstorming new mitigation actions. A mitigation action project sheet was provided to all participants for the creation of mitigation actions. Additionally, it was determined to use a high/medium/low ranking to prioritize mitigation actions. It was decided to follow a

similar maintenance schedule as Albany County, utilizing the LEPC to review the Plan annually. The following post-meeting action items were discussed for the local planning team:

- Finalize new Mitigation Actions / Projects
- Review draft updated Plan
- Public Review and Comment

Following the final planning team workshop, Ron Brown, the interim emergency management coordinator for Carbon County, and Melinda Gibson, the State Hazard Mitigation Officer, met with both the Town of Dixon and the Town of Sinclair for individual meetings. At these meetings, approximately one hour was spent with each representative discussing natural and human-caused hazards that impact their community. Additionally, mitigation was clearly defined, the mitigation planning process the Region has been working through was discussed, and strategies the communities might pursue as a community to mitigate the hazards they face were discussed. A comprehensive mitigation conversation was had with each representative. Lastly, Plan maintenance and integration strategies were discussed with each community representative.

The final draft plan was distributed for a final review by the planning team during the two-week time period of 9/27/2019 to 10/11/2019. Comments were reviewed and incorporated prior to sending the Plan for the final public comment period on 10/15/2019.

3.3.4. Phase IV: Implement the Plan and Monitor Progress

As discussed previously, the implementation phase was discussed during both the Albany and Carbon Counties' mitigation strategy workshops. It was determined that for both counties, utilizing the existing LEPC meetings is the best way to implement and monitor the HMP. The HMP will be reviewed as an agenda item during an LEPC meeting for each County at least annually. Maintenance and implementation are discussed more thoroughly in Section 6: Plan Maintenance, Revision, and Integration.

4. Hazard Identification and Risk Assessment (HIRA)

4.1. Hazard Identification

As part of the update process, the hazards from the both Albany and Carbon Counties' existing plans were reviewed, and new hazards were considered. The existing hazards were also cross-checked with hazards in the State Plan. The state plan included two additional hazards – expansive soil and space weather. At the first planning team meeting, the planning team voted not to include expansive soils in the risk assessment due to no risk from this hazard in Albany or Carbon County. However, a new study by the Wyoming Geological Survey was released towards the end of this Risk Assessment update that provided webmap locations of areas with risk to expansive soils. When reviewing this webmap, the Region does have low to moderate risk areas. This topic should be reviewed during the annual maintenance process and the next Plan update. Additionally, it was determined that space weather is a hazard the jurisdictions do not have the ability to mitigate against, and which has a very low risk, so it was also not profiled. Communicable and Infectious Disease was added to this Plan for Region 3. At the first planning team meeting, it was determined that communicable and infectious diseases are a concern for both counties, and both counties' public health departments actively work to reduce risk to the hazard. Additionally, previously only Albany County profiled terrorism, which is now profiled for both counties in this Plan. The following Table 4-1 compares the hazards listed in each county's previous HMP to the current identified hazards for this Plan, and hazards profiled by the State Plan. (NP – not profiled, n/a – not applicable)

Table 4-1 Hazards Profiled

State	Albany (2015)	Carbon (2016)	Region 3 (2019)
Natural Hazard			
Avalanche	Avalanche	Avalanche	Avalanche
Drought	Drought	Drought	Drought
Earthquake/ Liquifaction	Earthquake	Earthquake	Earthquake
Expansive Soil	n/a	n/a	n/a
Flood	Flood	Flood	Flood
Landslide/Mine Subsidence	Land Subsidence (Mine Collapse)	Landslide / Mine Subsidence	Geologic Hazards (landslide/ land subsidence/mine subsidence)
Lightning/Hail	Severe Thunderstorm (Lightning / Hail)	Lightning / Hail	Severe Thunderstorm (Lightning / Hail)
Tornado	Tornado	Tornado	Tornado
Wildland Fire	Wildland Fire	Wildland Fire	Wildland Fire
Wind/Windblown Deposits	Wind/Windblown Deposits	Wind/Windblown Deposits	Wind / Windblown Deposits
Winter Storm (Blizzard)	Winter Storm (Blizzard)	Winter Storm (Blizzard)	Winter Storm (Blizzard)
NP	NP	NP	Communicable and Infectious Disease

State	Albany (2015)	Carbon (2016)	Region 3 (2019)
Human-Caused Hazard			
Dam Failure	Dam Failure	Dam Failure	Dam Failure
Tech/Human Caused	Hazmat	Hazmat	Hazmat
Tech/Human Caused	Terrorism	NP	Terrorism
Space Weather	n/a	n/a	n/a

It is important to note that many of these hazards are interconnected (for example, severe storms can cause flooding and prolonged drought can lead to wildland fire). Therefore, discussion of these hazards overlaps throughout the Risk Assessment.

4.1.1. Disaster Declaration History

Major disaster declarations were also used to identify and assess hazards in Region 3. The following Table 4-2 presents a list of all federal disaster and emergency declarations that have occurred in Carbon and Albany Counties, according to the Federal Emergency Management Agency (FEMA). This list presents support for identifying which hazards pose the greatest risk to Region 3 communities.

Across Region 3, there have been 29 presidential declarations, fire management assistance declarations, and USDA secretarial disaster declarations from 1953 through 2018.[12]

Two presidential declarations have been made for Albany County since 1953 (2011 Severe Storms, Flood, and Landslides and 2015 Severe Storms and Flooding).[13] In addition, Albany County has received five fire management assistance declarations out of 20 total fire management assistance declarations in the state since 2000, which is the most out of all Wyoming counties. Albany County also has experienced 11 total USDA secretarial disaster declarations since 2012 as a primary or contiguous county for drought, high wind, excessive heat, wildfire, freeze, hail, flooding, lightning, and tornado events.

Carbon County has received one presidential disaster declaration, also the 2011 Severe Storms, Flood, and Landslide event. Additionally, Carbon County has experienced 11 USDA secretarial disaster declarations since 2012 as a primary or contiguous county for drought, excessive heat, high wind, wildfire, and freeze events.

It is notable that all of these declarations have occurred within the last 16 years. This is a potential reflection of rising population impinging on hazard prone areas. It may also correspond to the rise in the frequency and severity of hazard occurrences.

[12] https://www.fema.gov/data-visualization-disaster-declarations-states-and-counties; https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/disaster-designation-information/index (reviewed 12/6/2018)
[13] https://www.fema.gov/pdf/news/pda/4007.pdf

Table 4-2 Region 3 Declared Disasters (1953-2018)

Location	Date	Description	Disaster Type	Disaster Number
Albany County	June – July 2002	Wyoming Hensel Fire	Fire Management Assistance	FM-2427
Albany County	June-July 2002	Wyoming Reese Mountain Fire	Fire Management Assistance	FM-2436
Albany and Carbon counties	May 2011	Wyoming Severe Storms, Flooding, and Landslides	Presidential	DR-4007
Albany County	June-July 2012	Wyoming Arapahoe Fire	Fire Management Assistance	FM-2992
Albany County	July 2012	Wyoming Squirrel Fire	Fire Management Assistance	FM-2993
Albany County	July 2012	Included Albany County as a contiguous natural disaster area for drought, high winds, and excessive heat	USDA	S3260
Albany County	July 2012	Included Albany County as a contiguous natural disaster area for drought	USDA	S3290
Carbon County	July 2012	Included Carbon County as a contiguous natural disaster area for drought	USDA	S3298
Carbon County	July 2012	Included Carbon County as a primary natural disaster area for drought	USDA	S3290
Carbon County	July 2012	Included Carbon County as a contiguous natural disaster area for drought, excessive heat, high winds	USDA	S3260
Albany County	Aug 2012	Included Albany County as a primary natural disaster area for drought	USDA	S3319
Albany County	Aug 2012	Included Albany County as a contiguous natural disaster area for the combined effects of excessive heat, high winds, drought, wildfires, and freezes	USDA	S3350
Carbon County	Aug 2012	Included Carbon County as a contiguous natural disaster area for the combined effects of excessive heat, high winds, drought, wildfires, and freezes	USDA	S3350

Location	Date	Description	Disaster Type	Disaster Number
Carbon County	Aug 2012	Included Carbon County as a contiguous natural disaster area for drought	USDA	S3319
Albany County	April 2013	Included Albany County as a primary natural disaster area for drought	USDA	S3508
Carbon County	April 2013	Included Carbon County as a primary natural disaster area for drought	USDA	S3508
Carbon County	May 2013	Included Carbon County as a contiguous natural disaster area for drought	USDA	S3548
Albany County	July 2013	Included Albany County as a contiguous natural disaster area for drought	USDA	S3548
Albany County	July 2015	Wyoming Severe Storms and Flooding	Presidential	DR-4227
Albany County	July 2016	Included Albany County as a contiguous natural disaster area for hailstorms	USDA	S4087
Albany County	June 2018	Wyoming Badger Creek Fire	Fire Management Assistance	FM-5241
Carbon County	Aug 2018	Included Carbon County as a contiguous natural disaster area for drought	USDA	S4357
Albany County	Sep 2018	Included Albany County as a contiguous natural disaster area for drought	USDA	S4386
Albany County	Sep 2018	Included Albany County as a contiguous natural disaster area for excessive rain, flash flooding, hail, high winds, lightning, and tornados	USDA	S4397
Albany County	Sep 2018	Included Albany County as a contiguous natural disaster area for drought	USDA	S4407
Carbon County	Sep 2018	Included Carbon County as a contiguous natural disaster area for drought	USDA	S4386
Carbon County	Sep 2018	Included Carbon County as a primary natural disaster area for drought	USDA	S4407
Carbon County	Oct 2018	Included Carbon County as a contiguous natural disaster area for drought	USDA	S4410

Location	Date	Description	Disaster Type	Disaster Number
Albany County	Oct 2018	Included Albany County as a contiguous natural disaster area for drought	USDA	S4408

4.2. Hazard Ranking

Hazards were ranked for each jurisdiction based on the results of this HIRA, planning team input, and public perception of risk. The overall ranks were derived by assigning each jurisdiction a value of 1 (low), 2 (medium), or 3 (high) for each hazard for the probability of losses occurring, the potential impact of the hazard on property/structures, and the potential impact of the hazard on people. The results were summed for each hazard and jurisdiction to create an overall rank. The results are shown in Figure 4-1 below. Winter storms/blizzards, flood, wildland fire, and hazmat release overall consistently rank high throughout the region.

Figure 4-1 Hazard Rankings

Jurisdiction	Avalanche	Drought	Earthquake	Flood	Geologic	Severe Thunderstorm (hail, lightning)	Tornado	Wildland Fire	Wind / Windblown Deposits	Winter Storm / Blizzard	Communicable and Infectious Disease	Dam Failure	Hazardous Material Release	Terrorism
	Risk Rank										Key: < 4 = L 5 - 6 = M 7+ = H			
Albany County														
Unincorporated County	L	H	L	H	L	M	M	H	M	H	M	M	H	L
Laramie	L	M	M	M	L	M	M	M	M	H	M	M	H	M
Rock River	L	M	L	M	L	M	M	M	M	H	M	M	M	L
Carbon County														
Unincorporated County	L	H	L	H	L	H	M	H	M	H	M	M	H	L
Baggs	L	M	L	H	L	M	M	H	M	H	M	M	L	L
Dixon	L	M	L	M	L	M	M	H	M	H	M	M	L	L
Elk Mountain	L	M	L	H	L	M	M	H	M	H	M	M	H	L
Encampment	L	M	L	H	L	M	M	H	M	H	M	M	L	L
Hanna	L	M	L	H	M	M	M	M	M	H	M	M	H	L
Medicine Bow	L	M	L	H	L	M	M	M	M	H	M	M	H	L
Rawlins	L	M	L	H	L	M	M	M	M	H	M	M	H	M
Riverside	L	M	M	H	L	M	M	H	M	H	M	M	M	L
Saratoga	L	M	M	H	L	M	M	M	M	H	M	M	M	L
Sinclair	L	M	L	L	L	M	L	H	M	H	M	L	H	M

4.3. Building Inventory and Assets

In addition to people, structures and infrastructure have the potential to be exposed to all hazards identified in this plan. Table 4-3 and Table 4-4 summarize the property inventory for each individual County. The summary includes parcel count, total assessed value, and total actual value.[14] It is important

[14] Wyoming Property Tax Division, statewide GIS data download, accessed March 2019

to note that government owned buildings are listed as "exempt" and do not contain value information. Therefore, total values are higher than portrayed in this Plan.

Table 4-3 Albany County Property Inventory

Jurisdiction	Parcel Count	Parcel Assessed Value	Parcel Actual Value
City of Laramie	10,473	$291,152,060	$3,061,922,922
Town of Rock River	264	$1,179,593	$12,416,836
Unincorporated Albany County	7,569	$111,823,388	$1,161,199,456
Totals	**18,306**	**$404,155,041**	**$4,235,539,214**

Table 4-4 Carbon County Property Inventory

Jurisdiction	Parcel Count	Parcel Assessed Value	Parcel Actual Value
Town of Baggs	310	$2,702,633	$2,8424,523
Town of Dixon	82	$567,155	$5,970,043
Town of Elk Mountain	148	$1,486,966	$15,652,072
Town of Encampment	719	$5,593,888	$58,882,153
Town of Hanna	982	$5,023,297	$52,875,744
Town of Medicine Bow	429	$2,510,678	$26,428,585
City of Rawlins	7,486	$131,439,078	$1,383,116,477
Town of Riverside	200	$1,557,874	$16,398,607
Town of Saratoga	1,532	$19,946,614	$209,867,864
Town of Sinclair	288	$3,150,689	$31,531,999
Unincorporated Carbon County	5,472	$68,870,514	$724,536,098
Totals	**17,648**	**$242,849,386**	**$2,553,684,165**

4.4. Critical Facilities

For the purpose of this Plan, 'critical facilities' are defined as local assets vital to the health, safety, and well-being of residents and visitors during the time of and following a natural disaster. These facilities can include: community centers, churches, hospitals, libraries, non-profits, post offices, water treatment centers, police & fire stations, and city administration buildings. Critical facilities are essential to a community's long-term disaster resilience as they are important delivery pathways for diverse crisis management services and resources. As part of the planning process, Albany and Carbon Counties identified facilities being termed as critical by utilizing the best available data from their respective GIS departments and assessor's data.

The critical facilities analysis for both counties are located in a confidential appendix available to the Steering Committee and Planning Team.

4.5. Hazard Profiles

4.5.1. Profile Methodology

The following sections, 4.5.3 through 4.5.16, profile each identified hazard to include the description, location, previous occurrences, extent, probability of occurrence, and vulnerability assessment. These sections in the main body of the report discuss the hazards at a regional level and a summary of each subsection for each county. Supporting information for each hazard can be found in Appendix C. The hazard profiles are consistently formatted to cover the same information. This format includes five different subsections that are described below:

- **Description:** A scientific explanation of the hazard.
- **Location:** Geographical areas within each county that are affected by the hazard.
- **Extent:** The strength or magnitude of the hazard. Measures of extent may include, but are not limited to, an established scientific scale, wind speed, speed of onset, or duration of the hazard event.
- **Previous Occurrences:** Information regarding historical events of the hazard in Albany and Carbon Counties. Previous occurrence data was derived from a variety of sources, including, but not limited to, the local planning team, news articles, county websites, the State of Wyoming, and federal databases. One main database was used to assist in documenting past occurrences. This was the National Center for Environmental Information (NCEI), which has been tracking severe weather since 1950. Their storm events database tracks severe weather events on a county basis and contains data for the following identified hazards in this plan: drought, extreme cold, flooding, hail, lightning, tornadoes, windstorms, and winter storms and blizzards. The NCEI data is shown as tabular, countywide data and can be found in the profile sections for the hazards listed above.
- **Probability:** The likelihood of future events impacting each county. Given that an exact probability is often difficult to quantify, this characteristic is categorized into ranges to be used in hazard profiles:
    - Unlikely: Less than 1% annual probability
    - Possible: Between 1% and 10% annual probability
    - Likely: Between 10+% and 90% annual probability
    - Highly Likely: Greater than 90% annual probability
- **Vulnerability Assessment:** The vulnerability assessment addresses conditions that may increase or decrease vulnerability. This section will include the inventory exposed/impacts, loss estimations, and land use and development trends.
    - **Inventory Exposed/Impacts:** A qualitative or quantitative analysis of impacts on structures, people, and the environment.
    - **Loss estimations**: A qualitative or quantitative analysis on potential losses from each hazard is conducted using best available data and resources. Methods utilized include GIS analysis and Hazus analysis where tools are available. Additionally, damage estimates are calculated based on reported damages from previous occurrences by jurisdiction, where available. For this Plan, SHELDUS county-wide damage data was also utilized for a method of consistent loss estimations across hazards. It is noted that SHELDUS only reports on a county-wide scale, so it is not possible to determine losses by jurisdiction using this data. Additionally, SHELDUS results may vary from other sources of data, such as NCEI, due to differences in reporting. It should viewed as an

additional resource to understand damage impacts and risks across counties. SHELDUS results are explained in more detail below, as well in each hazard profile.

- **Land Use and Development**: Discusses the impact of development trends on jurisdiction's vulnerability to each hazard. Land use and development data was obtained from jurisdiction planners and population statistics from the U.S. Census Bureau.

4.5.2. SHELDUS Results

The Spatial Hazard Events and Losses Database for the United States (SHELDUS) Version 17.0 was utilized to assess losses from the following hazards: avalanche, flooding, fog, hail, lightning, severe storm/thunderstorm, tornado, wind, and winter weather. SHELDUS is a county-level dataset that allows for consistent comparison of losses across hazards. All loss information used in this Plan from SHELDUS is reported in 2017 dollars to facilitate even comparison between hazards. SHELDUS utilizes data from 1960 to 2017. It is recognized that this data is not reported by jurisdiction, but can still provide value in consistent comparison across hazards at the county-level. A summary of SHELDUS data is reported below, and damages are additionally reported in each hazard profile.

Albany County

From 1960 to 2017, Albany County experienced a total of 178 hazard events equating to $9,655,874 (2017 dollars) in damages reported across all hazards. The county experienced more wind events (86) than any other hazard. This is followed by winter weather events (50). Of the damages, $957,926 were crop damages and $8,697,948 were property damages. Total number of events by hazard is displayed in Figure 4-2 below, and total damages is displayed in Figure 4-3 below.

Figure 4-2 Albany County SHELDUS Total Events by Hazard

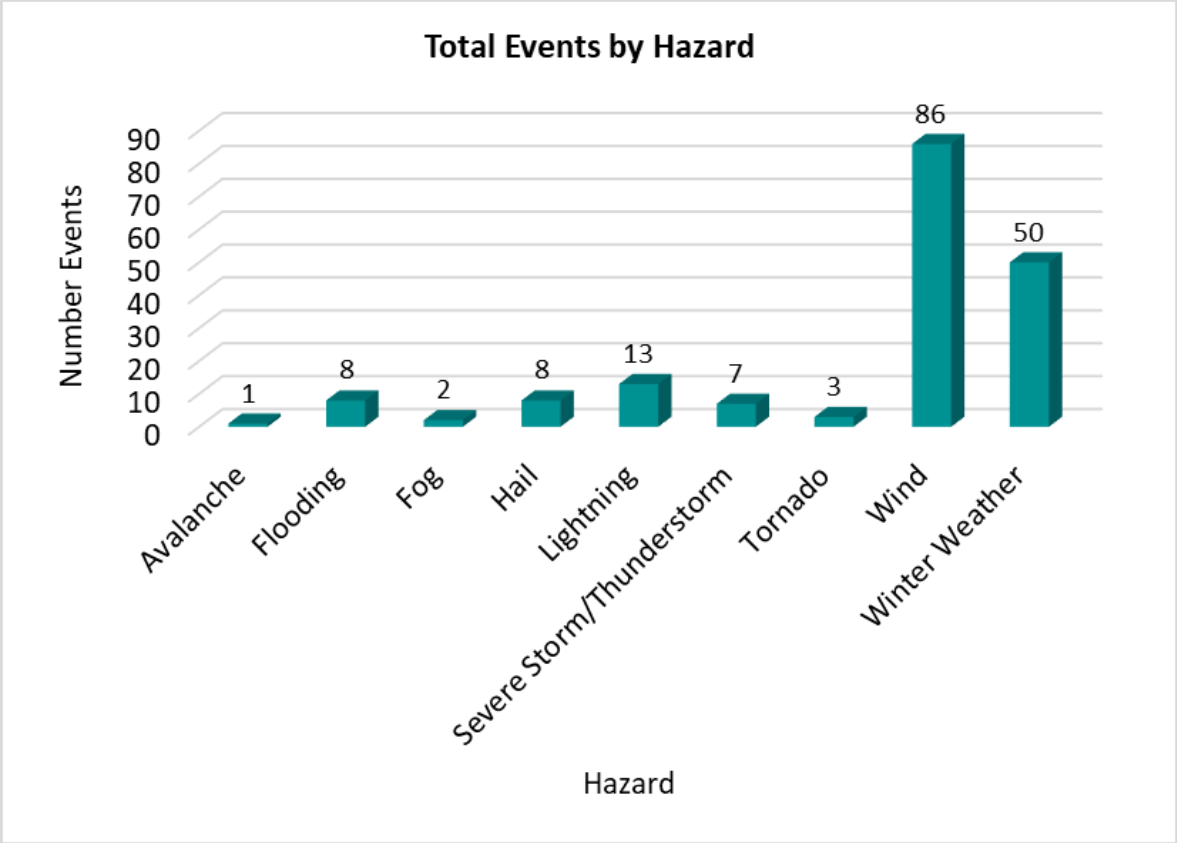
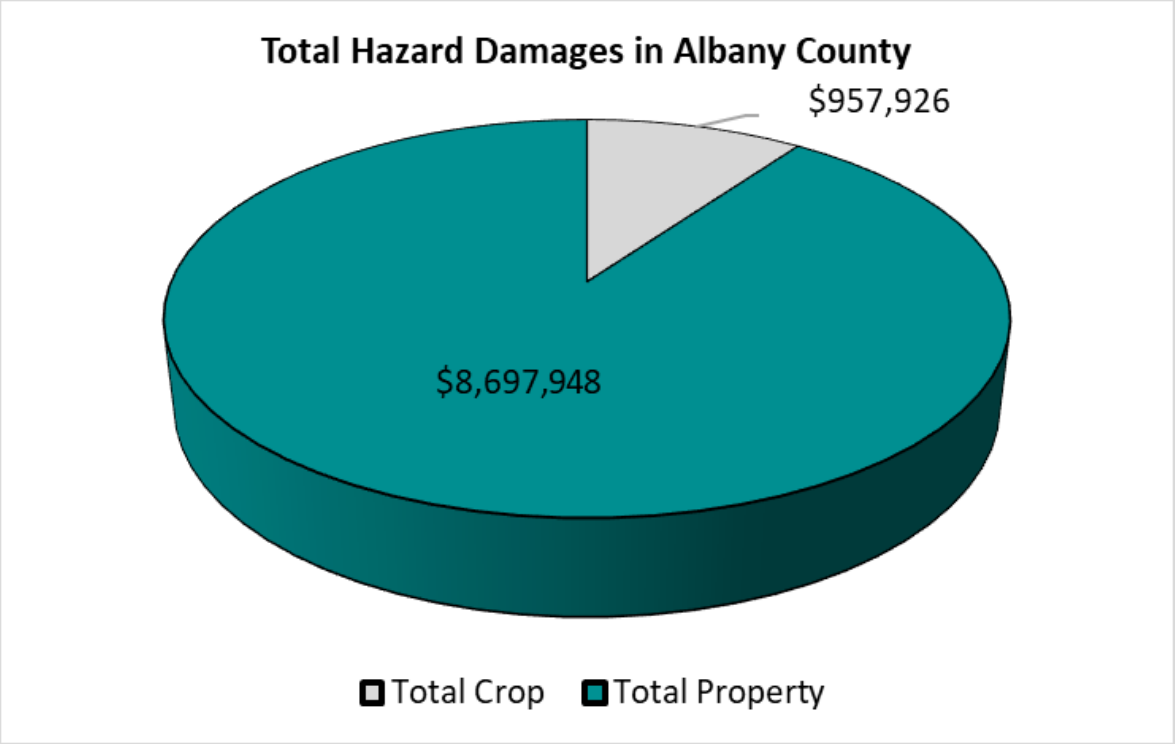
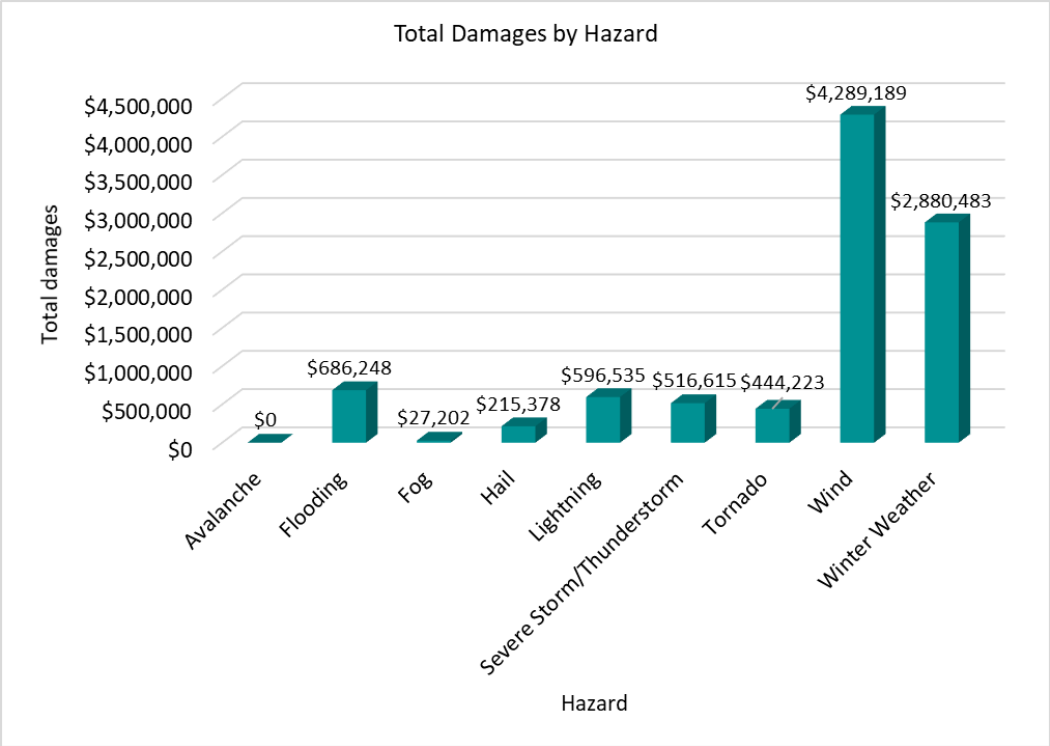


Figure 4-3 Albany County SHELDUS Total Hazard Damages



Wind caused the most in total damages from 1960 to 2017, causing $4,289,189 in total damages, representing approximately half of all damages. Winter weather followed with $2,880,483 in total damages. Figure 4-4 shows damages by hazard.

Figure 4-4 Albany County SHELDUS Total Damages by Hazard



These damages are further broken down by property and crop damage by hazard (Figure 4-5 and Figure 4-6, respectively). Wind has caused the most property damages in the county, with $4,127,308 in damages. This represents approximately half of the total property damages across all hazards. Winter weather caused the next highest in property damages, with $2,298,217 in damages. For crop damages, winter weather caused the most in damages, with $582,266. This represents over half of the total crop damages across all hazards. Wind caused the next highest in crop damages, with $161,881 in damages.

Figure 4-5 Albany County SHELDUS Property Damages by Hazard

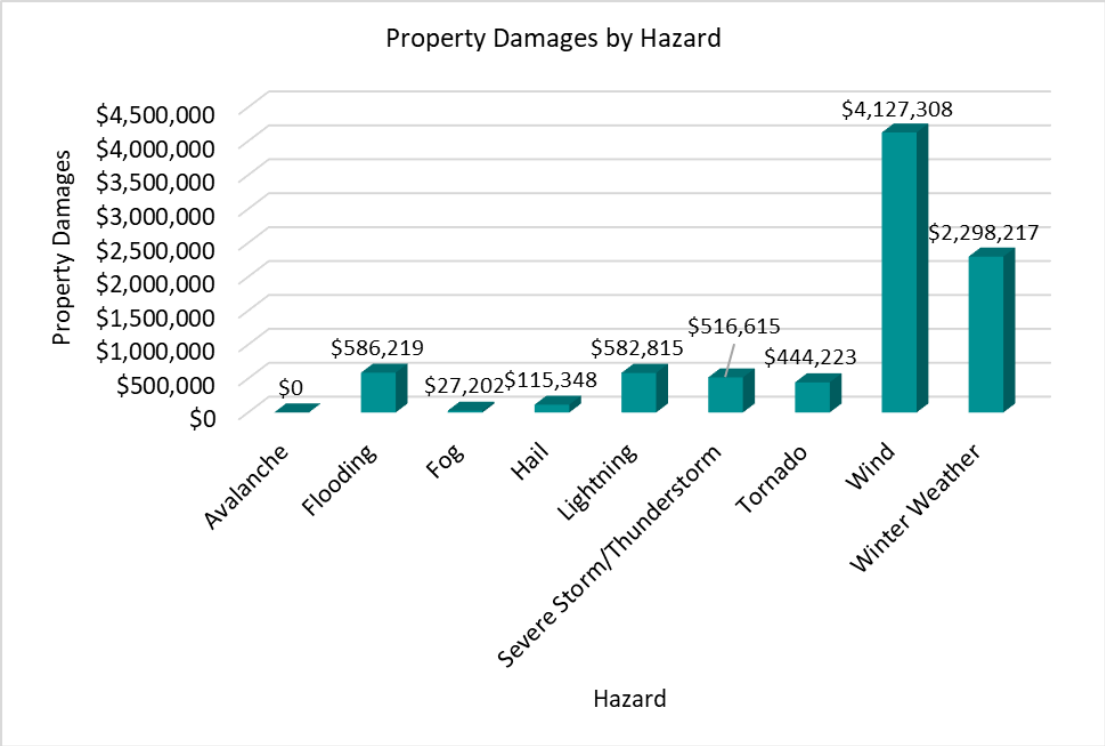


Figure 4-6 Albany County SHELDUS Crop Damages by Hazard

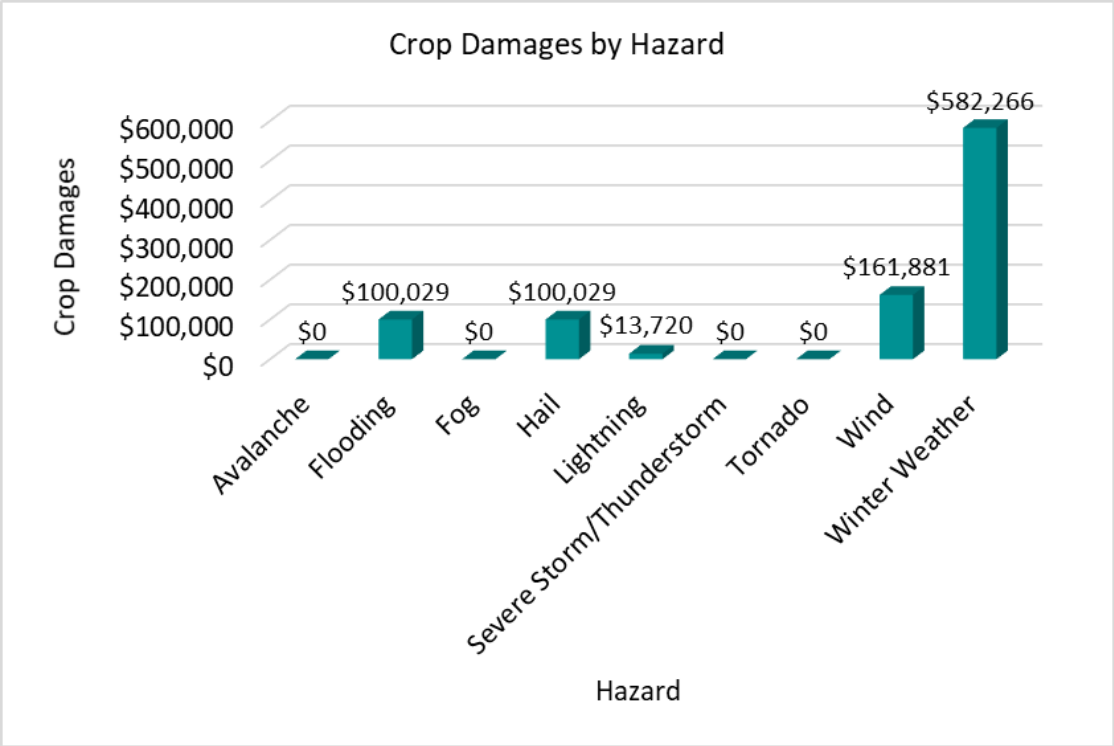


Table 4-5 summarizes all of the above information in a table.

Table 4-5 Albany County SHELDUS Summary Table

Hazard	Total Events	Crop Damages	Property Damages	Total Damages
Avalanche	1	$0	$0	$0
Flooding	8	$100,029	$586,219	$686,248
Fog	2	$0	$27,202	$27,202
Hail	8	$100,029	$115,348	$215,378
Lightning	13	$13,720	$582,815	$596,535
Severe Storm/Thunderstorm	7	$0	$516,615	$516,615
Tornado	3	$0	$444,223	$444,223
Wind	86	$161,881	$4,127,308	$4,289,189
Winter Weather	50	$582,266	$2,298,217	$2,880,483
Totals	**178**	**$957,926**	**$8,697,948**	**$9,655,874**

Carbon County

In Carbon County from 1960 to 2017, a total of 149 hazard events equating in $4,415,301 (2017 dollars) in damages was reported across all hazards. The county experienced more wind events (79) than any other hazard. This was followed by winter weather (42 events). Of the damages, $335,406 were crop damages and $4,079,895 were property damages. Total number of events by hazard is displayed in Figure 4-7 below, and total damages is displayed in Figure 4-8 below.

Figure 4-7 Carbon County SHELDUS Total Events by Hazard

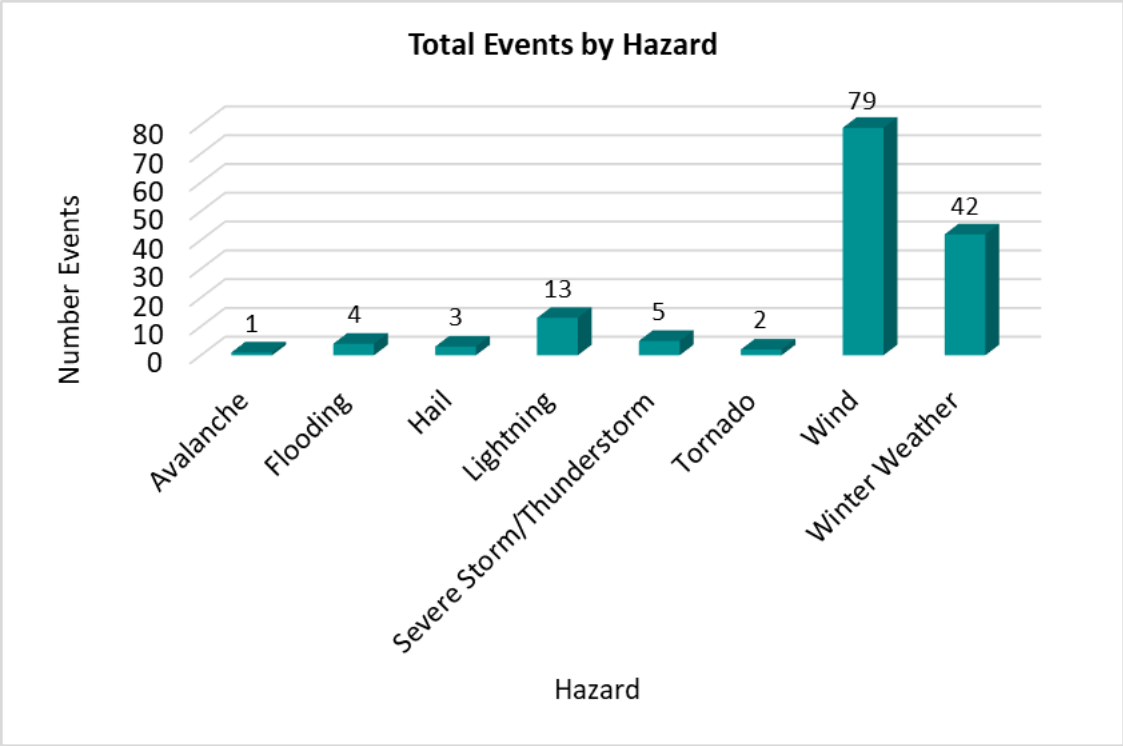
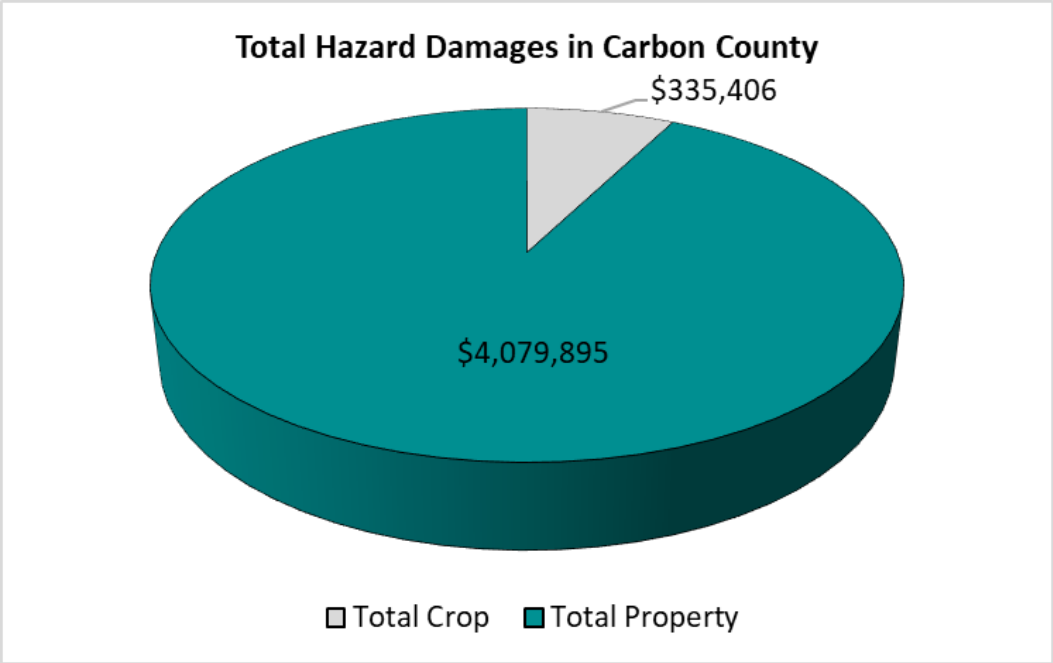
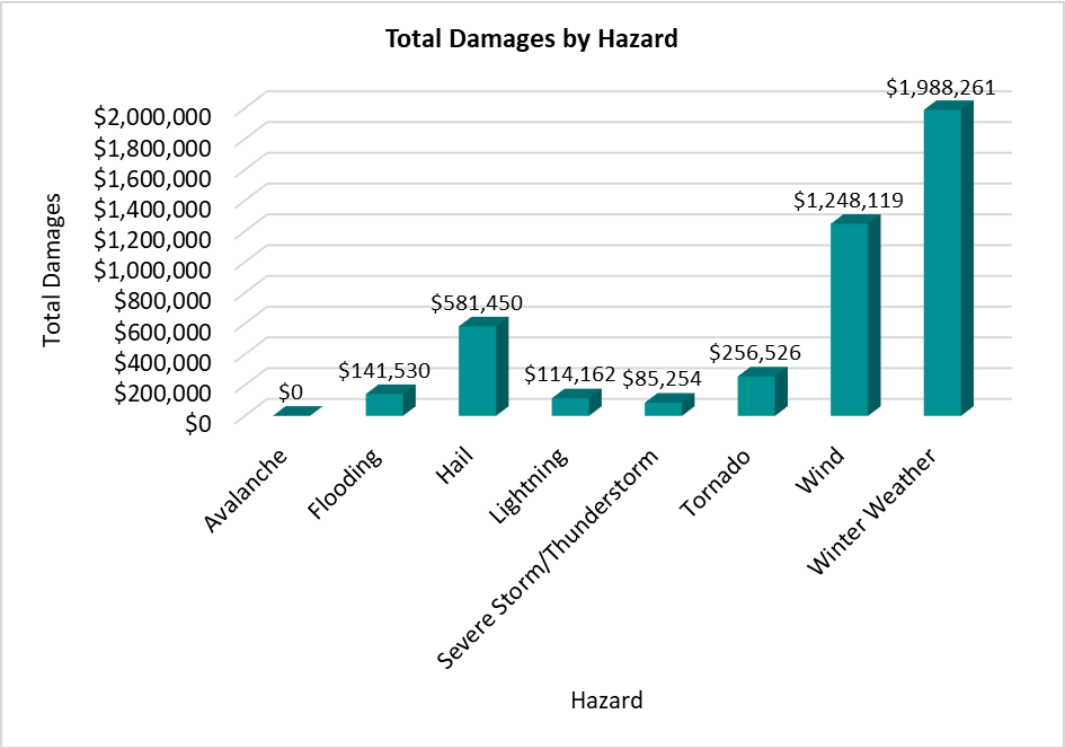


Figure 4-8 Carbon County SHELDUS Total Damages



Winter weather caused the most in total damages from 1960 to 2017, causing $1,988,261in total damages. Wind followed relatively closely with $1,248,119in total damages. Figure 4-9 shows damages by hazard.

Figure 4-9 Carbon County SHELDUS Total Damages by Hazard



These damages are further broken down by property and crop damage by hazard (Figure 4-10 and Figure 4-11, respectively). Winter weather has caused the most property damages in the County, with $1,986,318 in damages. Wind caused the next highest in property damages, with $1,187,029in damages. For crop damages, tornados caused the most in damages, with $256,526. This represents the vast majority of the total crop damages across all hazards. Wind caused the next highest in crop damages, with $61,090 in damages.

Figure 4-10 Carbon County SHELDUS Property Damages by Hazard

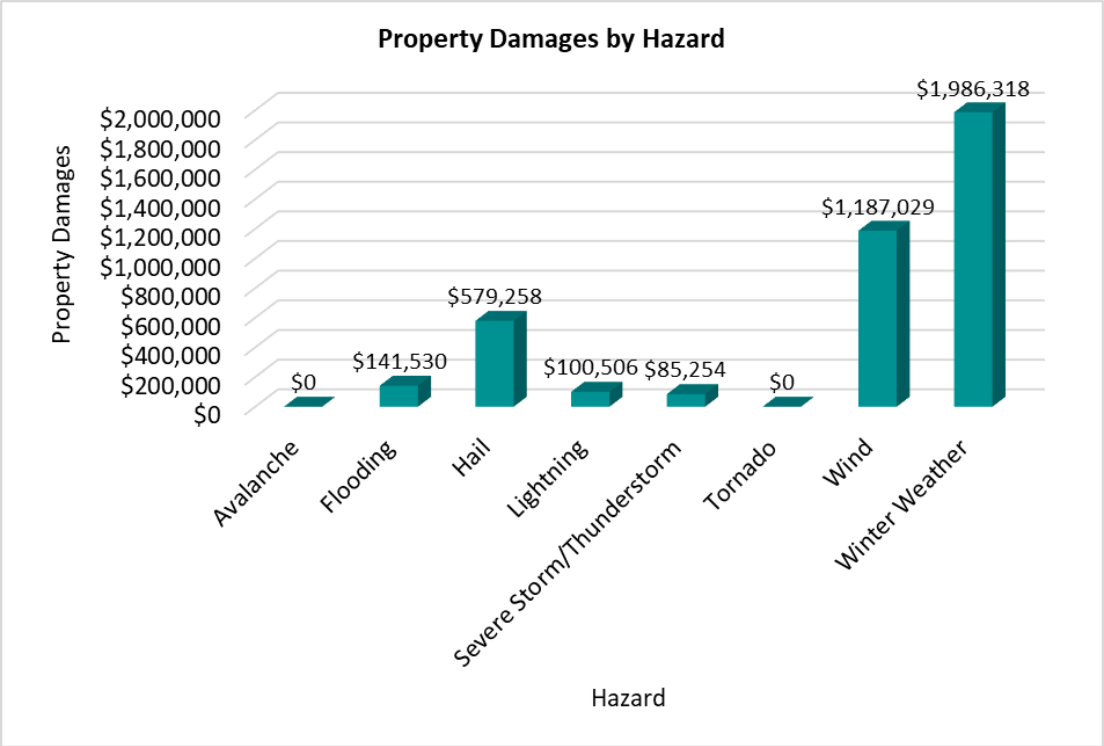


Figure 4-11 Carbon County SHELDUS Crop Damages by Hazard

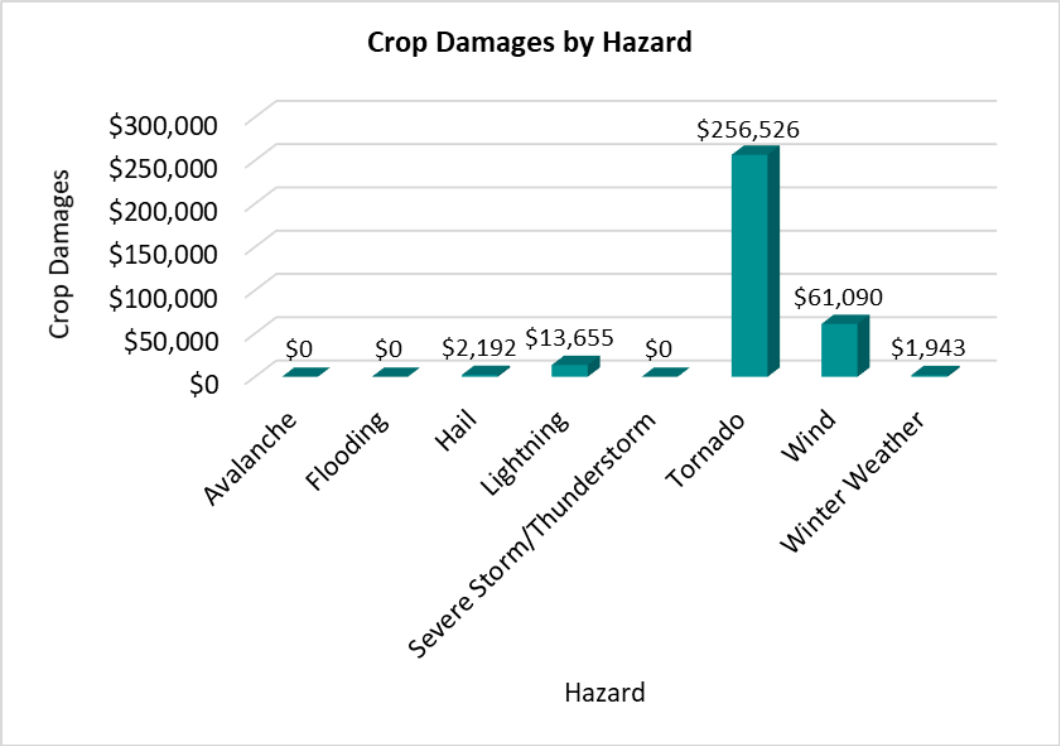


Table 4-6 summarizes all of the above information in a table.

Table 4-6 Carbon County SHELDUS Summary Table

Hazard	Total Events	Crop Damages	Property Damages	Total Damages
Avalanche	1	$0	$0	$0
Flooding	4	$0	$141,530	$141,530
Hail	3	$2,192	$579,258	$581,450
Lightning	13	$13,655	$100,506	$114,162
Severe Storm/Thunderstorm	5	$0	$85,254	$85,254
Tornado	2	$256,526	$0	$256,526
Wind	79	$61,090	$1,187,029	$1,248,119
Winter Weather	42	$1,943	$1,986,318	$1,988,261
Grand Total	**149**	**$335,406**	**$4,079,895**	**$4,415,301**

4.5.3. Avalanche

Description

An avalanche is defined as a mass of snow moving down a slope.[15] An avalanche occurs when the stress (from gravity) trying to pull the snow downhill exceeds the strength (from bonds between snow grains) of the snow cover. There are four ingredients of an avalanche: a steep slope, a snow cover, a weak layer in the snow cover, and a trigger. About 90% of all avalanches start on slopes of 30-45 degrees and about 98% of all avalanches occur on slopes of 25-50 degrees. Avalanches release most often on slopes above timberline that face away from prevailing winds (leeward slopes collect snow blowing from the windward sides of ridges). Avalanches can run, however, on small slopes well below timberline, such as gullies, road cuts, and small openings in the trees. Very dense trees can anchor the snow to steep slopes and prevent avalanches from starting; however, avalanches can release and travel through a moderately dense forest.

Skiers, snowboarders, and snowmobile operators are most commonly associated with avalanche hazards. However, motorists and others not engaging in recreation are also at risk of being caught in an avalanche. Wyoming is one of the top-ranking states for avalanche hazard because of its rural character and mountain recreation.

Location

In Albany County, the two main mountain ranges are the Laramie Mountains in the eastern part, and the Snowy Range Mountains in the west. Each receives large amounts of snowfall and has very steep terrain, making the areas susceptible to avalanches. The Medicine Bow/Centennial Range and Sierra Madre mountains in southern Carbon County, due to their steep terrain, high elevations, and winter snows, experience avalanches every winter. Other portions of the Region, including the jurisdictions, are relatively flat and not subject to avalanche impacts. Generally, the avalanches occur in remote areas and have little impact, except when unwary backcountry travelers get caught and buried.

Extent

The North American Avalanche Danger Scale (Figure 4-12) is used by the U.S. and Canada to communicate the potential for avalanches to cause harm or injury.[16]

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[15] https://avalanche.org/avalanche-education/
[16] https://avalanche.org/avalanche-encylopedia/#extreme-danger

Figure 4-12 North American Public Avalanche Danger Scale

North American Public Avalanche Danger Scale

Avalanche danger is determined by the likelihood, size and distribution of avalanches.

Danger Level		Travel Advice	Likelihood of Avalanches	Avalanche Size and Distribution
5 Extreme	4 5	Avoid all avalanche terrain.	Natural and human-triggered avalanches certain.	Large to very large avalanches in many areas.
4 High	4 5	Very dangerous avalanche conditions. Travel in avalanche terrain not recommended.	Natural avalanches likely; human-triggered avalanches very likely.	Large avalanches in many areas; or very large avalanches in specific areas.
3 Considerable	3	Dangerous avalanche conditions. Careful snowpack evaluation, cautious route-finding and conservative decision-making essential.	Natural avalanches possible; human-triggered avalanches likely.	Small avalanches in many areas; or large avalanches in specific areas; or very large avalanches in isolated areas.
2 Moderate	2	Heightened avalanche conditions on specific terrain features. Evaluate snow and terrain carefully; identify features of concern.	Natural avalanches unlikely; human-triggered avalanches possible.	Small avalanches in specific areas; or large avalanches in isolated areas.
1 Low	1	Generally safe avalanche conditions. Watch for unstable snow on isolated terrain features.	Natural and human-triggered avalanches unlikely.	Small avalanches in isolated areas or extreme terrain.

Safe backcountry travel requires training and experience. You control your own risk by choosing where, when and how you travel.

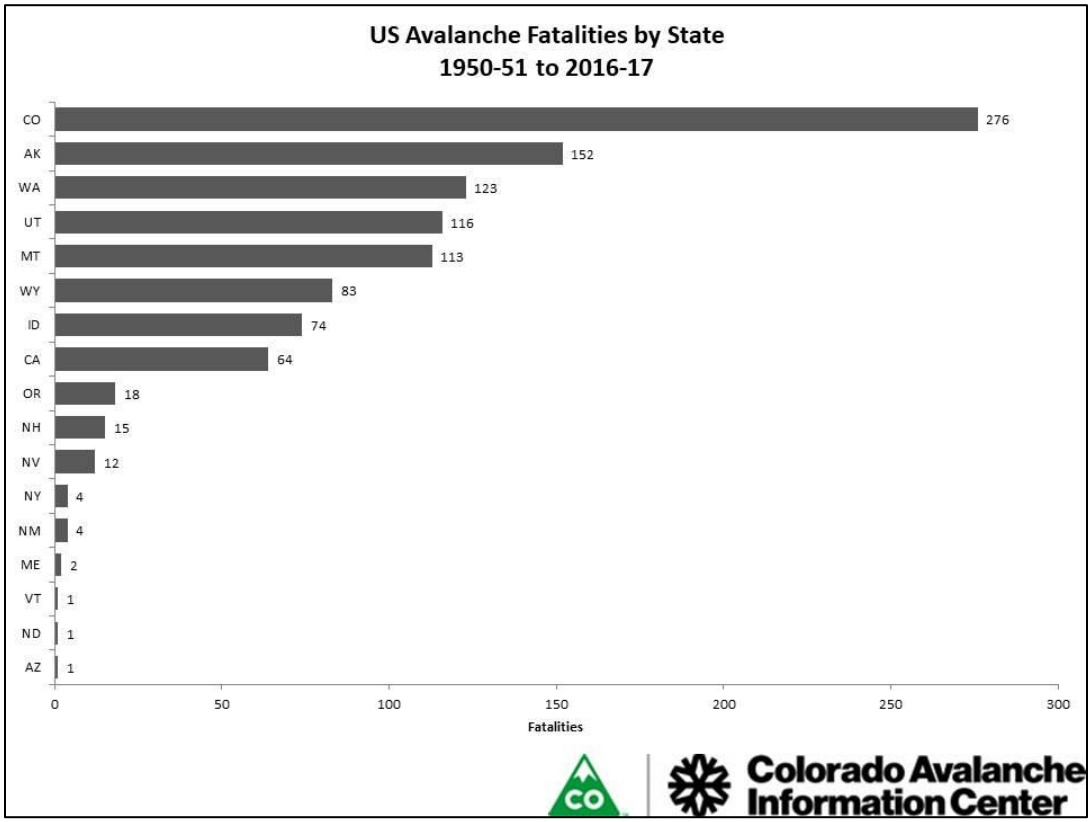
Understanding avalanche conditions can help prevent injuries from occurring, however, once an avalanche is triggered it has a sudden onset making them difficult to escape from.

Previous Occurrences

Avalanche events are frequent in Wyoming. As noted in Figure 4-13, Wyoming experienced the sixth-most avalanche fatalities in the United States from 1950 to 2017.[17] The majority of these fatalities occurred in western Wyoming, in particular the Teton area.

[17] https://avalanche.state.co.us/wp-content/uploads/2017/10/Slide3.jpg

Figure 4-13 Avalanche Fatalities by State from 1950-2017



In Region 3, avalanches occur almost every year in the Medicine Bow National Forest (including the Snowy Range). However, most go unreported since they do not result in death, injury, or property damage. Across Region 3, there have been seven avalanche fatalities.[18] All deaths were a result of outdoor recreation including playing in the snow, skiing, and snowmobiling. There have not been any additional avalanche fatalities since the previous Albany County or Carbon County hazard mitigation plans.

Three deaths have been reported due to avalanche in Albany county in the past 30 years, and Carbon County has had four deaths in the past thirty years. The details of these events are shown in Table 4-7 below. Fortunately, because most mountainous terrain in Region 3 are National Forest area, little development exists or as at risk though property adjacent to the forest may be at risk.

Table 4-7 Previous Avalanche Fatalities in Region 3

County	Date	Location	Activity
Albany	2/8/1975	Centennial	14 year old playing in snow died
Albany	2/9/1985	Med. Bow National Forest	Backcountry skier
Albany	1/21/1996	Centennial Ridge, Snowy Range	Backcountry skier
Carbon	2/9/1985	Rock Creek Knoll, Snowy Range	Backcountry skier

[18] http://www.jhavalanche.org/dateFatalities

County	Date	Location	Activity
Carbon	1/11/1998	Battle Lake, Sierra Madre Range	Snowmobiler
Carbon	12/26/2002	West side of the Snowy Range	Snowmobiler
Carbon	1/2/2008	French Creek, Snowy Range	Snowmobiler

Probability

Avalanches occur annually in the mountains of Albany and Carbon Counties. This results in an annual probability of "highly likely" (greater than 90% probability) in both Albany and Carbon Counties. However, not all events result in death, injury, or damage.

Albany County

Estimated annual probability for fatality or injury causing events in Albany County, based on three past events between 1913 and 2018, is 3%, which results in an annual probability of "possible."

Carbon County

In Carbon County, the annual probability for fatality or injury from an avalanche is also "possible," with a 4% chance of annual occurrence.

Vulnerability Assessment

Inventory Exposed/Impacts

The greatest avalanche risk in Region 3 is on public lands, including the Medicine Bow National Forest. This limits risk to property, however, it continues to pose a risk to those engaging in winter recreational activities. As stated previously, skiers, snowboarders, and snowmobilers are most commonly victims of avalanche hazards. Albany and Carbon Counties continue public awareness efforts for backcountry travelers (especially for tourists) for these hazards. Motorists and others not engaging in recreation are also at risk of being caught in an avalanche.

A second vulnerability associated with avalanche is road blocks. This is a particular concern when an avalanche blocks a major road. Roadblocks can hinder rescue and emergency assistance efforts, necessitate traffic detours, and spur costly debris clearance. Fortunately, most of the avalanche areas are on public lands, limiting risk to major thoroughfares such as Interstate 80 and U.S. 30, and U.S. 287. However, several state and local roads including, 130 and 230, cross through the National Forest. There are also major costs associated with rescuing motorists if they are involved in an avalanche.

There are several ways to prevent avalanches and lessen their power and destruction. For example, by traveling on previously packed snow and defined trails risk can be limited. In some cases, explosives are used to trigger avalanches before they occur unexpectedly. This also helps to cause small avalanches and prevent major ones. Additional passive measures such as snow fences, snow nets, avalanche dams, earth mounds, and light walls can be used to direct the placement of snow through the construction of artificial barriers. Trees also serve as a natural mechanism to reduce avalanche strength. Additionally, large shelters, called snow sheds, can be built directly along major transportation corridors to protect traffic from avalanches.

Potential Losses

While there is considerable risk for injury and death with the avalanche hazard, limited dollar losses have been reported with this hazard. As noted earlier, the most avalanche prone areas in the Region are

located on public lands. These areas do not permit private development and have very limited public facilities. This curtails potential losses to current and future structures. There are currently no dollar loss amounts reported for Carbon or Albany county, however, some costs may not be included such as search and rescue expenses.

Land Use and Development

As noted in the State Plan, developing areas prone to avalanches may actually reduce the risk. This is because mitigation efforts are undertaken to reduce the risk to within developed areas. Avalanche areas known to have the potential to interfere with highways and roads are typically mitigated prior to endangering citizens.

Given the popularity of winter recreational activities in Region 3, it is likely that avalanches will continue to pose a threat for backcountry travelers. Albany and Carbon Counties encourages its citizens to be prepared when going out in the backcountry and to have an avalanche beaker and knowledge of avalanche safety.

Albany County

Population has been increasing in unincorporated Albany County, which includes communities near the Medicine Bow National Forest, such as Centennial. Recreation is an asset to these communities, and an increased population and recreation may put more people at risk to an avalanche.

Carbon County

In Carbon County, recreation is a large part of communities such as Riverside and Encampment near the Medicine Bow National Forest. Although there has not been any major change in population in these communities since 2010, residents as well as visitors may be at a higher risk to avalanches when recreating amongst the high peaks of the Medicine Bow National Forest. It is important to note that resident population in these communities is not the only vulnerable population to avalanches, as people visit the National Forest from outside the Region and State.

4.5.4. Drought

Description

Drought is defined by the National Drought Mitigation Center as “a protracted period of deficient precipitation resulting in extensive damage to crops, resulting in loss of yield.”[19] Although sometimes considered a rare and random event, drought is a normal, recurrent feature of climate. Climatic factors such as high temperatures, high wind, and low relative humidity are often associated with drought. Drought occurs in virtually all climatic zones, although varying significantly from one region to another, and can be defined according to meteorological, hydrological, agricultural, or socioeconomic criteria as detailed in Table 4-8 below.[20]

[19] http://drought.unl.edu/DroughtBasics/WhatisDrought.aspx
[20] https://drought.unl.edu/Education/DroughtIn-depth/TypesofDrought.aspx

Table 4-8 Drought Types

Type	Description
Meteorological Drought	Meteorological drought is usually based on long-term precipitation departures from normal, but there is no consensus regarding the threshold of the deficit or the minimum duration of the lack of precipitation that makes a dry spell an official drought.
Hydrological Drought	Hydrological drought refers to deficiencies in surface and subsurface water supplies. It is measured as stream flow, and as lake, reservoir, and ground water levels.
Agricultural Drought	Agricultural drought occurs when there is insufficient soil moisture to meet the needs of a particular crop at a particular time. A deficit of rainfall over cropped areas during critical periods of the growth cycle can result in destroyed or underdeveloped crops with greatly depleted yields. Agricultural drought is typically evident after meteorological drought but before a hydrological drought.
Socioeconomic Drought	Associates the supply and demand of economic goods or services with elements of meteorological, hydrologic, and agricultural drought. Socioeconomic drought occurs when the demand for water exceeds the supply as a result of a weather related supply shortfall. The incidence of this type of drought can increase because of a change in the amount of rainfall, a change in societal demands for water (or vulnerability to water shortages), or both.

Location

A drought is a regional event that is not confined to geographic or political boundaries; it can affect several areas at once. It can also range in severity across those areas. All of Region 3 is at risk to drought occurrence.

Extent

The Palmer Drought Severity Index (PDSI) was developed by Wayne Palmer in the 1960s and uses temperature and rainfall information in a formula to determine dryness. Over time it has become the semiofficial drought index for risk assessment and hazard analysis. The Palmer Index is most effective in determining long term drought, a matter of several months, and is not used for short-term forecasts (a matter of weeks). It uses a zero as normal conditions and drought is shown in terms of negative numbers; for example, -2 is moderate drought, -3 is severe drought, and -4 is extreme drought. The following Table 4-9 provides an overview of the Palmer Index compared to other drought classification systems. The return period is related to how often the type of drought typically occurs. For example, a minor drought occurs every three to four years.

Table 4-9 Palmer Drought Severity Index

			Drought Monitoring Indices		
Drought Severity	Return Period (years)	Description of Possible Impacts	Standardized Precipitation Index (SPI)	NDMC* Drought Category	Palmer Drought Index
Abnormal Drought	3 to 4	Going into drought, short term dryness slowing growth of crops or pastures. Fire risk above average. Coming out of drought, some lingering water deficits, pastures or crops not fully recovered.	-0.5 to -0.7	DO	-1.0 to -1.9
Moderate Drought	5 to 9	Some damage to crops or pastures, fire risk high, streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested.	-0.8 to -1.2	D1	-2.0 to -2.9
Severe Drought	10 to 17	Crop or pasture losses likely, fire risk very high, water shortages common, water restrictions imposed.	-1.3 to -1.5	D2	-3.0 to -3.9
Extreme Drought	18 to 43	Major crop and pasture losses, extreme fire danger, widespread water shortages or restrictions	-1.6 to -1.9	D3	-4.0 to -4.9
Exceptional Drought	44+	Exceptional and widespread crop and pasture losses, exceptional fire risk, shortages of water in reservoirs, streams, and wells creating water emergencies.	Less than -2.0	D4	-5.0 or less

*National Drought Monitoring Center

Previous Occurrences

Previous occurrences of drought for the Region can be measured in several ways. For this Plan, previous occurrences were determined by reviewing precipitation averages over time to identify periods with precipitation amounts below the long-term average, and reviewing U.S. Drought Monitor records/current conditions. It is evident some level of drought has been persistent across the Region since 2000, with Carbon County experiencing more frequent drought than Albany County. Drought conditions based on precipitation deficits are described in Table 4-10 and drought conditions based on U.S. Drought Monitor records are shown in Table 4-11. Additional details on previous occurrences of drought for the State of Wyoming and by county can be found in Appendix C. The U.S. Drought Monitor records are also displayed in Figure 4-14 and Figure 4-15 for Albany and Carbon Counties, respectively. Based on this data, the most severe drought for both counties occurred during the years of 2002 to 2003.

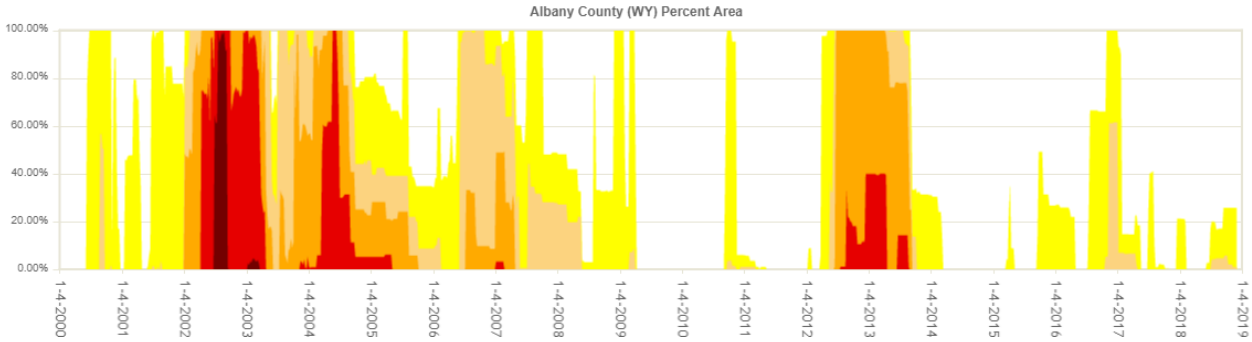
Table 4-10 Precipitation Deficits 1895-2018[21]

County	Long-Term Precipitation Annual Average	Year	Deficit
Albany	15.11 inches	2012	5.29 inches
Albany	15.11 inches	2002	5.10 inches
Albany	15.11 inches	1939	4.98 inches
Carbon	15.98 inches	2012	5.71 inches
Carbon	15.98 inches	2002	5.44 inches
Carbon	15.98 inches	1902	6.76 inches

Table 4-11 Drought Monitor Previous Droughts, 2000-2018[22]

County	Years	Drought Category	Approximate Percent of County
Albany	2012-2014	D0-D4	100%
Albany	2002-2003	D3-D4	100%
Albany	2001-2009	D0-D4	100%
Carbon	2017-present	D2-D3	60%
Carbon	2012-2014	D0-D3	100%
Carbon	2002-2003	D3-D4	100%
Carbon	2000-2009	DO-D9	100%

Figure 4-14 Albany County Previous Drought Events



[21] https://www.ncdc.noaa.gov/cag/county/time-series for Albany and Carbon counties

[22] https://droughtmonitor.unl.edu/Data/Timeseries.aspx for Albany and Carbon counties

Figure 4-15 Carbon County Previous Drought Events

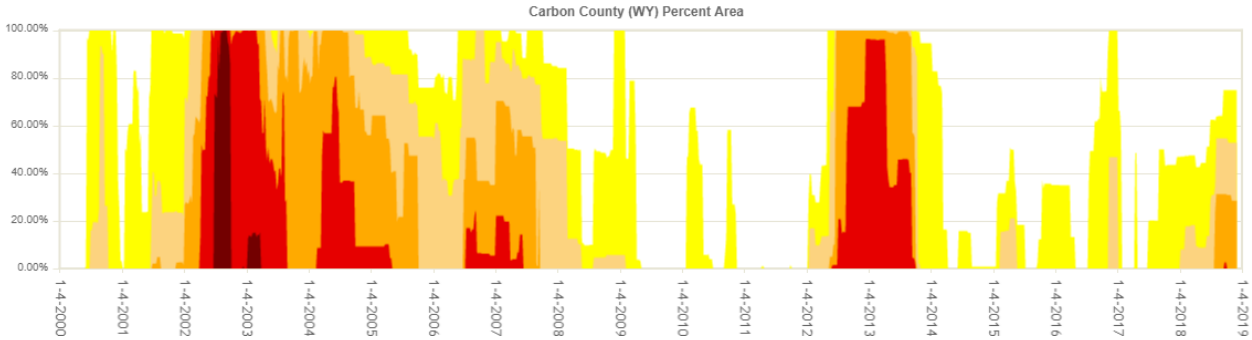
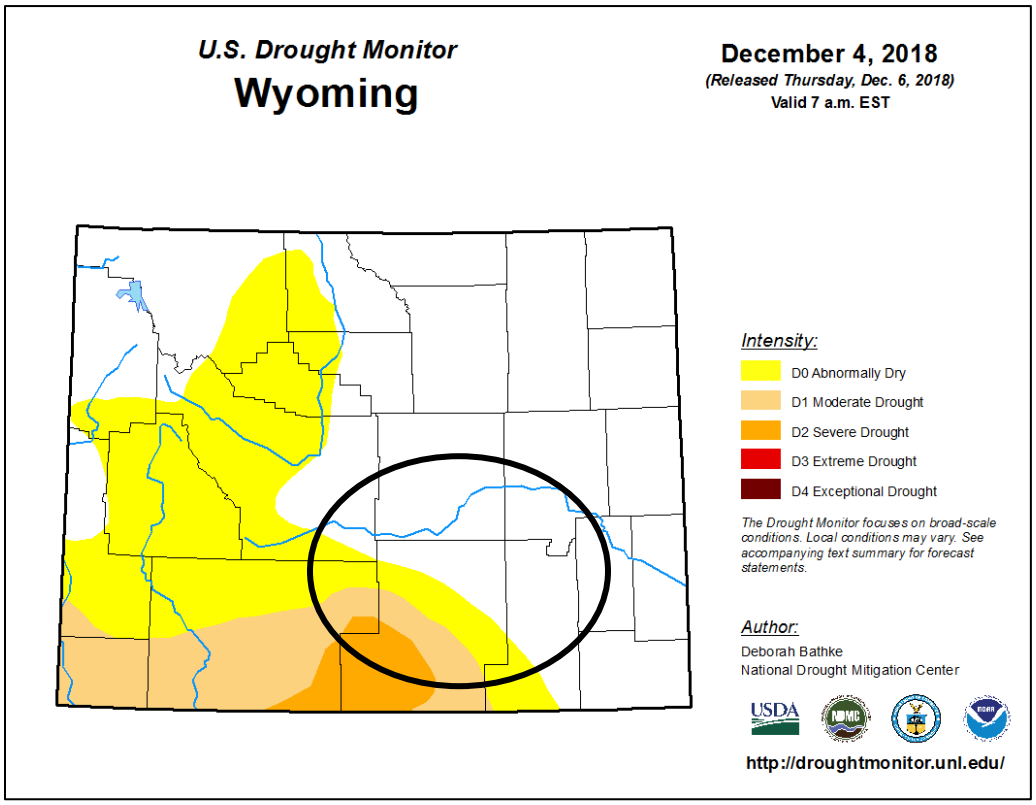


Figure 4-16 shows the current drought conditions as of December 4, 2018 for Albany and Carbon Counties, according to the U.S. Drought Monitor. The southwest corner of Albany County is experiencing abnormally dry drought conditions, while further west is experiencing moderate to severe drought conditions. In Carbon County, the majority of the county is experiencing some level of drought, with conditions worsening moving west to severe drought in the southeast portion of the county.

Figure 4-16 Albany and Carbon Counties Drought Conditions, December 4, 2018[23]



[23] https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?WY

Probability

An exact probability is difficult to quantify given limited data. Based on U.S. Drought Monitor data, drought conditions were experienced in some part of Albany County for 10 out of 18 years on record (2000-2018). Based on this data, the annual probability is 56%, which corresponds to a likely probability.

Carbon County has experienced drought in portions of the county for 13 of the 18 years on record, for an annual probability of 72%, which corresponds to a likely probability of drought occurrence.

More severe droughts, such as those meeting D3 and D4 Drought Monitor criteria are less common. It should be noted that drought events are likely to span several months, or even years, adding to the probability of occurrence. Further, there is evidence that droughts may be more common during El Nino years, when summers are typically warmer and drier in Wyoming. According to the Wyoming State Climate Office, Wyoming is the 5th driest state in the U.S and drought is expected to be a normal occurrence due to the State's natural climate. According to the seasonal drought outlook released by the Climate Prediction Center, drought is likely to persist throughout the season in southern Wyoming, including Carbon County.

Vulnerability Assessment

Inventory Exposed/Impacts

It is assumed that all current and future buildings, populations, agricultural holdings, and critical facilities in Region 3 are at risk to drought. It should be noted, however, that the majority of drought impacts are not structural but societal and economic in nature.

Drought may impact water supply, prompt water conservation measures, compromise wildfire protection/increase fire risk, hinder tourism industry, and damage agricultural crops or harm livestock. Impacts include, but are not limited to:

- Substantial water is needed to fight wildfires which are more frequent in dry conditions. A lack of availability could limit this capability.
- Albany and Carbon counties rely heavily on agriculture, particularly livestock as a sector of their economy. Drought can severely impact this sector as described in the estimated losses.
- The prairieland relies on spring rains that grow the grass to sustain livestock. Agricultural crops can be irrigated, however, in times of drought the precipitation is limited and water shortages may exist, severely impacting the ability to irrigate effectively.

The State Plan also notes several impacts of drought including:

- Irrigation of farmland and livestock (which may impact food supply availability and price)
- Limited grazing lands on the prairie grasslands, compromising grazing
- Municipal water conservation
- Decreased water quality/higher salinity
- Increased risk of fires
- Decreased air quality due to increased soil erosion and blowing dust

As noted above, agriculture is not the only sector impacted by drought, however, agricultural dollar impacts are often used to show the effects of drought due to the availability of data. The 2012 Census of Agriculture provides the most recent county-level statistics for agriculture, which has not changed since the 2015 Albany County HMP or 2016 Carbon County HMP.

Albany County

According to the 2012 Census of Agriculture for Albany County, there was $93.4 million in farms sales including $8 million in crop sales and $85.4 million in livestock sales. This is an increase in sales of 160% from 2007 and makes Albany County the 6th highest producer in the state and 1,227th highest producer nationally. In addition, there are 1.96 million acres of farmland in the county, which has increased 6% from 2007. All of these sales and assets are considered at risk to future drought events. Further, with both the land area and value of products sold increasing, the vulnerability of drought increases.

Carbon County

According to the 2012 Census of Agriculture for Carbon County, there was $78.5 million in farms sales including $11.2 million in crop sales and $67.3 million in livestock sales. This is an increase in sales of 31% from 2007 and makes Carbon County the 8th highest producer in the state and 1,388th highest producer nationally. In addition, there are 2.3 million acres of farmland in the county, which has increased 11% from 2007. All of these sales and assets are considered at risk to future drought events. Further, with both the land area and value of products sold increasing, the vulnerability of drought increases.

Potential Losses

Unfortunately, historical agricultural production data specific to Albany or Carbon Counties are not available. In order to provide an estimate of the economic impact of drought, agricultural data for the State of Wyoming were analyzed. Table 4-12 shows the peak commodity production changes from the pre-drought period of 1994 to 1998 compared to the 2000 to 2002 drought.

Table 4-12 Peak Commodity Production Changes from Pre-Drought (1994-1998) to Drought (2000-2002)

Commodity	5-Year Pre-Drought Production Average (1994-1998)	Units	Lowest Production During Drought (2000-2002)	Year of Lowest Production	Percent Change
Winter Wheat	6,029	1,000 bu.	2,375	2002	-61%
Spring Wheat	648	1,000 bu.	96	2002	-84%
Barley	8,383	1,000 bu.	4,680	2002	-44%
Oats	1,648	1,000 bu.	750	2002	-54%
Dry Beans	691	1,000 cwt.	514	2001	-26%
Sugar Beets	1,151	1,000 tons	659	2002	-43%
Corn	6,328	1,000 bu.	4,165	2002	-34%
Alfalfa Hay	1,581	1,000 tons	1,150	2002	-27%
Other Hay	817	1,000 tons	450	2002	-45%
Cattle/ Calves Inventory	1,536	1,000 head	1,320	2002	-14%

Quantitative loss data is not readily available for losses from drought in Albany or Carbon Counties, therefore previous reported impacts were used to understand potential losses from drought in the Region.

Albany County

Reviewing USDA crop loss data from 1989 to 2018, no losses were reported for Albany County from drought.[24] There have been 11 USDA Disaster Declarations in Albany County due to drought, with two of those including Albany County as a primary disaster area (as opposed to contiguous), occurring in August 2012 and April 2013. Additionally, the National Drought Mitigation Center Drought Impacts Reporter depicts 10 total impacts from drought in Albany County from 2009 to 2018. Notable impacts from this report were drought contributing to wildfire as well as drought impacting ranching activities.[25] In 2012, it was reported that ranchers were selling cattle in southeast Wyoming (including Albany County) due to drought conditions. In 2012, it was also reported that hay production in the North Platte Valley was about half of normal. The vice president of the Wyoming Stock Grower's Association stated that some livestock producers were anticipating higher hay prices and possibly a shortage and were stocking up on hay to get through the upcoming winter.[26]

Carbon County

Reviewing USDA Crop Loss data, from 1989 to 2018, Carbon County has experienced $6,382 in crop indemnity payments, impacting 4,520 acres due to drought. All of these losses occurred from 2002 to 2003, corresponding with the most extreme drought conditions during this time period.[27] There have also been 11 USDA Disaster Declarations in Carbon County, with three of these as a primary disaster area in July 2012, April 2013, and September 2018. Additionally, the National Drought Mitigation Center Drought Impacts Reporter depicts 11 total impacts from drought in Carbon County from 2009 to 2018.[28] In July 2018, it was reported that the Encampment River was barely running and hay irrigators were almost out of water. Additionally, near Hanna it was reported that many seasonal water sources were dry in July 2018 and grasses had turned entirely brown. Similar to Albany County, ranchers were also selling livestock due to drought conditions in 2012.[29]

Land Use and Development

Both Albany and Carbon Counties experienced an increase in agricultural production from the 2007 to 2012 Agricultural Census. Assuming this trend continues, drought could have a larger impact on agriculture in the future. Additionally, more farms requiring water resources may exacerbate impacts of drought when they occur. Additional people moving to the region also puts more stress on water resources when during drought conditions.

Albany County

Albany County has experienced an increase in population since 2010, and is expected to continue to increase through 2030 across all jurisdictions and the unincorporated county. To minimize the strain on water resources that additional people will bring to the county, residential growth is directed to occur within buffer zones of currently established communities. This is intended to keep much of the County rural in nature, and will reduce the strain that is necessary to bring new rural developments water.

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[24] https://legacy.rma.usda.gov/data/cause.html
[25] https://droughtreporter.unl.edu/map/
[26] https://droughtreporter.unl.edu/map/
[27] https://legacy.rma.usda.gov/data/cause.html
[28] https://droughtreporter.unl.edu/map/
[29] https://droughtreporter.unl.edu/map/

According to the 2015 Laramie Water Master Plan, at the time of the plan, the existing total water demand for the city was 15.41 million gallons/day (MGD). With population growth, the total future water demand is projected to be 19.7 MGD.

Carbon County

Carbon County population has slightly decreased since 2010, and is projected to increase slightly (2.1%) by 2030. However, Carbon County's population is heavily influenced by the energy industry, so may fluctuate over time. Similar to Albany County, the Carbon is directing residential growth in buffer zones around existing communities to reduce the strain that rural development puts on resources, including water. Increase in energy production as well as increase in population would put additional strain on water resources, that may be exacerbated in drought conditions.

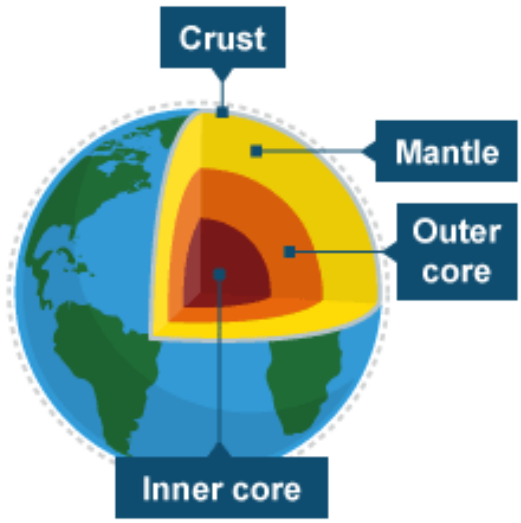
4.5.5. Earthquake

Description

Scientifically, earthquakes are defined as the sudden release of strain (or displacement of rock) in the earth's crust, resulting in waves of shaking that radiate outward from the earthquake source. Earthquakes result from crustal strain, volcanism, landslides, or the collapse of caverns. They can occur underwater or on land and can affect hundreds of thousands of square miles. Their intensity ranges from very minor (shaking not detected by humans without instruments) to very violent (catastrophic in nature). Damages follow this intensity ranging from minor to catastrophic. Earthquakes also occur without warning, which can result in high deaths and injuries.

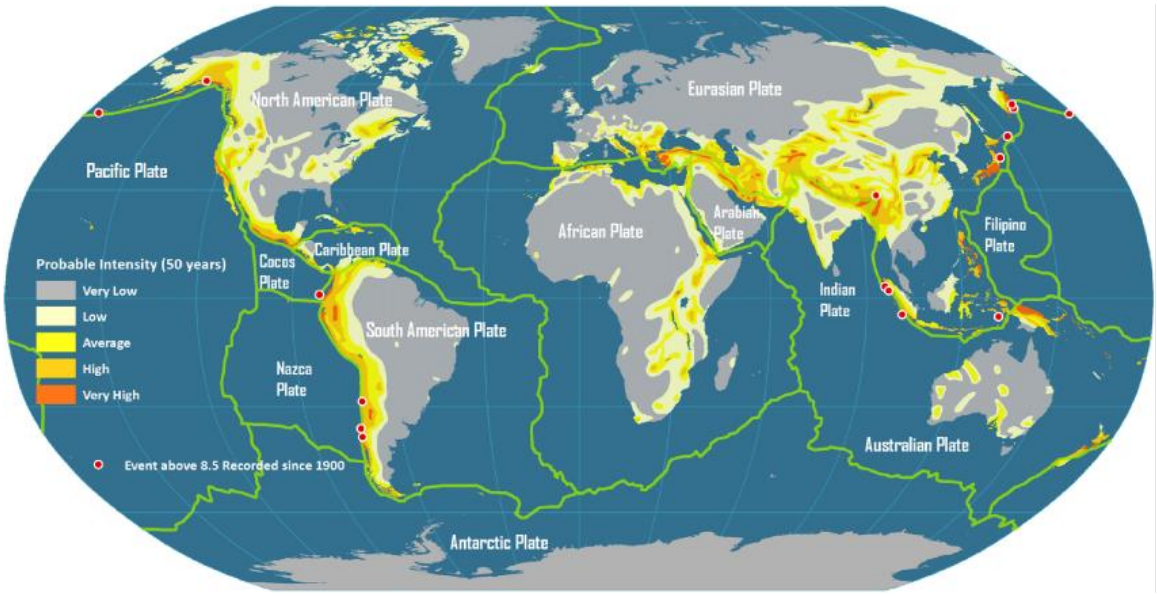
To understand the nature of earthquakes, the composition of the earth must be explored. The earth is made up four major layers and several sub layers (Figure 4-17): a solid inner core, a liquid outer core, a semi-molten mantle, and the rocky crust (the thin outermost layer of the earth). The upper portion of the mantle combined with the crust forms the lithosphere. This area is susceptible to fractures and can be thought of a shell. The lithosphere breaks up into large slabs, known as tectonic plates. It is this area where earthquakes occur.

Figure 4-17 Earth's Sub-Layers



There are approximately twelve major plates and several dozen more minor plates on the earth's crust, as shown in Figure 4-18.[30]

Figure 4-18 Tectonic Plates



Plates are regions of the crust that continually move over the mantle. Areas where these plates meet, and either grind past each other, dive under each other, or spread apart, are called plate boundaries. Most earthquakes are caused by the release of stresses accumulated as a result of the sudden displacement of rock in the Earth's crust along opposing plates. The areas bordering the Pacific Plate, also known as the "Pacific Ring of Fire," are at a particularly high risk since most of the largest earthquake events of the last century took place in the region.[31] While earthquakes typically occur along plate boundaries, they may also result from crustal strain, volcanism, landslides, or the collapse of caverns. Earthquakes can affect hundreds of thousands of square miles, cause damage to property measured in the tens of billions of dollars, result in loss of life and injury to hundreds of thousands of persons, and disrupt the social and economic functioning of the affected area. The point where an earthquake starts is termed the focus or hypocenter and may be many miles to several hundred miles deep within the earth. The point at the surface directly above the focus is called the earthquake's epicenter. Earthquakes are measured in terms of their magnitude and intensity.

Liquefaction is the phenomenon that occurs when the strength and stiffness of a soil is reduced by earthquake shaking or other rapid loading. Essentially, the soil acts like a fluid, similar to wet sand near the beach, resulting in ground failure. Liquefaction causes two types of ground failure: lateral spread and loss of bearing strength. Lateral spreads develop on gentle slopes and entails the sidelong

[30] http://www.bbc.co.uk/bitesize/ks3/geography/physical_processes/plate_tectonics/revision/2/
[31] https://people.hofstra.edu/geotrans/eng/ch9en/conc9en/plate_tectonics.html

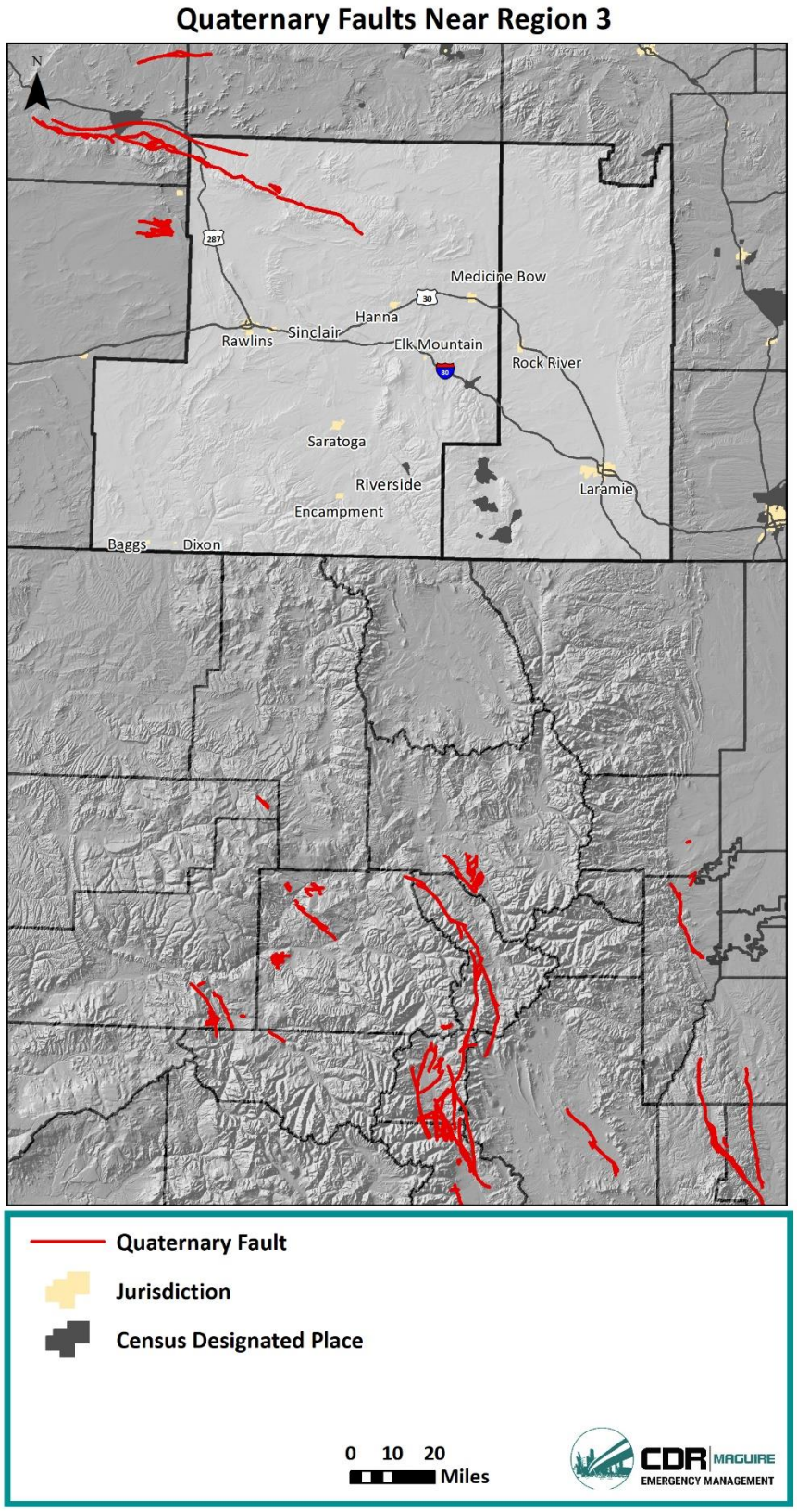
movement of large masses of soil as an underlying layer liquefies. Loss of bearing strength results when the soil supporting structures liquefies and causes structures to collapse.

Location

An earthquake event would impact the entire Region. Earthquake faults and earthquake risk areas help define locations. There are no known active or suspected faults in Albany County, however, in Carbon County there is one active fault system, the South Granite Mountain Fault System. Additionally, there are active faults in the surrounding areas as shown in Figure 4-19.[32] Earthquakes from the Estes Park, Colorado area (Northern Boundary Fault System) have resulted in earthquakes felt in Albany and Carbon Counties. Major earthquakes from Yellowstone would also be felt in the Region. The quaternary faults from the USGS are believed to be sources of M>6 earthquakes during the Quaternary (the past 1,600,000 years). The Wyoming Faults are all faults identified in Wyoming and provided by Wyoming State Geological Survey (2008).

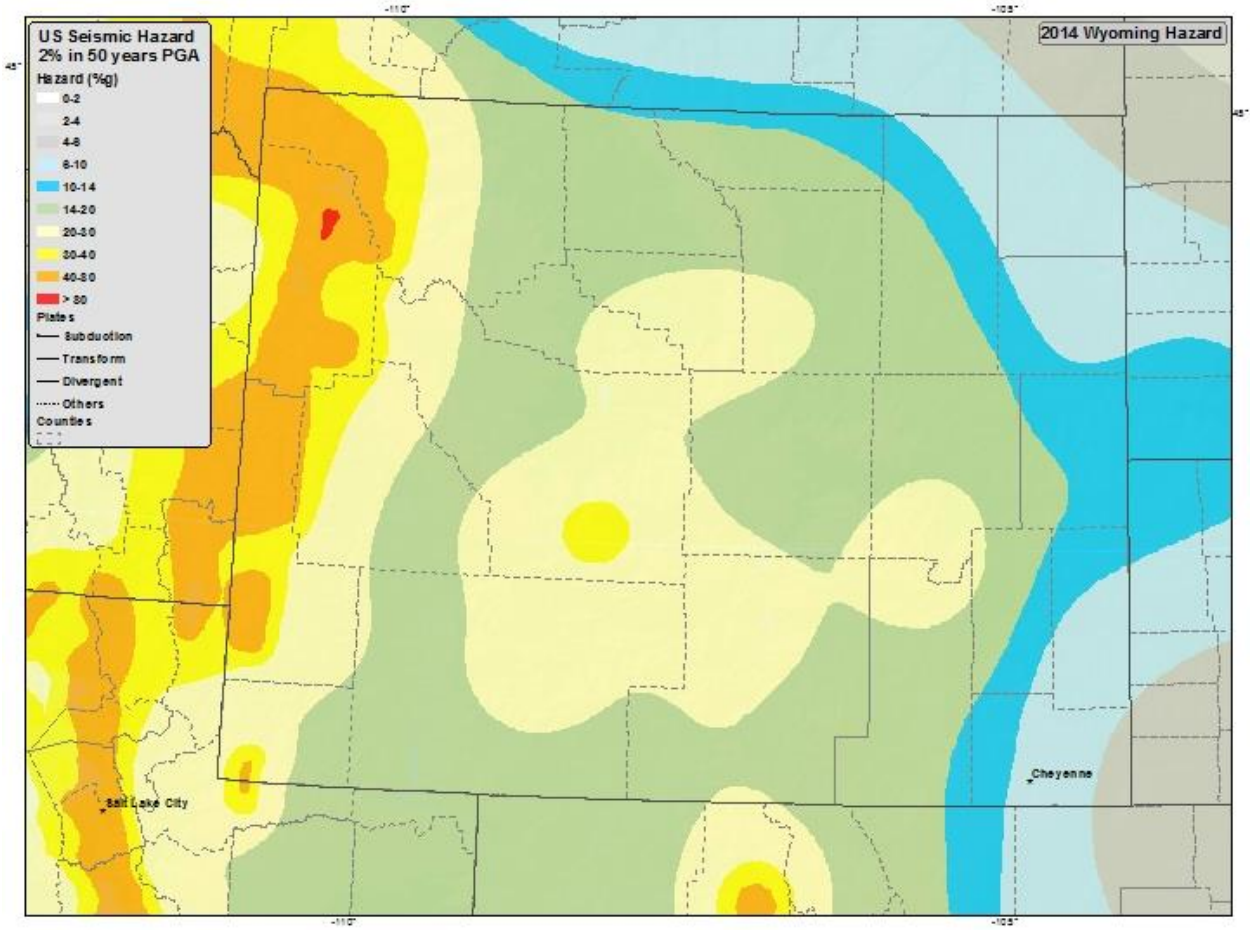
[32] https://earthquake.usgs.gov/hazards/qfaults/

Figure 4-19 Quaternary Faults Near Region 3



In addition to fault lines, risk areas help define earthquake location can emphasize the region-wide risk. Figure 4-20 shows the USGS potential for ground shaking from an earthquake, and it indicates that Albany and Carbon counties are in a mid-range hazard area.

Figure 4-20 2014 USGS Seismic Hazard Map[33]

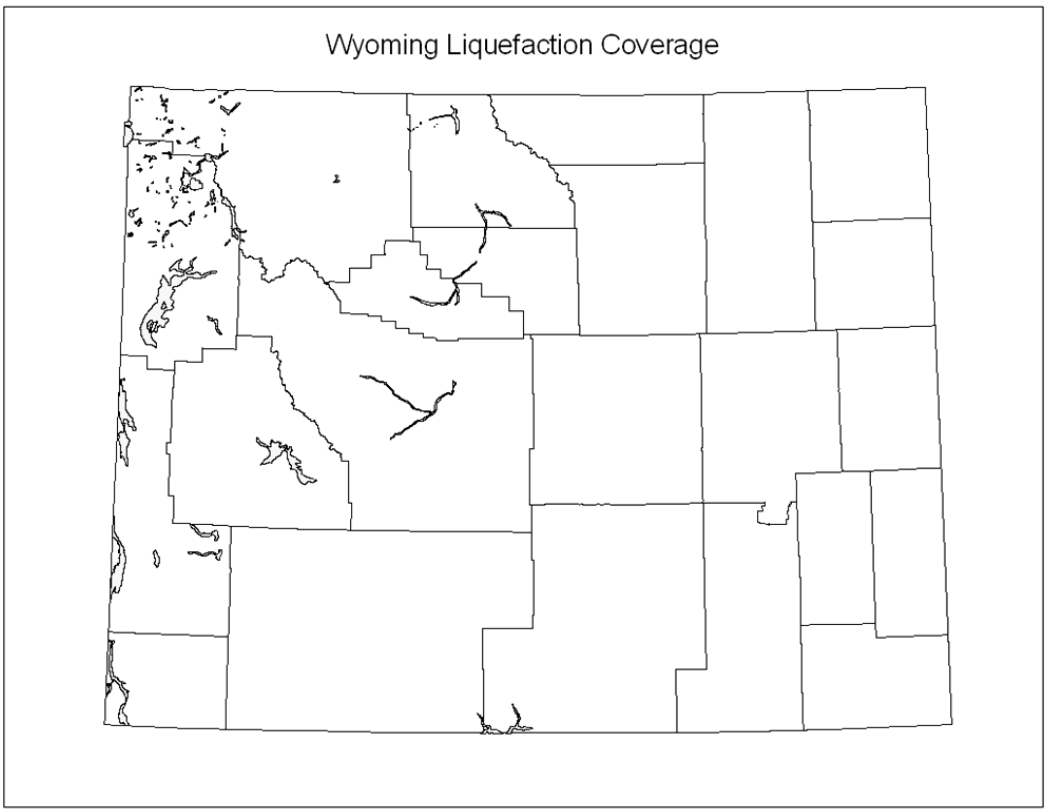


Liquefaction

There are few documented cases of liquefaction in Wyoming and the State Plan does not indicate any liquefaction in Albany County, and a small section of potential liquefaction in the southwest corner of Carbon County, as shown in Figure 4-21.[34]

[33] https://earthquake.usgs.gov/earthquakes/byregion/wyoming-haz.php
[34] Wyoming State Hazard Mitigation Plan

Figure 4-21 Potential Liquefaction Coverage



Extent

Earthquake magnitude is measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake through a measure of shock wave amplitude (Table 4-13). Each unit increase in magnitude on the Richter Scale corresponds to a 10-fold increase in wave amplitude, or a 32-fold increase in energy. Intensity is most commonly measured using the Modified Mercalli Intensity (MMI) Scale based on direct and indirect measurements of seismic effects. The scale levels are typically described using roman numerals, ranging from "I" corresponding to imperceptible (instrumental) events to "XII" for catastrophic (total destruction). A detailed description of the Modified Mercalli Intensity Scale of earthquake intensity and its correspondence to the Richter Scale is given in Table 4-14.

Table 4-13 Richter Scale[35]

Richter Magnitudes	Earthquake Effects
< 3.5	Generally not felt, but recorded.
3.5 - 5.4	Often felt, but rarely causes damage.

[35] FEMA

Richter Magnitudes	Earthquake Effects
5.4 - 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1 - 6.9	Can be destructive in areas up to about 100 kilometers across where people live.
7.0 - 7.9	Major earthquake. Can cause serious damage over larger areas.
8 or >	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

Table 4-14 Modified Mercalli Intensity Scale for Earthquakes[36]

Scale	Intensity	Description of Effects	Corresponding Richter Scale Magnitude
I	Instrumental	Detected only on seismographs.	
II	Feeble	Some people feel it.	< 4.2
III	Slight	Felt by people resting; like a truck rumbling by.	
IV	Moderate	Felt by people walking.	
V	Slightly strong	Sleepers awake; church bells ring.	< 4.8
VI	Strong	Trees sway; suspended objects swing, objects fall off shelves.	< 5.4
VII	Very strong	Mild alarm; walls crack; plaster falls.	< 6.1
VIII	Destructive	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged.	
IX	Ruinous	Some houses collapse; ground cracks; pipes break open.	< 6.9
X	Disastrous	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread.	< 7.3
XI	Very disastrous	Most buildings and bridges collapse; roads, railways, pipes and cables destroyed; general triggering of other hazards.	< 8.1
XII	Catastrophic	Total destruction; trees fall; ground rises and falls in waves.	> 8.1

Another way to express an earthquake's severity is to compare its acceleration to the normal acceleration due to gravity. Peak ground acceleration (PGA) measures the strength of ground movements in this manner and represents the rate in change of motion of the Earth's surface during an earthquake as a percent. PGA can be partly determined by what soils and bedrock characteristics exist in

[36] FEMA

the region. Unlike the Richter scale, PGA is not a measure of the total energy released by an earthquake, but rather of how hard the earth shakes at a given geographic area (the intensity). PGA is measured by using instruments including accelerographs and correlates well with the MMI scale. PGA is represented as %g, and is described in Table 4-15 below.

Table 4-15 PGA Intensity Descriptions

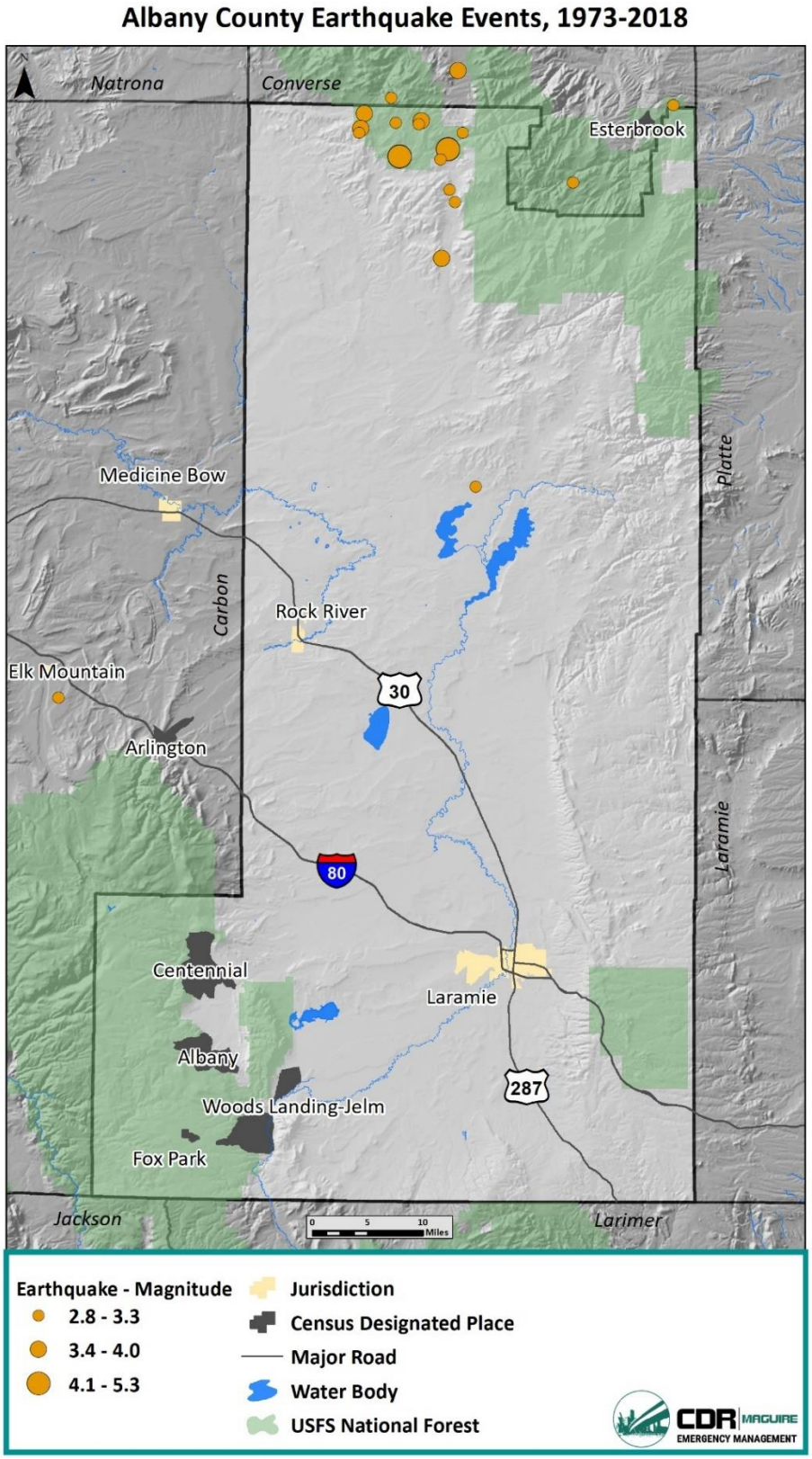
Perceived Shaking	Not Felt	Weak	Light	Moderate	Strong	Very Strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	None	None	None	Very light	Light	Moderate	Moderate/ Heavy	Heavy	Very Heavy
PEAK ACC (%G)	< .17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL (CM/S)	< 0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Previous Occurrences

Albany County

Albany County is seismically active though rarely impacted by very strong events. According to the Wyoming State Geological Survey (WSGS) and the USGS, 27 magnitude 2.5 and greater or Intensity III and greater earthquakes have been recorded throughout Albany County from 1871 to 2018. Hundreds of smaller ones have been reported, and northern Albany County is the most seismically active area in the county. However, not all of these earthquakes have been felt or resulted in damage. The most severe earthquake had an intensity of VI and a magnitude of 5.5 and occurred on 10/18/1984 in northern Albany County. That earthquake, with an epicenter located approximately four miles west-northwest of Toltec, was felt in Wyoming, South Dakota, Nebraska, Colorado, Utah, Montana, and Kansas. Stover (1985) reports that cracks were found in the exterior brick walls of the Douglas City Hall and a public school in Medicine Bow. Chimneys were cracked at Casper, Douglas, Guernsey, Lusk, and Rock River. A wall in a Laramie-area school was slightly cracked by the earthquake. The earthquake was one of the largest felt in eastern Wyoming. The USGS provides GIS locations of earthquake occurrence since 1973, shown in Figure 4-22. Although this is not a comprehensive data-set of all previous earthquake events, it is evident northern Albany County has experienced the majority of past earthquakes.

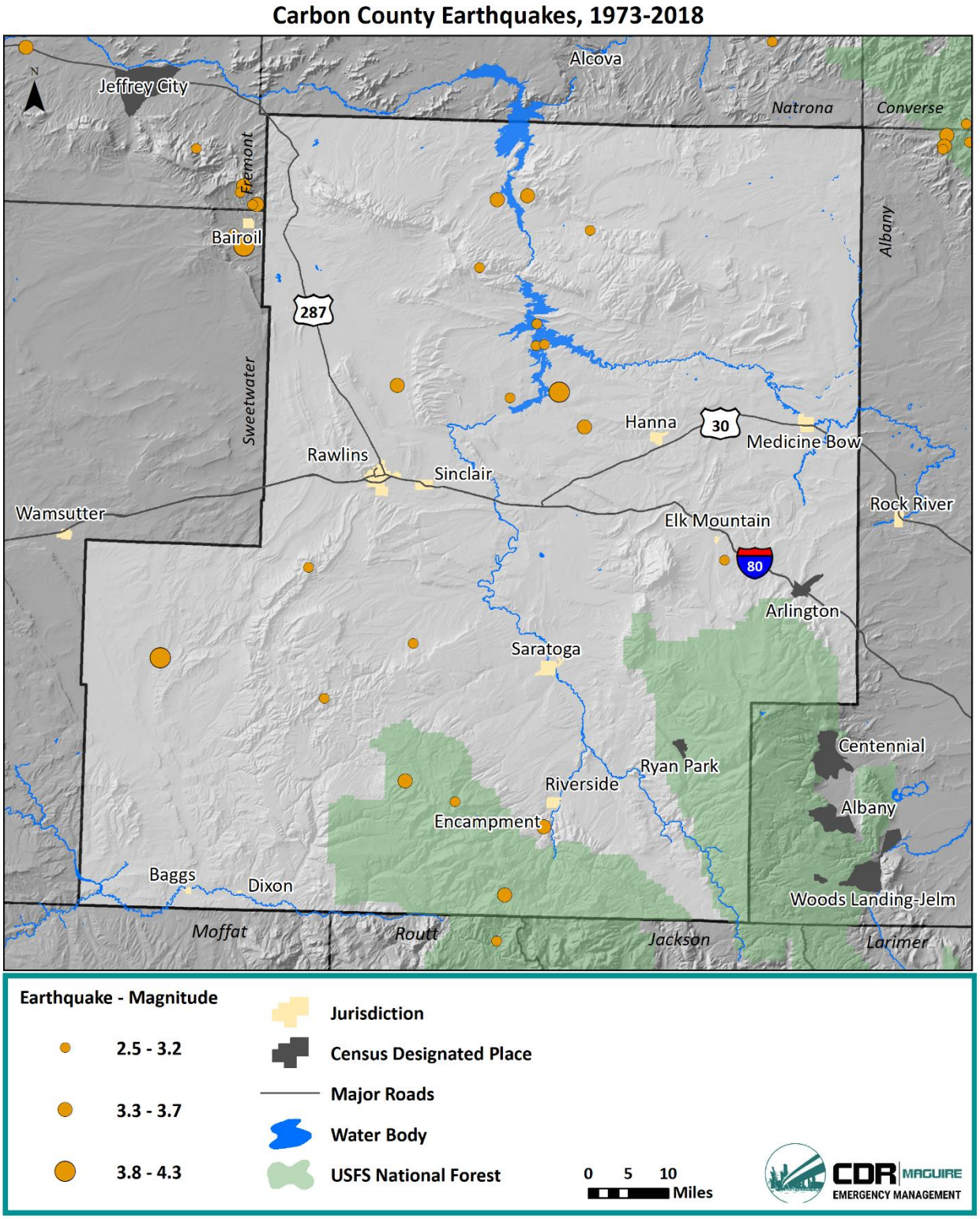
Figure 4-22 Albany County Earthquake Events



Carbon County

Thirty-five magnitude 2.0 or intensity II and greater earthquakes have been recorded in Carbon County according to the WSGS and USGS from 1871 to 2018. The most severe earthquake had a magnitude of 4.3 and occurred on 4/6/1999 in southwestern Carbon County, approximately 29 miles north-northwest of Baggs. It was felt in Rawlins, Sinclair, Baggs, Wamsutter, and Rock Springs. Residents of Rawlins reported that pictures fell off walls. The most significant damage occurred between Baggs and Creston Junction, and at Wamsutter. The owner of a ranch house, located approximately 30 miles north of Baggs, reported that cinder block walls in the basement of the home cracked, separated, and may have to be replaced. A motel and associated residence in Wamsutter also suffered cracks in the cinder-block walls of the basement. Figure 4-23 shows the USGS locations of previous earthquakes from 1973 to 2018. Based on these previous occurrences, earthquakes occur across the entire County.

Figure 4-23 Carbon County Earthquake Events



Additionally, earthquakes occurring in areas outside of Albany or Carbon counties have impacted people and infrastructure in the Region. Full details of previous occurrences for each county can be found in Appendix C.

Probability

The U.S. Geological Survey (USGS) publishes probabilistic acceleration maps for 500-, 1,000-, 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. Until recently, the 500-year map was often used for planning purposes for average structures, and was the basis of the most current Uniform Building Code. The new International Building Code, however, uses a 2,500-year map as the basis for building design. The maps reflect current perceptions on seismicity in Wyoming. Overall, in all three scenarios, the intensity of earthquakes increases moving north in both Albany and Carbon Counties. The likelihood for the highest intensity earthquake in each scenario is greatest in northern Albany County and the extreme northeast corner of Carbon County. Based on these maps, the highest intensity earthquake likely to occur in either county is an intensity of VII. A full description of the probabilistic acceleration maps can be found in Appendix C.[37]

Albany County

Based on previous occurrences, in Albany County there have been 27 magnitude >= 2.5 or Intensity >= III earthquakes in 147 years. This equates to a 18% annual chance of occurrence, or a likely probability.

Carbon County

Carbon County has experienced 35 magnitude 2.0 or intensity II earthquakes during the same time frame. This equates to 24% chance annual occurrence, also a likely probability.

Vulnerability Assessment

Inventory Exposed/Impacts

It can be assumed that all existing and future buildings and populations are at risk to the earthquake hazard. Previous events have results in cracked plaster and chimneys, broken windows, and shaken buildings. Additional potential impacts include building collapse and fire following earthquake due to natural gas line rupture. Based on the USGS probabilistic acceleration maps, the highest intensity earthquake experienced in either county is a VII, which may cause mild alarm, cracked walls, and falling plaster, although well-designed buildings are not expected to incur substantial damage.

Potential Losses

The most appropriate loss estimation methodology for seismic hazards involves scenario modeling using FEMA's Hazus loss estimation software. There are two levels of Hazus analysis, 'Standard,' which uses the default FEMA-derived datasets and damage functions, and 'Enhanced,' which uses independently compiled and accurately verified structure and infrastructure inventories and damage functions. The earthquake analysis conducted for this report includes a Standard level analysis using the latest version,

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[37] http://www.wrds.uwyo.edu/wrds/wsgs/hazards/quakes/seischar/seischar.html

Hazus-MH Earthquake Model V4.2. This risk assessment leveraged census tract data to conduct a Standard Hazus probabilistic scenario for both counties.

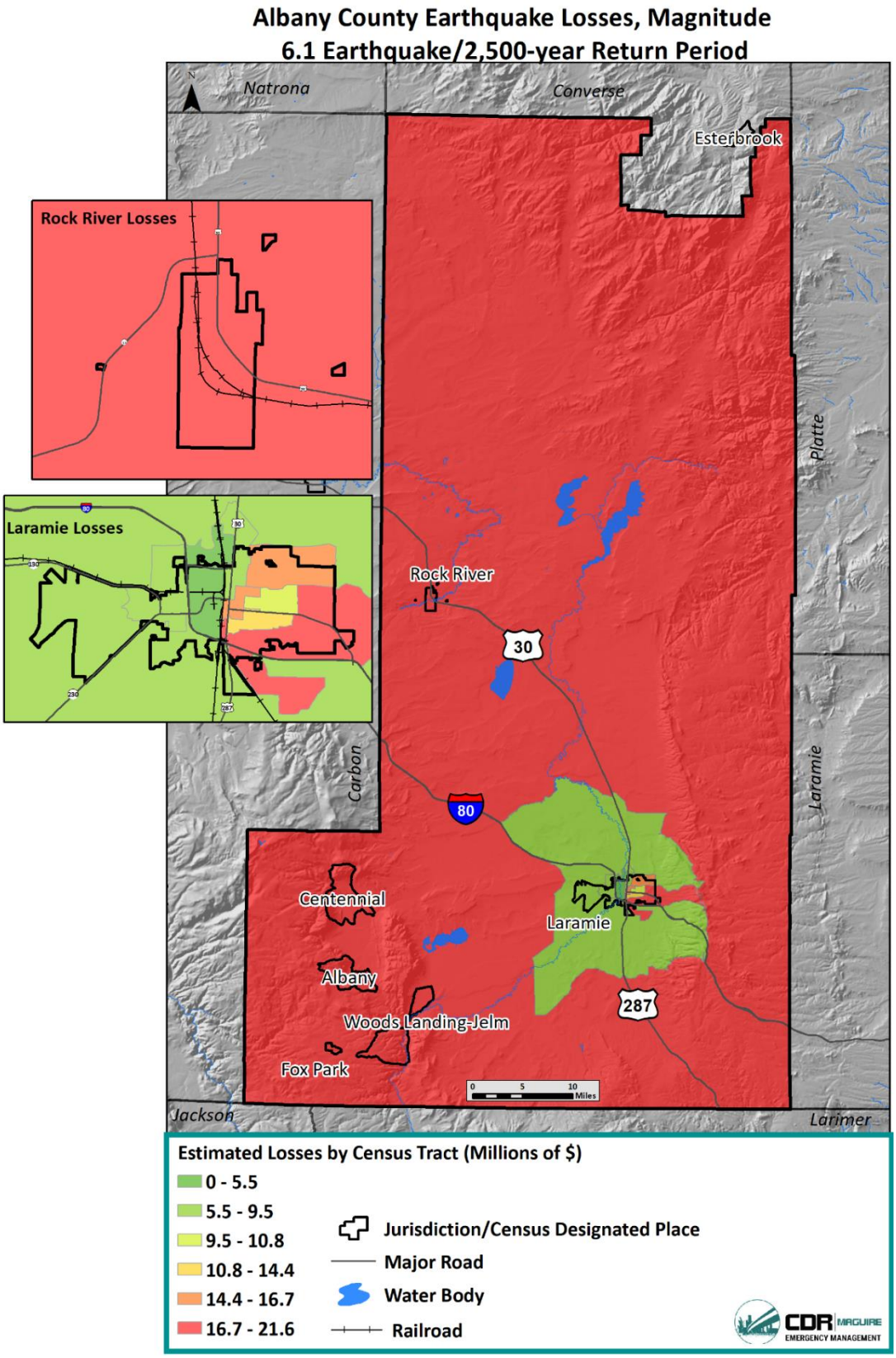
A 2,500-year return period probabilistic scenario was used for both counties (probability of 2% of occurrence in 50 years). A 2,500-year return period was chosen because the new International Building Code uses a 2,500-year map as the basis for building design. Based on the USGS probabilistic acceleration maps, the highest intensity earthquake that could be expected to occur in either county under a 2,500-year return period is an VII. This equates to a 6.1 magnitude earthquake. This value was used for both counties in the probabilistic scenario in Hazus.

Albany County

Hazus estimates that there are 14,000 buildings in the county which have an aggregate total replacement value of $3,889 million. Hazus estimates that about 1,374 buildings will be at least moderately damaged. This is over 9% of the buildings in the County. There are an estimated 13 buildings that will be damaged beyond repair. Residential homes will be the most impacted.

The total economic loss estimated for the earthquake is $141.98 million, which includes building and lifeline related losses based on the county's available inventory. The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake. The total building-related losses were $131.43 million; 20% of the estimated losses were related to the business interruption of the County. By far, the largest loss was sustained by the residential occupancies which made up over 62% of the total loss. Total building-related losses are mapped in Figure 4-24. Overall, the highest amount of losses in the City of Laramie could be expected in the eastern portion of the city. It is difficult to determine losses for the Town of Rock River due to it being included in a large Census Tract, covering much of unincorporated Albany County.

Figure 4-24 Albany County Hazus Earthquake Losses



The model estimates that a total of 30,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 34% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 1,200 truckloads (at 25 tons/truck) to remove the debris generated by the earthquake.

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 103 households to be displaced due to the earthquake. Of these, 71 people (out of a total population of 36,299) will seek temporary shelter in public shelters.

Hazus also estimates casualties due to the earthquake at three different times of day, including: 2:00 am representing a time when residential occupancy is at a maximum, 2:00 pm representing a time when business sectors are at a maximum, and 5:00 pm representing peak commute time. At 2:00 am, there is an estimated 17 casualties, with 15 of these being injuries that require medical attention but no hospitalization and two being injuries that require hospitalization but are not considered life-threatening. At 2:00 pm there is an estimated 31 casualties. Twenty-six of these being injuries that require medical attention but no hospitalization, four being injuries that require hospitalization but are not considered life-threatening, and one fatality. At 5:00 pm there is an estimated 23 casualties, with 20 of these being injuries that require medical attention but no hospitalization and three being injuries that require hospitalization but are not considered life-threatening. The highest overall total casualties can be expected in the eastern portion of the City of Laramie.

Overall, higher damages/losses are found in those areas that are more densely/highly populated, namely the City of Laramie and more specifically the eastern portion of the city. A number of variables are included in Hazus analyses in order to arrive at the estimated values of loss due to earthquake. For this reason, it is important to note that the Hazus loss estimates detailed above should not be used as a precise measure, but rather viewed from the perspective of the potential magnitudes of expected losses.

Carbon County

Hazus estimates that there are 8,000 buildings in the county which have an aggregate total replacement value of $2,019 million. Hazus estimates that about 1,105 buildings will be at least moderately damaged. This is over 13% of the buildings in the county. There are an estimated 16 buildings that will be damaged beyond repair. Residential homes will be the most impacted.

The total economic loss estimated for the earthquake is $127.75 million, which includes building and lifeline related losses based on the county's available inventory. The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake. The total building-related losses were $106.07 million; 19% of the estimated losses were related to the business interruption of the county. By far, the largest loss was sustained by the residential occupancies which made up over 63% of the total loss. Total building-related losses are mapped in Figure 4-25. Overall, the northern portion of the City of Rawlins would likely experience the most in building losses from this earthquake event, particularly the northwest portions. The Towns of Riverside, Saratoga, and Encampment would also experience high amounts of losses. Jurisdictional losses are portrayed in Figure 4-26.

Figure 4-25 Carbon County Hazus Earthquake Losses

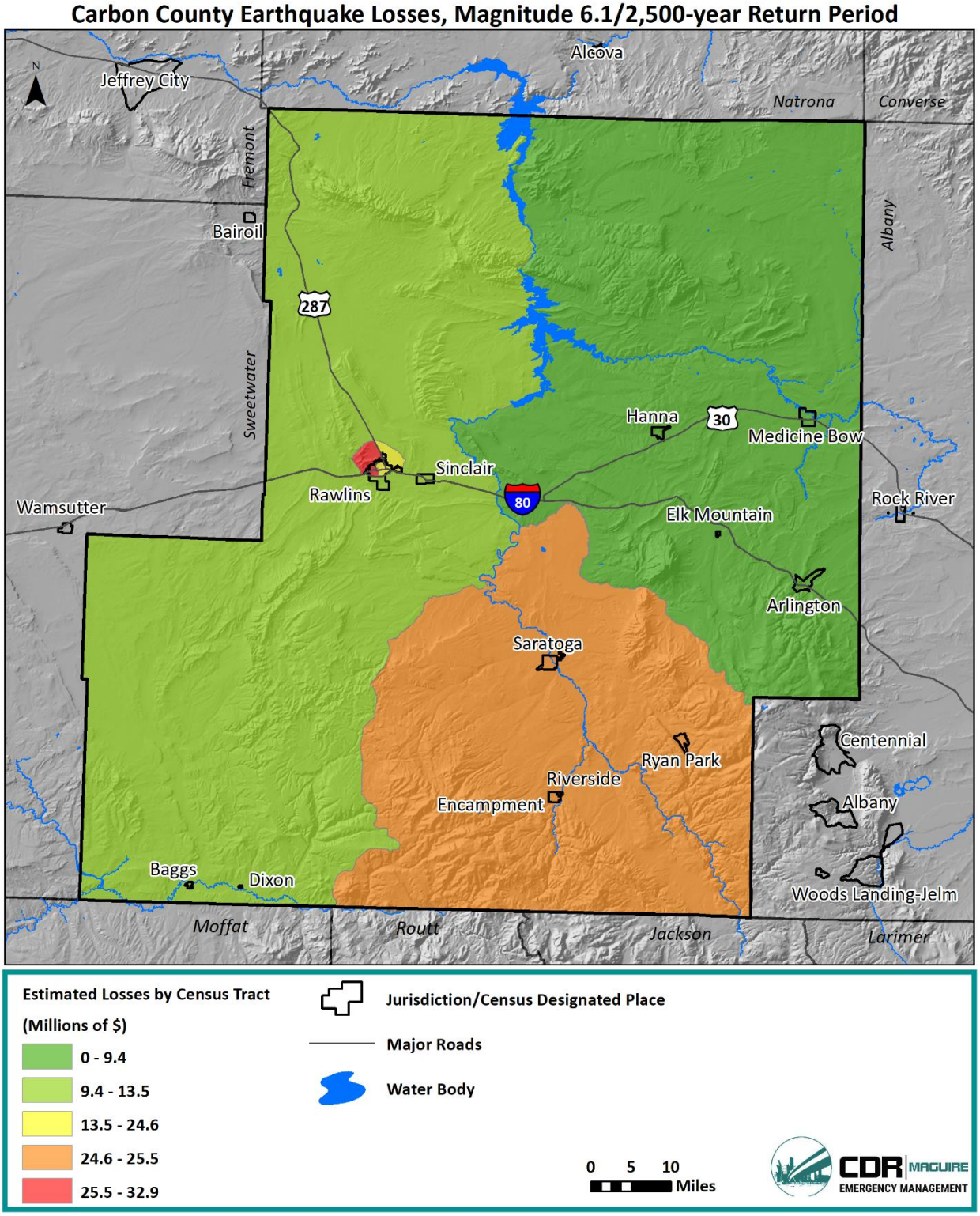
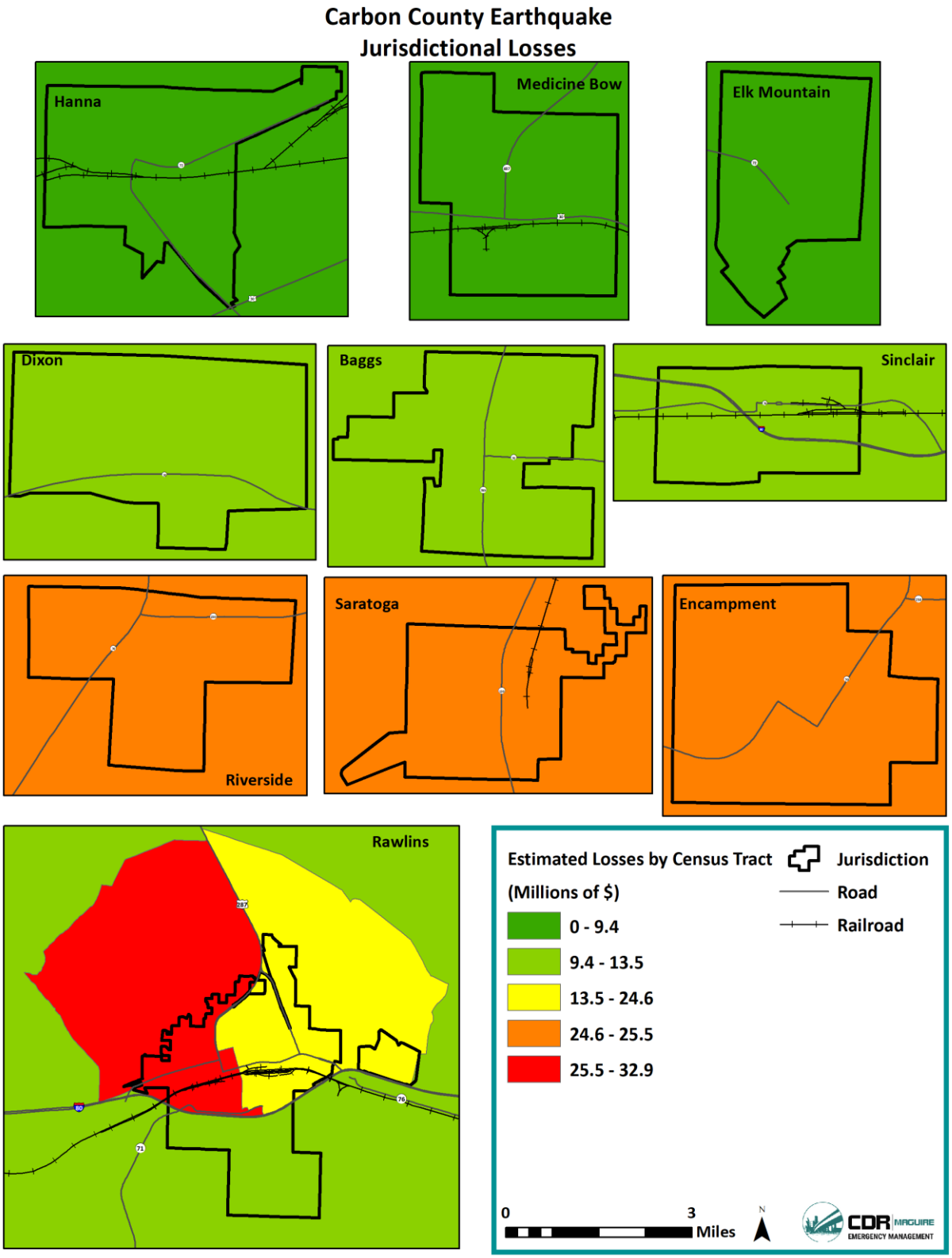


Figure 4-26 Carbon County Jurisdictional Hazus Earthquake Losses



The model estimates that a total of 24,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 34% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 960 truckloads (at 25 tons/truck) to remove the debris generated by the earthquake.

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 34 households to be displaced due to the earthquake. Of these, 18 people (out of a total population of 15,885) will seek temporary shelter in public shelters.

Hazus also estimates casualties due to the earthquake at three different times of day, including: 2:00 am representing a time when residential occupancy is at a maximum, 2:00 pm representing a time when business sectors are at a maximum, and 5:00 pm representing peak commute time. At 2:00 am, there is an estimated 11 casualties, with 10 of these being injuries that require medical attention but no hospitalization and one being injuries that require hospitalization but are not considered life-threatening. At 2:00 pm there is an estimated 22 casualties. Eighteen of these being injuries that require medical attention but no hospitalization, three being injuries that require hospitalization but are not considered life-threatening, and one fatality. At 5:00 pm there is an estimated 15 casualties, with 13 of these being injuries that require medical attention but no hospitalization and two being injuries that require hospitalization but are not considered life-threatening. The highest overall total casualties can be expected in the northern portion of the City of Rawlins.

Overall, higher damages/losses are found in those areas that are more densely/highly populated, namely the City of Rawlins and more specifically the northern portion of the city. It should be noted that Carbon County's rural character and large Census Tracts make it difficult to predict precise losses for many of its jurisdictions. A number of variables are included in Hazus analyses in order to arrive at the estimated values of loss due to earthquake. For this reason, it is important to note that the Hazus loss estimates detailed above should not be used as a precise measure, but rather viewed from the perspective of the potential magnitudes of expected losses.

Land Use and Development

With the unpredictable nature of earthquake epicenter locations, it is not feasible to identify specific areas where development may exacerbate the risk to an earthquake. As population and development continue to expand, continued enforcement of the unified construction code has great potential to mitigate increasing vulnerability and development pressure.

Earthquakes are relatively uncommon in both Albany and Carbon counties, and the probability is low that they will occur regularly in the future. However, if an event was to occur, there is potential for significant structural damage to occur near the epicenter. Additionally, as energy development and infrastructure continue to move into the Region, they will be at a risk to damages from earthquakes.

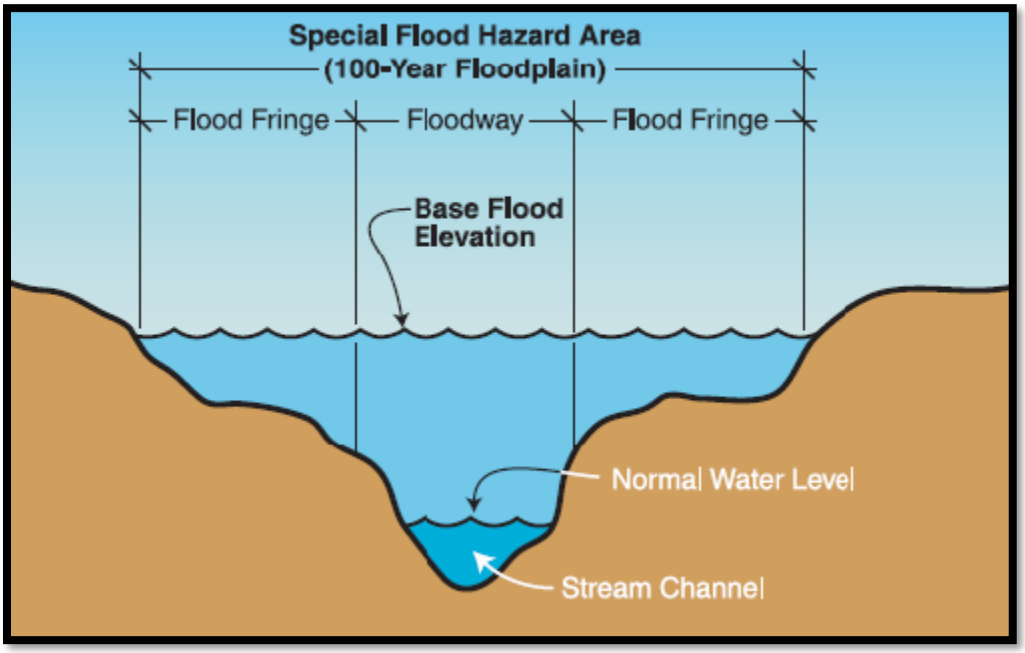
4.5.6. Flood

Description

A flood is a naturally occurring event for rivers and streams and occurs when a normally dry area is inundated with water. Excess water from snowmelt or rainfall accumulates and overflows onto the stream banks and adjacent floodplains. As illustrated in Figure 4-27 below, floodplains are lowlands adjacent to rivers, streams, and creeks that are subject to recurring floods. Flash floods, usually resulting from heavy rains or rapid snowmelt, can flood areas not typically subject to flooding, including urban

areas. Additionally, extreme cold temperatures can cause streams and rivers to freeze, causing ice jams and creating flood conditions.

Figure 4-27 Special Flood Hazard Area



Floods are considered hazards when people and property are affected. Nationwide, hundreds of floods occur each year, making it one of the most common hazards in all 50 states and U.S. territories. Most injuries and deaths from flooding happen when people are swept away by flood currents and most property damage results from inundation by sediment-filled water. Fast-moving water can wash buildings off of their foundations and sweep vehicles downstream. Pipelines, bridges, and other infrastructure can be damaged when high water combines with flood debris. Basement flooding can also cause extensive damage. Flooding can cause extensive damage to crop lands and bring about the loss of livestock. Several factors determine the severity of floods including rainfall intensity and duration, topography, and ground cover.

Floods can be slow or fast rising, but generally develop over a period of many hours or days. Causes of flooding relevant to the Region include:

- Rain in a general storm system
- Rain in a localized intense thunderstorm
- Dam failure (addressed in a separate hazard profile)
- Spring snowmelt
- Urban stormwater drainage
- Rain on fire-damaged watersheds

Riverine flooding originates from a body of water, typically a river, creek, or stream, as water levels rise onto normally dry land. Water from snowmelt, rainfall, freezing streams, ice flows, or a combination thereof causes the river or stream to overflow its banks into adjacent floodplains. Winter flooding usually occurs when ice in the rivers freeze from the bottom up during extreme cold spells, creating

dams. Spring flooding is usually the direct result of melting winter snow packs, heavy spring rains, or a combination of the two.

Flash floods can occur anywhere when a large volume of water flows or melts over a short time period, usually from slow moving thunderstorms or rapid snowmelt, or a combination of the two. Because of the localized nature of flash floods, clear definitions of hazard areas do not exist. These types of floods often occur rapidly with significant impacts. Rapidly moving water only a few inches deep can lift people off their feet, and only a depth of a foot or two is needed to sweep cars away. Most flood deaths result from flash floods.

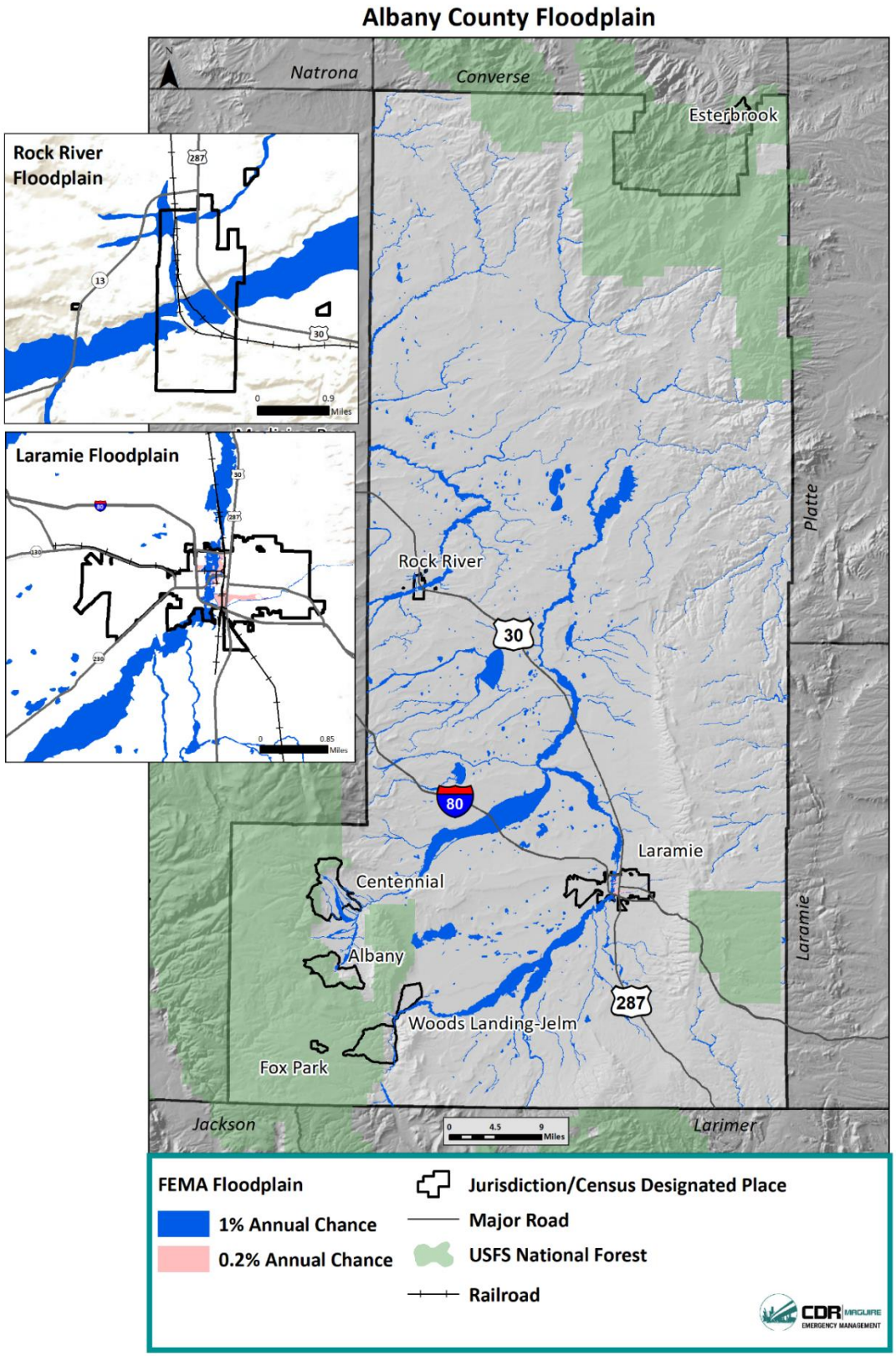
Location

Albany County

There are flood locations throughout the county. In order to capture these areas, the FEMA flood maps were referenced, and additional input was provided by the planning team and public.

In 2011, updated DFIRMs were published by FEMA for Albany County in support of the National Flood Insurance Program designating zones according to potential risk and impact due to flooding. The FEMA flood hazard maps indicate that there are areas of 1% annual chance (100-year flood) or 0.2% annual chance (500-year flood) floodplain areas in the county. This is shown in Figure 4-28 below, which highlight county and jurisdictional regulated floodplain boundaries. However, it should be noted that flooding outside of the FEMA designated flood areas is possible. For example, a more severe event, such as one greater than the 500-year flood, could easily exceed the boundaries shown. In addition, flash flooding is possible throughout the planning area. Additionally, localized street flooding is common in downtown Laramie. The Laramie River runs through the City of Laramie and the Little Laramie River runs north-northeast from Centennial. In addition, there is an expansive stream system (many intermittent) that contributes to flood risk in the county.

Figure 4-28 Albany County Floodplain[38]



In addition to the FEMA designated flood areas, several flood risk areas were noted by the planning team and the public. These include:

- Areas on the Laramie River southwest of the City
- Ranches are impacted by development related to interstate infrastructure (currently not being mitigated)
- Browns Creek and Little Laramie flooding impacts ranches and some County roads
- Northern Albany County is at risk to flash floods from previous years' wildfires
- Drainage problems in downtown Laramie continue to contribute to flash flooding
- Concerns of landslides in burn scar areas of the Badger Creek and Britania wildfires that may jam the Laramie River and cause flooding
- Creeks, in general, pose a risk for flooding. They are easily overwhelmed in heavy rain events.
- Spring Creek Basin (South Laramie)
- North Fork Brook including the North Fork subdivision (near Centennial)
- West side of Laramie River (river flooding)

Carbon County

During this Plan update, Carbon County's FEMA floodplain maps were being updated. Figure 4-29 and Figure 4-30 show the 1% annual chance flood and 0.2% annual chance flood floodplains in the County and jurisdictions. It should be noted these maps are currently best available data for floodplains in Carbon County, but are in a draft stage and have not gone through FEMA's quality control process. Significant floodplains exist in Medicine Bow, Elk Mountain, Saratoga and Baggs, with the 1% annual chance floodplain also going through Hanna, Sinclair, Riverside, Rawlins, and a small portion of Encampment. The Town of Dixon is the only jurisdiction that does not contain any floodplains. Detailed studies are also now available Medicine Bow, Saratoga, and Baggs.

Flooding is possible outside of the designated floodplains, and flash flooding is a concern for the County, particularly in mountainous areas. Sources of flooding in Carbon County include the North Platte River which flows north through Saratoga; its tributaries (Encampment River) flow through Encampment and Riverside. The Medicine Bow River flows from the east through Medicine Bow and then drains into the North Platte River.

[38] https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd

Figure 4-29 Carbon County Floodplain

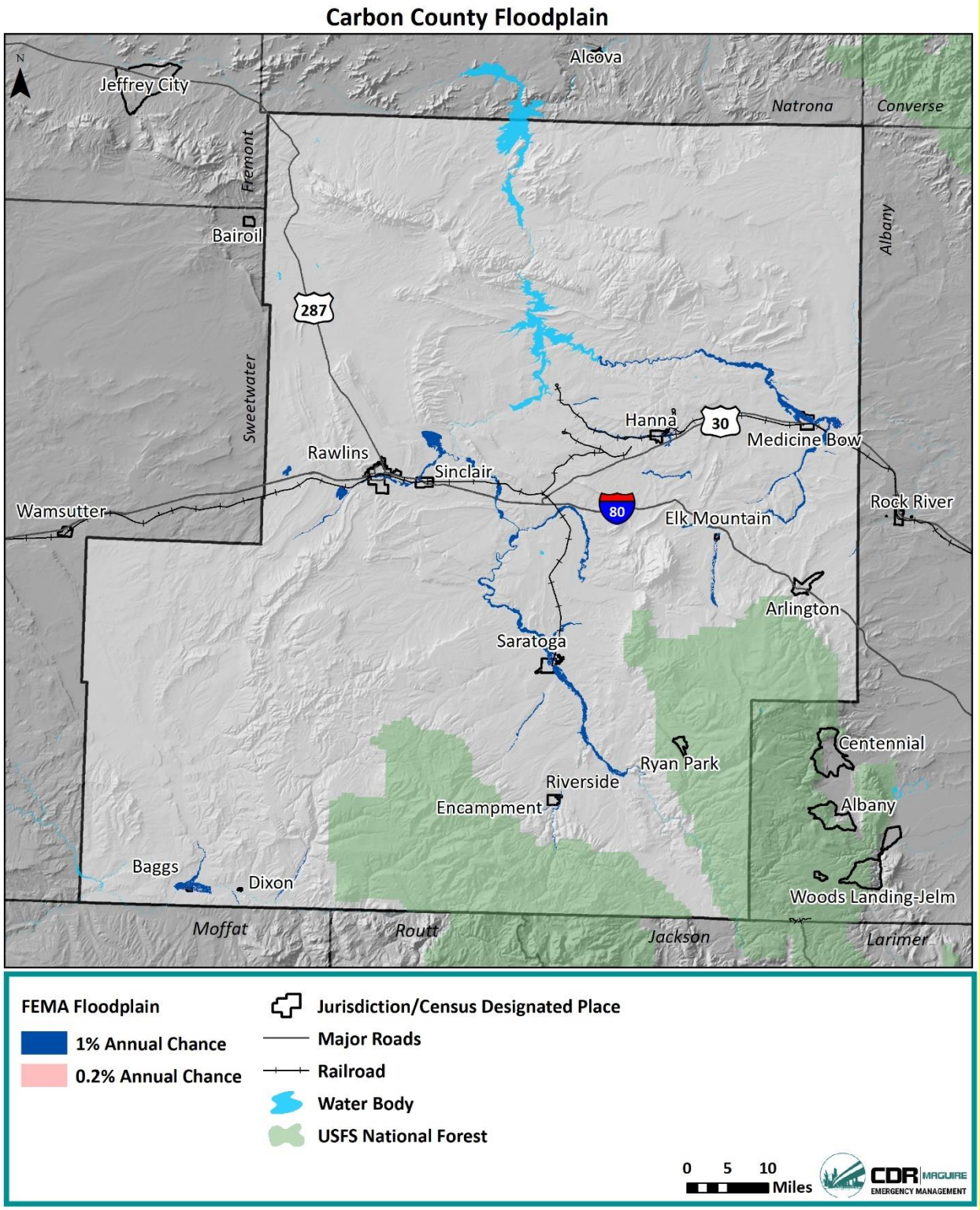
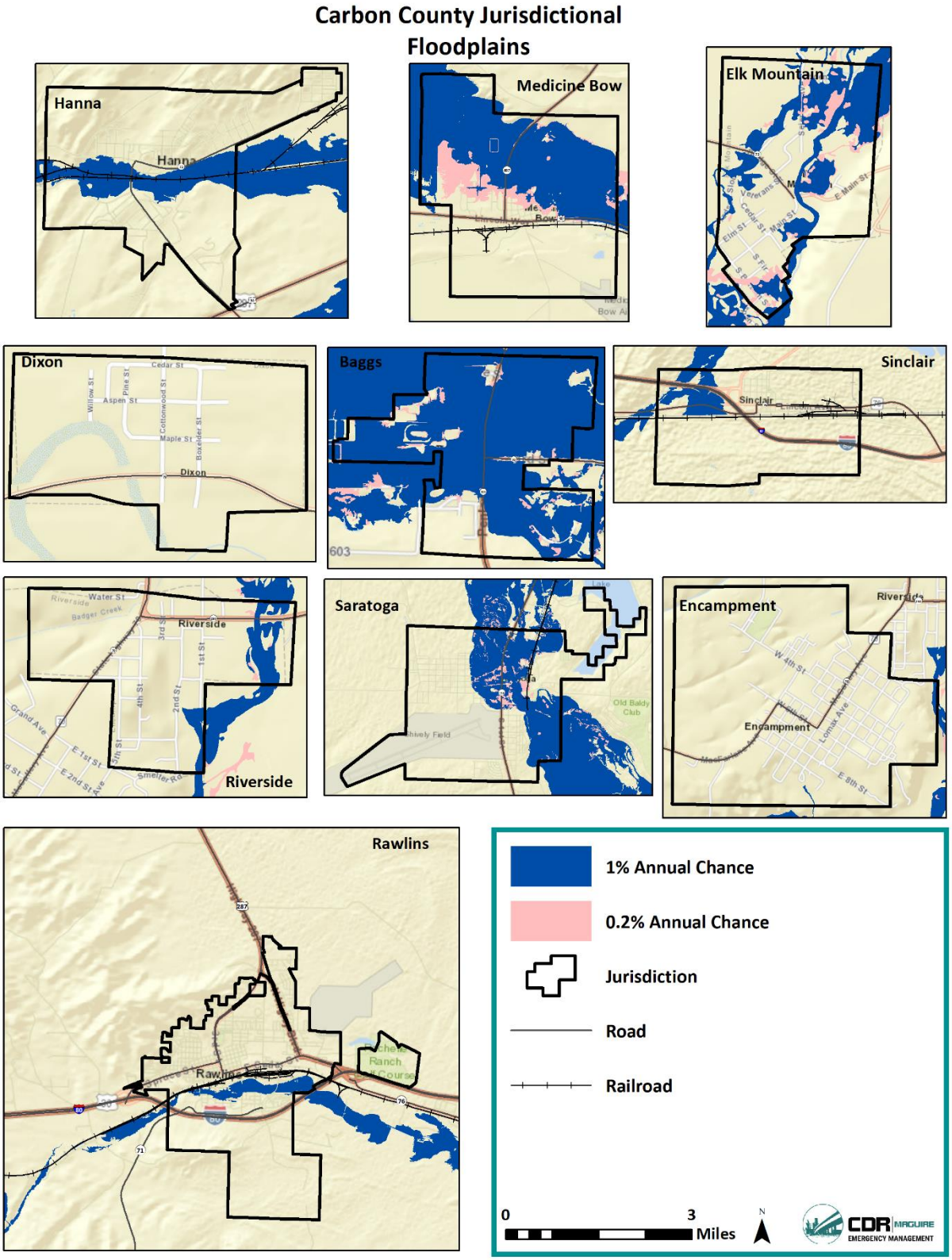


Figure 4-30 Carbon County Jurisdictional Floodplains



Extent

Flood events are typically described based on their frequency, such as the 100-year or 500-year flood event. Frequencies are determined by plotting a graph of the size of all known floods for an area and determining how often floods of a particular size occur. Another way of expressing the flood frequency is the chance of occurrence in a given year, which is the percentage of the probability of flooding each year. For example, the 100-year flood has a 1% chance of occurring in any given year, and the 500-year flood drops to a 0.2% chance of occurring in any given year. Therefore, they are commonly referred to as the 1% annual chance flood and 0.2% annual flood, respectively. It should be noted that flooding is possible every year and even multiple times each year.

The U.S. Army Corp of Engineers and FEMA have a role in defining floodplains. The U.S. Army Corps of Engineers calls a 100-year flood an Intermediate Regional Flood, while a Standard Project flood describes a major flood that could be expected to occur from a combination of severe meteorological and hydrologic conditions. Most dam and flood-related structures have been designed to meet 100-year flood conditions. FEMA develops digital Flood Insurance Rate Maps (DFIRMs) to indicate areas where mandatory flood insurance requirements apply (the 100-year flood). They are also used for planning purposes to identify hazard areas.

Previous Occurrences

Albany County

Several sources were consulted to determine previous flood events including the NCEI, USGS, University of Wyoming, planning team members, and local news sources.

A total of 30 flood events were reported from these sources beginning in 1905, and they are presented in detail in Appendix C. Eight of these events were reported in Laramie, one in Rock River, and 21 in unincorporated Albany County.

These events vary in nature. For example, there are 13 events reported through the University of Wyoming listed as historic, damaging flood events from 1905 through 2005.[39] The NCEI reported minor and severe flood and flash flood events beginning in 2007. Eleven flash flood events were reported between 2007 and 2018. Two deaths were reported due to drowning in swollen creeks. Based on this data, $31,800 in damages from flooding occurred in unincorporated Albany County and $112,000 to the City of Laramie.

According to SHELDUS data, from 1960 to 2018, flooding has caused $586,219 in property damages and $100,029 in crop damages, adjusted to 2017 dollars.

Carbon County

A total of 16 flood events were reported from the NCEI, USGS, University of Wyoming, planning team members, and local news sources beginning in 1905, and they are presented in detail in Appendix C. Two of these events were reported in Baggs, one in Dixon, one in Elk Mountain, three in Saratoga, two in Rawlins, and seven in unincorporated Carbon County.

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[39] http://wyofloods.wrds.uwyo.edu/Albany/historicalfloods.html

There are six events reported through the University of Wyoming listed as historic, damaging flood events from 1905 through 2005.[40] The NCEI reported minor and severe flood and flash flood events beginning in 2007. Four flash flood and two flood events were reported between 2007 and 2018. Four deaths and two injuries occurred during a flooding event in Ryan Park on 7/19/2011. Debris carried down by runoff from heavy rainfall clogged a drainage culvert on a small section of Highway 130, resulting in the water washing away the pavement around the culvert shortly after midnight on July 19. Four fatalities occurred when one vehicle drove into the washout, with its driver escaping injury. An emergency vehicle also drove into the washout, but the driver was able to escape. The reported events resulted in $5,225,000 in damages in unincorporated Carbon County. However, most of these damages were the result of dam failures, and not flooding alone. Flooding damages of $2,250 occurred near Saratoga.

According to SHELDUS data, from 1960 to 2018, flooding has caused $141,530 in property damages, adjusted to 2017 dollars. It should be noted that the SHELDUS damage information does not include the damages resulting from the dam failure in the University of Wyoming historic, damaging flood data.

NFIP Participation

Albany County

Albany County and the City of Laramie participate in the National Flood Insurance Program. The Town of Rock River does not participate. The County and City have a total of 59 policies in force for a total coverage of $12,714,100. There has been one paid loss in Albany County and two in the City of Laramie (as shown in Table 4-16) for a total of $24,326 in paid losses. Neither community participates in the Community Rating System (CRS).

Repetitive Loss and Severe Repetitive Loss Information was also requested through the state NFIP Coordinator (Kim Johnson). **According to information provided, there are no repetitive loss or severe repetitive loss structures in Albany County.** These are defined as an NFIP-insured structure that has had at least two paid flood losses of more than $1,000 each in any 10-year period since 1978. In addition, there are no substantial damage claims reported in the planning area.

Table 4-16 Albany County NFIP Participation

Community	Date of Entry	Current Effective Map Date	Policies in Force	Insurance in Force ($)	Number of Paid Losses	Total Claims ($)
Albany County	10/1/86	6/16/11	19	$4,748,800	1	$5,899
Laramie	7/16/79	6/16/11	40	$7,965,300	2	$18,427
Rock River	Not participating	6/16/11				

The County and City of Laramie will continue to comply with the NFIP. Each community has a designated floodplain administrator. New floodplain maps are being developed for the planning area.

[40] http://wyofloods.wrds.uwyo.edu/Carbon/historicalfloods.html

Once these are approved, the existing ordinances will be updated to reflect the floodplain areas in the new maps. Each community maintains a floodplain ordinance that regulates development in the floodplain. In Albany County it is the Flood Damage Prevention Resolution; in Laramie, it is the Unified Development Code. In the County, all residential structures in the Special Flood Hazard Areas must include freeboard at least two feet above base flood elevation. In the City, the ordinance calls for freeboard of 1 foot above base flood elevation for residential structures. No development is allowed in either community's floodway per the regulations. Also, other regulatory plans, including the County's Subdivision and Planning Regulations, recognize and incorporate floodplain awareness for new developments and permitting.

Carbon County

According to the NFIP Community Status Book, Carbon County entered the regular program in 1987. The County's Flood Map is dated 1/16/87 and according to the Community Status Book the area is minimally flood prone and no flood elevations are shown on the map. The table that follows details the NFIP status of the incorporated areas within the County.

As of March 24, 2019, there were 54 flood insurance policies in force across all jurisdictions in the County for a total coverage of $10,918,600. There has been a total of 21 paid losses for a total of $117,762. There has been one substantial damage claim in unincorporated Carbon County.

According to Kim Johnson, State of Wyoming National Flood Insurance Program Coordinator, **there is one repetitive loss building in the Town of Saratoga that has experienced $16,487 in total payments ($15,257 in building payments and $1,229 in contents). There are no severe repetitive loss buildings in Carbon County.**

Table 4-17 Carbon County NFIP Participation

Community	Date of Entry	Current Effective Map Date	Policies in Force	Insurance in Force ($)	Number of Paid Losses	Total Claims ($)	Substantial Damage Claims
Carbon County	1/16/87	1/16/87	14	$1,901,000	5	$10,929	1
Baggs	8/16/88	8/16/88	7	$1,605,800	8	$70,932	0
Dixon	9/30/87	9/30/87	0	0	0	0	0
Elk Mountain	11/04/87	11/04/87	5	$944,100	2	$6,154	0
Encampment	Not participating						
Hanna	Not participating	8/22/75					
Medicine Bow	12/01/12	12/01/12	0	0	0	0	0
Rawlins	12/11/85	No SFHA	4	$1,008,000	0	0	0
Riverside	7/2/87	7/2/87 (Minimally flood prone)	1	$140,000	0	0	0
Saratoga	10/1/86	10/1/86	23	$5,319,700	6	$29,747	0

Community	Date of Entry	Current Effective Map Date	Policies in Force	Insurance in Force ($)	Number of Paid Losses	Total Claims ($)	Substantial Damage Claims
Sinclair	Not participating						

The state is in the beginning stages of RiskMAP for Unincorporated Carbon County and all communities within Carbon County to include: Baggs, Dixon, Elk Mountain, Encampment, Hanna, Medicine Bow, Rawlins, Riverside, Saratoga, and Sinclair. This study will include revised hydrology and hydraulics and possibly revised base flood elevations (BFE). Most likely there will be areas not currently mapped included in the new study. The flood risk products developed as part of a flood risk project are designed to help communities effectively plan to mitigate flood risk. The multiple discussions throughout the process allow FEMA and its partners to provide guidance to local officials to help them identify mitigation opportunities that work for their community. Discovery Meetings for RiskMAP began in early March 2015 and the project is estimated to take 5-7 years to complete.

The Town of Saratoga completed a river study entitled "North Platte River Conceptual Design" (September 5, 2014). This study was prepared by the firms Wildland Hydrology and Stantec Consulting. This report presents a conceptual restoration design for approximately 10,750 ft of the North Platte River through the Town of Saratoga and was completed to achieve the objectives of the town and project stakeholders, including design of a self-sustaining, natural, stable river and reducing the flood stage through Saratoga. The results of the assessment indicated that the North Platte River through Saratoga has a high sediment supply from streambank erosion and is unable to transport the sediment load generated from the watershed. The conceptual design proposes to increase the sediment transport capacity, competence, and flow hydraulics.

The flood risk potential for the Town of Saratoga and private land owners along the North Platte River through Saratoga is dependent on the discharge of water and the sediment that is being produced by this 2,840 mi^2 watershed area. The existing channel configuration (a result of previous channel manipulations and dredging that were intended to reduce flood risk through town) promotes aggradation and increases the flood stage through town. The proposed design will help decrease the flood risk through town compared to existing conditions by reducing the width/depth ratio and excess sediment deposition. The largest discharge of record on the river was 16,900 cubic feet per second (cfs) recorded on June 9th, 2011. This flow rate represents an approximate 25-yr flow event. The 100-yr discharge was predicted to be 24,000 cfs. The conceptual design shows a minimal reduction in flood stage of ~0.1 ft at the Highway 130 Bridge and 0.0–0.3 ft flood stage reduction for the 100-yr storm over the entire project reach. The higher frequency floods will also have a slight reduction in flood stage. The biggest flood-reduction advantage is a result of the increased sediment transport capacity. The project will not increase flood stage, but the projected reductions are minimal.

Probability

Albany County

In Albany County, a total of 30 events were reported over 113 years, which equates to a 26% annual probability (likely).

Carbon County

In Carbon County, a total of 16 events were reported over 113 years, a 14% annual probability (likely).

Vulnerability Assessment

Inventory Exposed/Impacts

All current and future buildings and populations should be considered at risk to flooding, although buildings located in the 100 or 500-year floodplain are at a higher risk. The impacts of flooding can be severe. Impacts of flood include business interruption, mold issues, and damaged contents and equipment, to name a few. Just a few inches of water in a building could cause thousands of dollars in damage to the flooring and foundation of the structure. In cases where water rises above a few inches, electrical systems and appliances may need to be replaced.

Albany County

There are several factors that influence vulnerability of flooding in Albany County.

- When rain "holds" (rain systems stall) in the hills on the outer edges of the county, this often results in flooding in town. Heavy rain in the hills drains down and overwhelms city drainage systems.
- The amount of snowmelt that occurs, which typically impacts the county in May. Late spring snow storms can increase the amount of snow in the mountains. When rising temperatures follow this increase in snow accumulation, the snow can quickly melt, which can lead to flooding in Laramie.
- Headwaters from the North Platte River flow north from the Rocky Mountains in Colorado into Wyoming. Heavy rain and quick snowmelt can quickly overwhelm areas in Albany County (namely Wood's Landing).
- Wildfire burn scars can increase the speed at which rain reaches the town. Rain and runoff following large wildfires can quickly overwhelm city drainage systems.
- Previous precipitation – as with any area, recent precipitation amounts will affect each watershed's ability to absorb additional rain or snowmelt impacts.

As noted above, there are several "hot spots" of flooding including Spring Creek, downtown Laramie, and south Laramie. Spring Creek is a major concern for possible injury or loss of life, as kids often play in the area.

Carbon County

Spring snow melt is a major factor in flooding in Carbon County. This is exacerbated if it rains on top of snow in the spring. Areas near steeper slopes can be impacted by flash flooding during this time. Additionally, burn scar areas from wildfires are more vulnerable to flash flooding. Flash flooding can also be a major concern for people recreating in the National Forest Areas, as demonstrated by the July 2011 event.

Most floods can be predicted with advanced warning of several hours (or days) though some events may be unexpected, caused by an unanticipated amount of rain. This is common with urban and flash flooding events.

Potential Losses

Albany County

Planning level flood loss estimates were conducted for Albany County using Hazus-MH (Hazus) software. Hazus is FEMA's GIS-based natural hazard loss estimation software. The Hazus flood model results include analysis for Albany County, modeling streams draining a 10 square mile minimum drainage area,

using 30 meter (1 arc second) Digital Elevation Models (DEM). Hydrology and hydraulic processes utilize the DEMs, along with flows from USGS regional regression equations and stream gauge data, to determine reach discharges and to model the floodplain. Losses are then calculated using Hazus national baseline inventories (buildings and population) at the census block level, in addition to critical infrastructure sited at the local level.

Hazus produces a flood polygon and flood-depth grid that represents the 100-year floodplain. The 100-year floodplain represents a flood that has a 1% chance of being equaled or exceeded in any single year. While not as accurate as official flood maps, these floodplain boundaries are available for use in GIS and could be valuable to communities that have not been mapped by the National Flood Insurance Program. Hazus generated damage estimates are directly related to depth of flooding and are based on FEMA's depth-damage functions. For example, a two-foot flood generally results in about 20% damage to a structure (which translates to 20% of the structure's replacement value). The Hazus flood analysis results provide number of buildings impacted, estimates of the building repair costs, and the associated loss of building contents and business inventory. Building damage can cause additional losses to a community as a whole by restricting the building's ability to function properly. Income loss data accounts for losses such as business interruption and rental income losses as well as the resources associated with damage repair and job and housing losses.

Potential losses derived from Hazus used default national databases and may contain inaccuracies; loss estimates should be used for planning level applications only. The damaged building counts generated are susceptible to rounding errors and are likely the weakest output of the model due to the use of census blocks for analysis. In rural Wyoming, census blocks are large and often sparsely populated or developed, which may create inaccurate loss estimates. Hazus assumes population and building inventory to be evenly distributed over a census block; flooding may occur in a small section of the census block where there are not actually any buildings or people, but the model assumes that there is damage to that block. In addition, excessive flood depths may occur due to problems with a DEM or when modeling lake flooding. Errors in the extent and depth of the floodplain may also be present from the use of 30-meter digital elevation models. Hazus Enhance (Level II) analyses based on local building inventory, higher resolution terrain models, and Digital Flood Insurance Rate Maps (DFIRMs) could be used in the future to refine and improve the accuracy of the results.

Maps and Results

According to the Hazus model output, 126 buildings would be impacted by a county-wide 100-year flood, in which 78 would be at least moderately damaged. An estimated 36 buildings would be completely destroyed. All of these damages would be to residential buildings. Additionally, the model estimates 392 households (or 1,175 people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 25 people (out of a total population of 36,299) will seek temporary shelter in public shelters. The total economic loss estimated for the flood is $78.56 million, which represents 12% of the total replacement value of the county's building stock. The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood. The total building-related losses were $32.08 million, in which 59% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 44% of the total loss.

Figure 4-31 shows the Hazus generated flood depths for a 1% annual chance flood event for the county and Figure 4-32 shows total losses from this event for the county. According to the Hazus analysis, the highest flood depths will occur just west of the City of Laramie. The highest flood losses are projected to occur near the Laramie River through the center of the City of Laramie. The highest losses in the Town of Rock River are projected to occur just south of Highway 30. Overall, of the estimated $78.56 million in total losses Albany County is projected to experience from a 1% annual chance flood, the City of Laramie is estimated to experience $50,606,000 in total losses, the Town of Rock River $772,000 in losses, and unincorporated Albany County $27,181,000 in total losses.

Figure 4-31 Albany County Hazus 1% Annual Chance Flood Depth

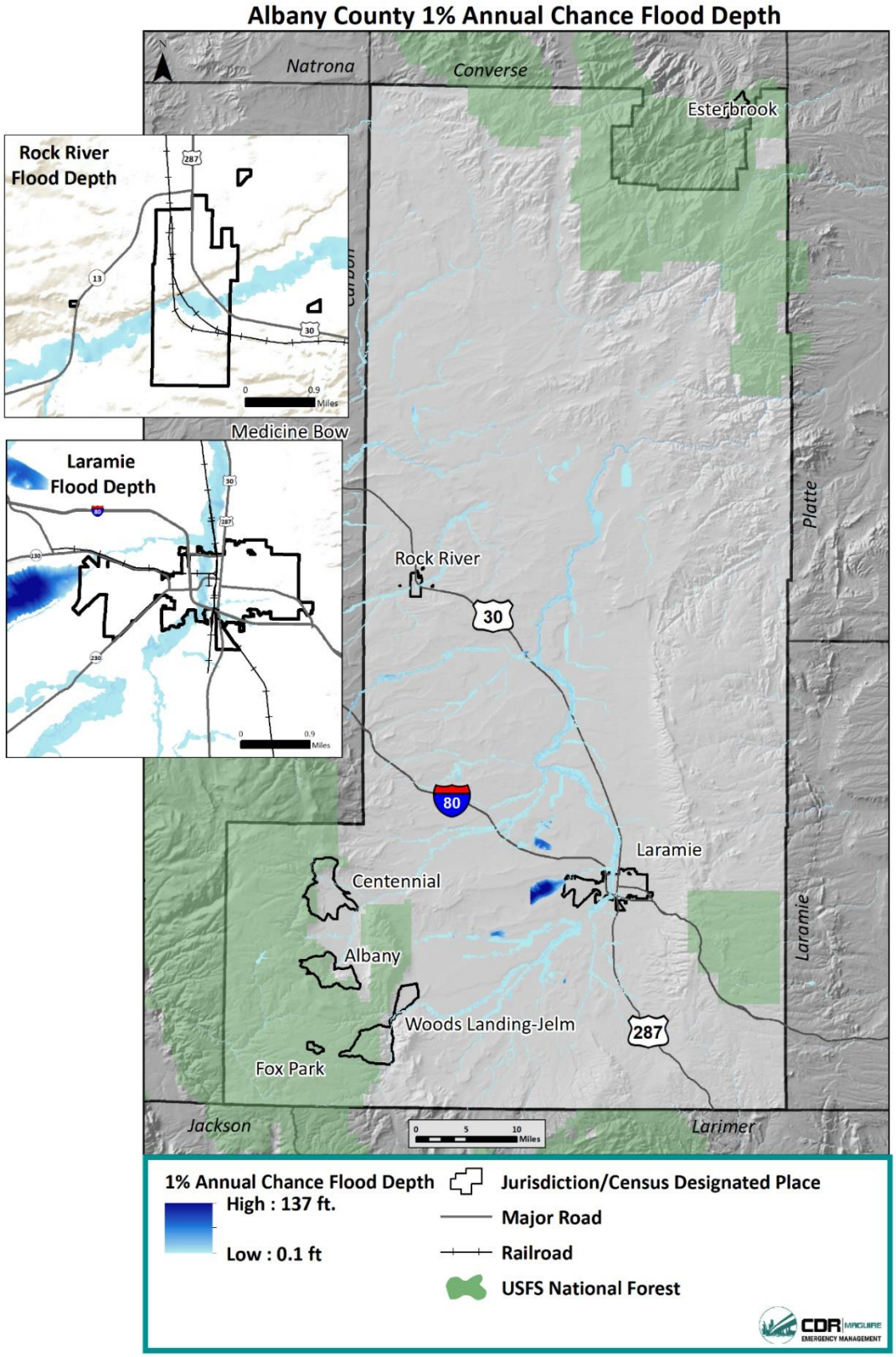
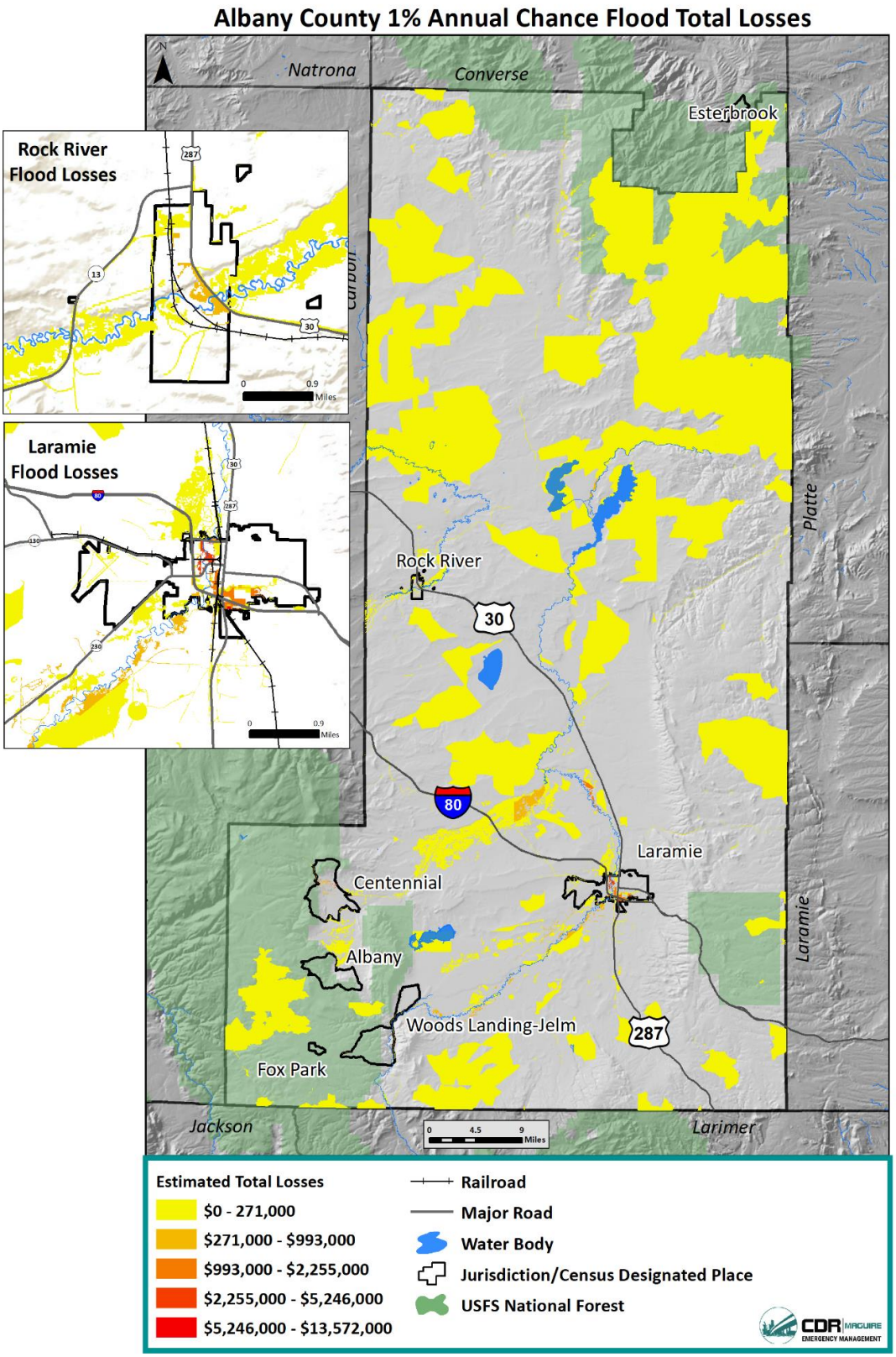


Figure 4-32 Albany County Hazus 1% Annual Chance Flood Losses



Carbon County

In place of a Hazus analysis in Carbon County, a GIS analysis was conducted to determine the number and value of parcels that intersect with the draft 100-year floodplain. It is important to note that this analysis only includes parcel information, rather than building footprints, and that government buildings are listed as "exempt" and therefore their value is not reflected in this analysis. The results of the analysis are shown in Table 4-18 below. The City of Rawlins as the highest count of parcels that intersect with the floodplain, and unincorporated Carbon County has the highest value of parcels that intersect with the floodplain.

Table 4-18 Parcels in the 100-year Floodplain

Jurisdiction	Count	Actual Value	Assessed Value
Baggs	290	$25,590,359	$2,433,387
Dixon	-	$0	$0
Elk Mountain	75	$10,178,106	$966,928
Encampment	12	$1,044,346	$99,215
Hanna	82	$2,918,834	$277,294
Medicine Bow	177	$14,987,996	$1,423,838
Rawlins	1,078	$91,952,869	$8,735,619
Riverside	27	$3,545,275	$336,813
Saratoga	677	$100,600,606	$9,565,743
Sinclair	5	$1,285,303	$147,704
Unincorporated Carbon County	488	$131,418,388	$12,484,984
Totals	**2,911**	**$383,522,082**	**$36,471,525**

Additionally, according to SHELDUS data, from 1960 to 2018, flooding has caused $141,530 in property damages, adjusted to 2017 dollars. This equates to approximately $2,440 in annual damages to the County.

Land Use and Development

Albany County

Increasing population in the county puts a greater number of people and property at risk, however continuing to regulate development in the floodplain helps reduce the risk. Albany County is experiencing an increase in population across all jurisdictions. It will be imperative that that future development plans take into account not only how many parcels are affected within the 100-year flood zone, but also the added risk of development activity that could alter the natural floodplain of the area. Development south of Laramie may be vulnerable to flooding, as that area already experiences impacts from flooding. Additionally, development around the communities near the Medicine Bow National Forest, or northern Albany, that are around steep slopes or near the WUI/wildfire burn scars will be vulnerable to flash floods. The County and the City of Laramie both participate in the NFIP and regulate floodplain development. This will help reduce the risk of flooding on future development. However, Rock River is also experiencing population growth, and does not participate in the NFIP.

Carbon County

Although not currently experiencing population growth, in Carbon County population can vary widely based on energy development. Regulating new development can help reduce the risk of new structures from flooding. All jurisdictions except for the Towns of Hanna, Encampment, and Sinclair participate in the NFIP and regulate floodplain development. Additionally, the county is going through the RiskMAP process and obtaining Base Level Engineering (BLE) data for highly accurate flood risk mapping for the entire county. This will provide the County and its municipalities with an opportunity to reduce the vulnerability of new development by avoiding these hazard areas.

In addition to land-use planning, zoning, and codes applicable to new development, flood mitigation measures can include structural and non-structural measures to address susceptibility of existing structures. Flood mitigation measures such as acquisition, relocation, elevation-in-place, wet/dry flood proofing, and enhanced storm drainage systems all have the potential to effectively reduce the impact of flood in the Region.

4.5.7. Geologic Hazards (Landslide/Land Subsidence/Mine Collapse)

Description

Landslides

Landslides occur when masses of rock, earth, or debris move down a slope, including rock falls, deep failure of slopes, and shallow debris flows. There are several types of landslide movement as described by the USGS and supported by Figure 4-33 below.

Slides

In addition to the general definition above, the more restrictive use of the term refers only to mass movements, where there is a distinct zone of weakness that separates the slide material from more stable underlying material. The two major types of slides are rotational slides and translational slides.

> **Rotational slide**: This is a slide in which the surface of rupture is curved concavely upward and the slide movement is roughly rotational about an axis that is parallel to the ground surface and transverse across the slide (See Figure 4-33, item A).
> **Translational slide**: In this type of slide, the landslide mass moves along a roughly planar surface with little rotation or backward tilting (See Figure 4-33, item B). A block slide is a translational slide in which the moving mass consists of a single unit or a few closely related units that move downslope as a relatively coherent mass (See Figure 4-33, item C).

Falls

Falls are abrupt movements of masses of geologic materials, such as rocks and boulders that become detached from steep slopes or cliffs. Separation occurs along discontinuities (e.g. fractures, joints, and bedding planes) and movement occurs by free-fall, bouncing, and rolling. Falls are strongly influenced by gravity, mechanical weathering, and the presence of interstitial water (See Figure 4-33, item D).

Topples

Toppling failures are distinguished by the forward rotation of a unit or units about some pivotal point, below or low in the unit, under the actions of gravity and forces exerted by adjacent units or by fluids in cracks (See Figure 4-33, item E).

Flows

There are five basic categories of flows that differ from one another in fundamental ways.

Debris flow: A debris flow is a form of rapid mass movement in which a combination of loose soil, rock, organic matter, air, and water mobilize as a slurry that flows downslope (See Figure 4-33, item F). Debris flows include <50% fine sediment. Debris flows are commonly caused by intense surface-water flow, due to heavy precipitation or rapid snowmelt that erodes and mobilizes loose soil or rock on steep slopes. Debris flows also commonly mobilize from other types of landslides that occur on steep slopes, are nearly saturated, and consist of a large proportion of silt- and sand-sized material. Debris-flow source areas are often associated with steep gullies, and debris-flow deposits are usually indicated by the presence of debris fans at the mouths of gullies. Fires that denude slopes of vegetation intensify the susceptibility of slopes to debris flows.

Debris avalanche: This is a variety of very rapid to extremely rapid debris flow (See Figure 4-33, item G).

Earthflow: Earthflows have a characteristic "hourglass" shape (See Figure 4-33, item H). The slope material liquefies and runs out, forming a bowl or depression at the head. The flow itself is elongated and usually occurs in fine-grained materials or clay-bearing rocks on moderate slopes and under saturated conditions. However, dry flows of granular material are also possible.

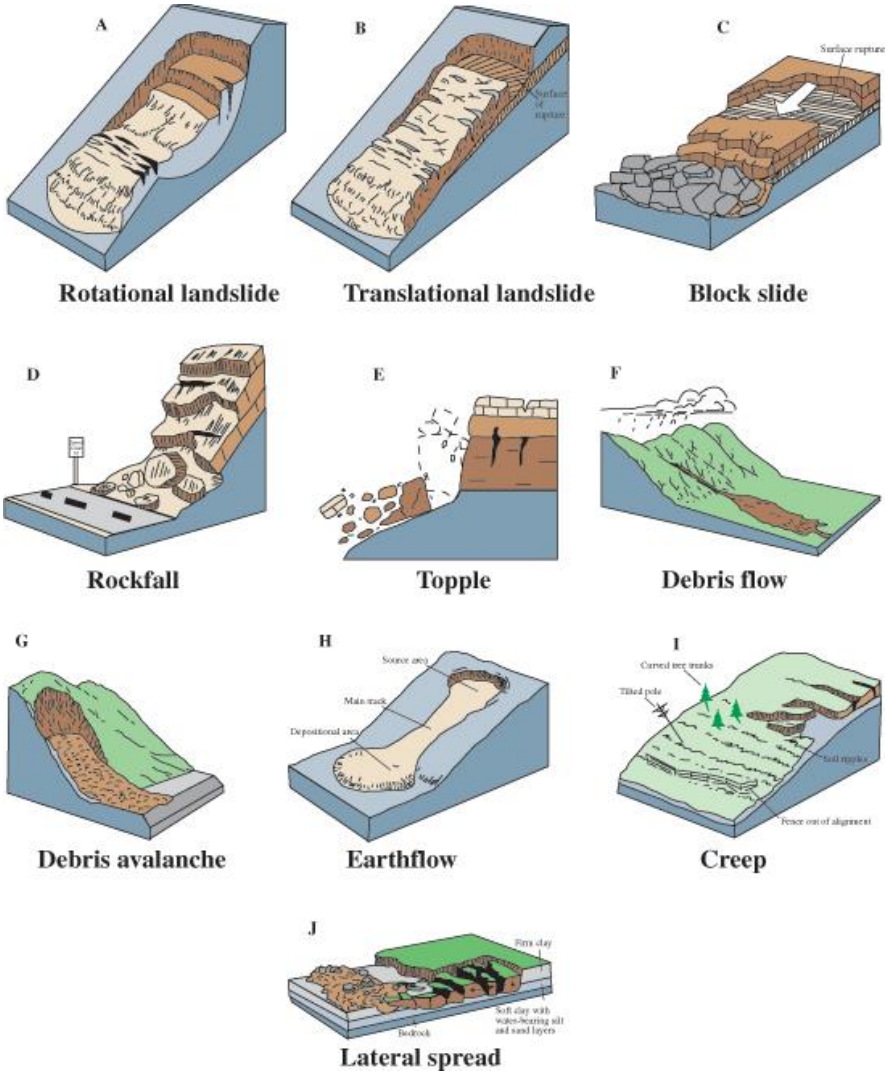
Mudflow: A mudflow is an earthflow consisting of material that is wet enough to flow rapidly and that contains at least 50 percent sand-, silt-, and clay-sized particles. In some instances, for example in many newspaper reports, mudflows and debris flows are commonly referred to as "mudslides."

Creep: Creep is the imperceptibly slow, steady, downward movement of slope-forming soil or rock. Movement is caused by shear stress sufficient to produce permanent deformation, but too small to produce shear failure. There are generally three types of creep: (1) seasonal, where movement is within the depth of soil affected by seasonal changes in soil moisture and soil temperature; (2) continuous, where shear stress continuously exceeds the strength of the material; and (3) progressive, where slopes are reaching the point of failure as other types of mass movements. Creep is indicated by curved tree trunks, bent fences or retaining walls, tilted poles or fences, and small soil ripples or ridges (See Figure 4-33, item I).

Lateral Spreads

Lateral spreads are distinctive because they usually occur on very gentle slopes or flat terrain. The dominant mode of movement is lateral extension accompanied by shear or tensile fractures. The failure is caused by liquefaction, the process whereby saturated, loose, cohesionless sediments (usually sands and silts) are transformed from a solid into a liquefied state. Failure is usually triggered by rapid ground motion, such as that experienced during an earthquake, but can also be artificially induced. When coherent material, either bedrock or soil, rests on materials that liquefy, the upper units may undergo fracturing and extension and may then subside, translate, rotate, disintegrate, or liquefy and flow. Lateral spreading in fine-grained materials on shallow slopes is usually progressive. The failure starts suddenly in a small area and spreads rapidly. Often the initial failure is a slump, but in some materials movement occurs for no apparent reason. Combination of two or more of the above types is known as a complex landslide (See Figure 4-33, item J).

Figure 4-33 Types of Landslides[41]



Land Subsidence/Mine Collapse

Land subsidence is defined as the gradual settling or sudden sinking of the Earth's surface due to the subsurface movement of Earth materials. Causes of land subsidence include groundwater pumpage, aquifer system compaction, drainage of organic soils, underground mining, hydrocompaction, natural compaction, sinkholes, and thawing permafrost. The primary cause of land subsidence in Region 3 is due to mine collapse, therefore the following sections will evaluate the land subsidence hazard in terms of mine collapse.

Today, there are nearly 4,000 abandoned mines throughout the State. The State Plan provides a history of mining in the state to describe the mine collapse hazard:

[41] http://pubs.usgs.gov/fs/2004/3072/images/Fig3grouping-2LG.jpg

> "Underground coal mining began in Wyoming during the 1860s. Many of the early coal mines were not designed and constructed well; as a result the underground pillars failed. If enough pillars failed, the cap rock in the mine would collapse, and the effects of the collapse would reach the surface in some cases. If the effects of the collapse reached the surface, a subsidence pit would form. Not all subsidence was due to poor design, however. In some cases, the pillars were pulled as mining retreated from an area. In other cases, fires would occur in mines, resulting in a loss of strength in the pillars and cap rock."

Location

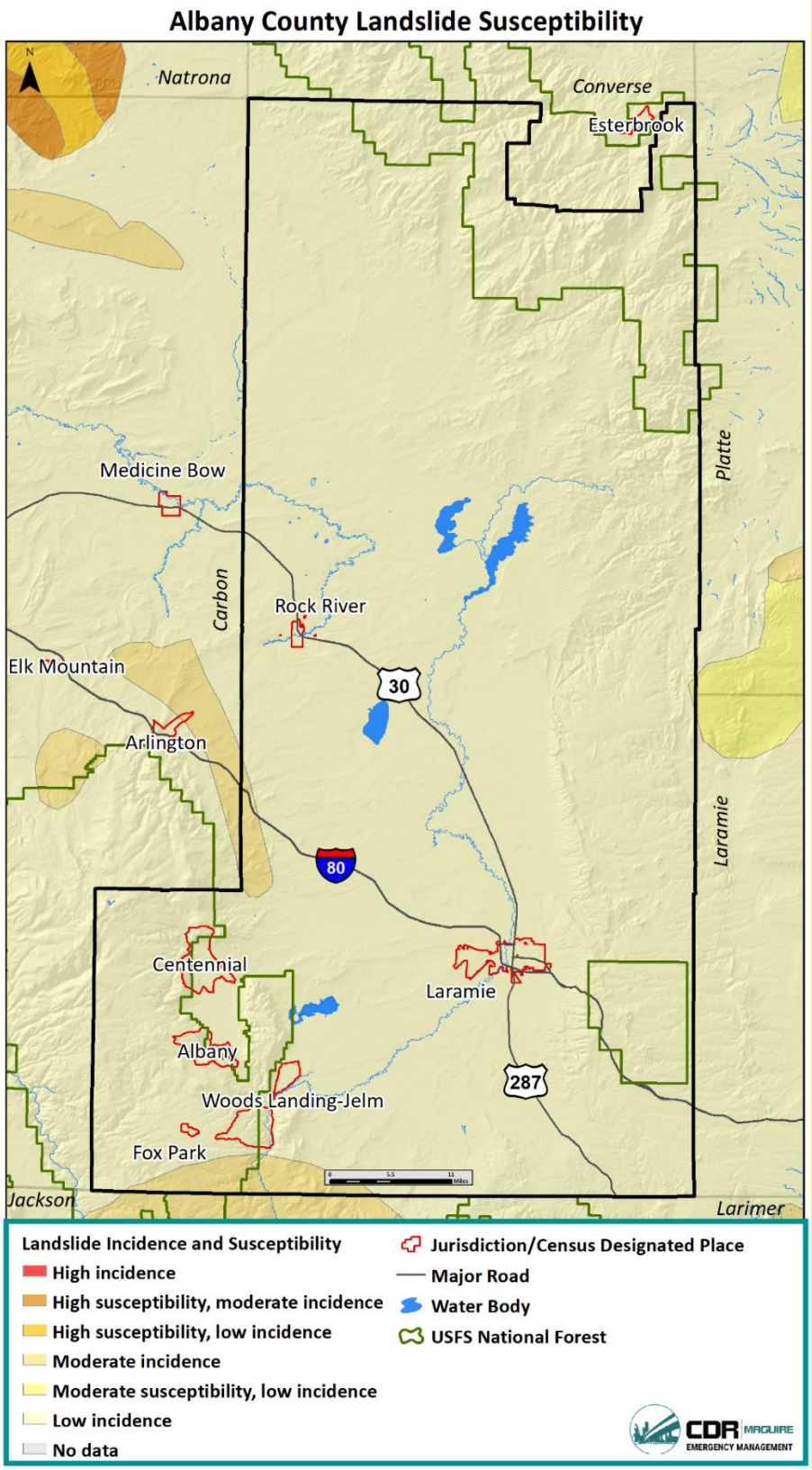
Landslide

Albany County

According to the Wyoming Geological Survey, parts of Wyoming have some of the highest landslide densities in the United States. Every year landslides occur in Wyoming, with some causing significant damage or disruption to daily activities.

Landslides are possible but not a frequent occurrence in Albany County given the relatively flat terrain in developed areas. According to the USGS Landslide Incident and Susceptibility Index, a majority of the county and jurisdictional areas reside in an area of low incident (less than 1.5% of the area is involved in landsliding). However, there is an area in southern Albany County of moderate landslide incidence (1.5-15% of land involved in landsliding). An additional area of moderate incidence resides on Interstate 80 in the western portion of the county. Figure 4-34 shows these areas. There is limited risk in Laramie and Rock River due to topography (limited steep slopes).

Figure 4-34 Landslide Incidence and Susceptibility in Albany County[42]

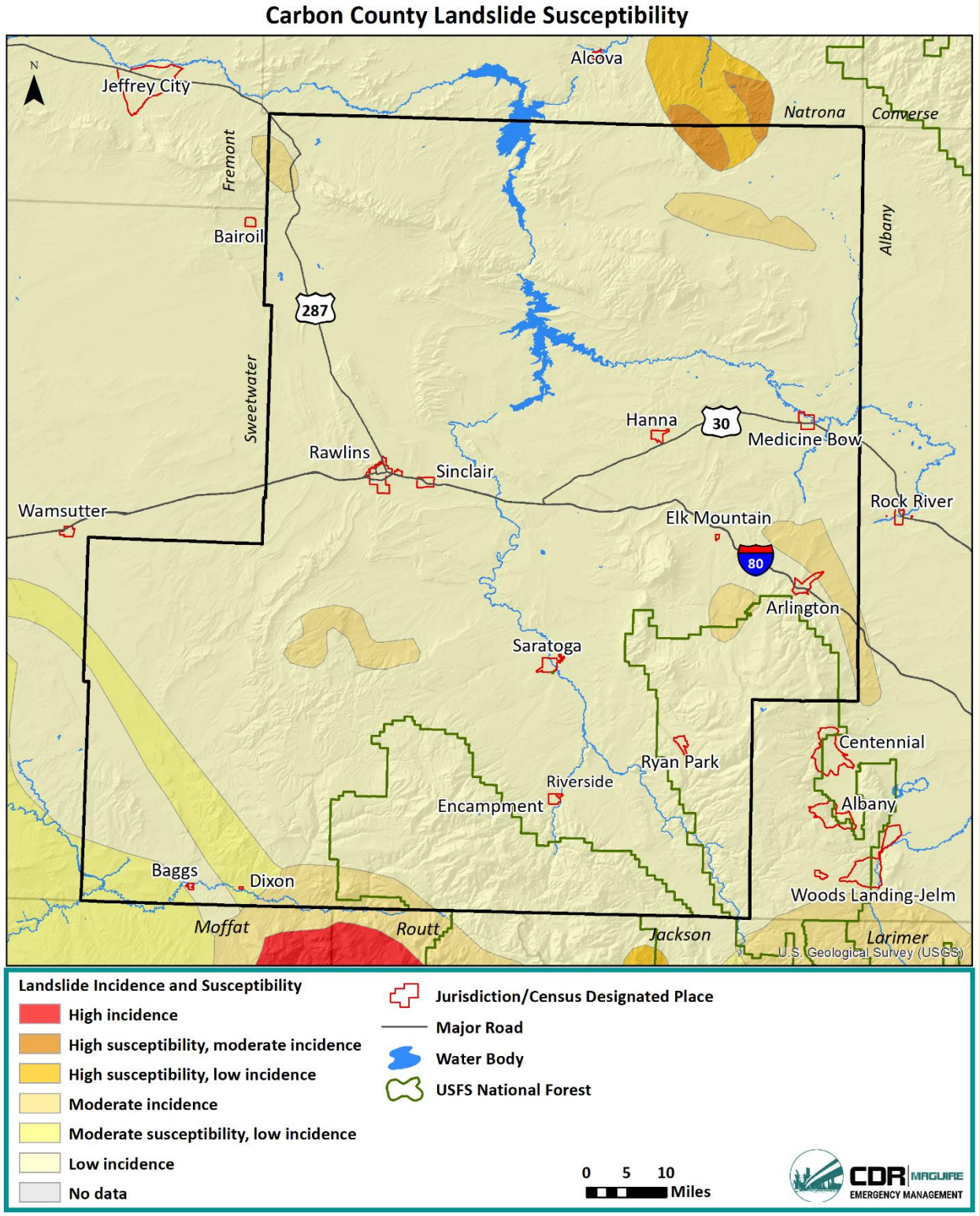


Carbon County

Landslides are also possible in Carbon County. According to the USGS Landslide Incident and Susceptibility Index, a majority of the county and jurisdictional areas reside in an area of low incident (less than 1.5% of the area is involved in landsliding). However, there is an area in southwest Carbon County of moderate landslide susceptibility and low incidence that covers the Town of Dixon and is very close to the Town of Baggs. Additionally, an area of moderate incidence (1.5-15% of land involved in landsliding) encompasses parts of the community of Arlington in unincorporated Carbon County. There are also areas of high susceptibility and low incidence as well as high susceptibility and moderate incidence in the extreme northeast portion of the County. Figure 4-35 shows these areas.

[42] https://www.arcgis.com/home/item.html?id=b3fa4e3c494040b491485dbb7d038c8a

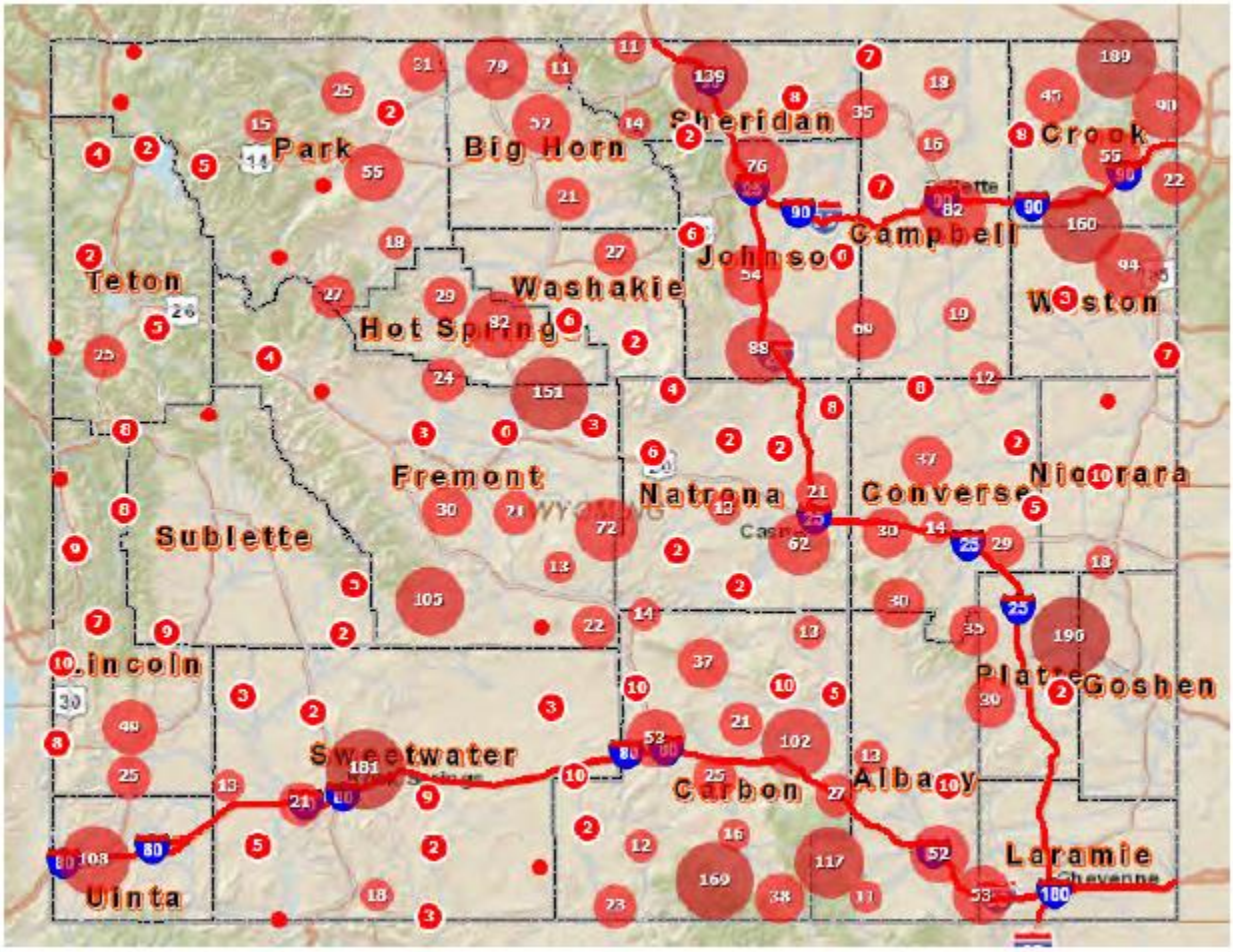
Figure 4-35 Landslide Incidence and Susceptibility in Carbon County[43]



Land Subsidence/Mine Collapse

Figure 4-36 shows mined-out areas and mine subsidence in Wyoming, from the 2014 Wyoming State Hazard Mitigation Plan. The numbers on the map show the number of mines in an area. It is evident mined-out areas and mine subsidence is prevalent in Albany and Carbon Counties. Carbon County has abandoned mines located throughout the county, with large clusters in the southeast portion of the County. Albany County has less overall abandoned mines, but has clusters in the southwest portion of the county.

Figure 4-36 Mined-out Areas and Mine Subsidence in Wyoming



Albany County

There are well over 100 abandoned mine sites in Albany County (primarily from coal mining). There are also a number of hard-rock mines in Medicine Bow National Forest near the Centennial ridge area located west and southwest of Centennial. Many of the mines have been reclaimed or sealed, which limits the risk. The following figures were provided by the Wyoming Abandoned Mine Land Division,

[43] https://www.arcgis.com/home/item.html?id=b3fa4e3c494040b491485dbb7d038c8a

Department of Environmental Quality, to help demonstrate abandoned mine location. It should be noted that exact locations are not released due to public safety and liability concerns. Figure 4-37 shows abandoned mines in the county, where each dot includes a number to represent the number of abandoned mines in the area. Figure 4-38 shows mines around Rock River and Laramie, Figure 4-39 shows subsidence history, and Figure 4-40 shows susceptibility areas. Table 4-19 lists ongoing mine remediation projects in Albany County. It should be noted that abandoned mines are very hazardous, and the public should avoid such areas. The Office of Surface Mining (the federal parent organization) has a "Stay Out-Stay Alive" program provides information on safety (http://www.msha.gov/SOSA/SOSAhome.asp).

Figure 4-37 Abandoned Mines in Albany County

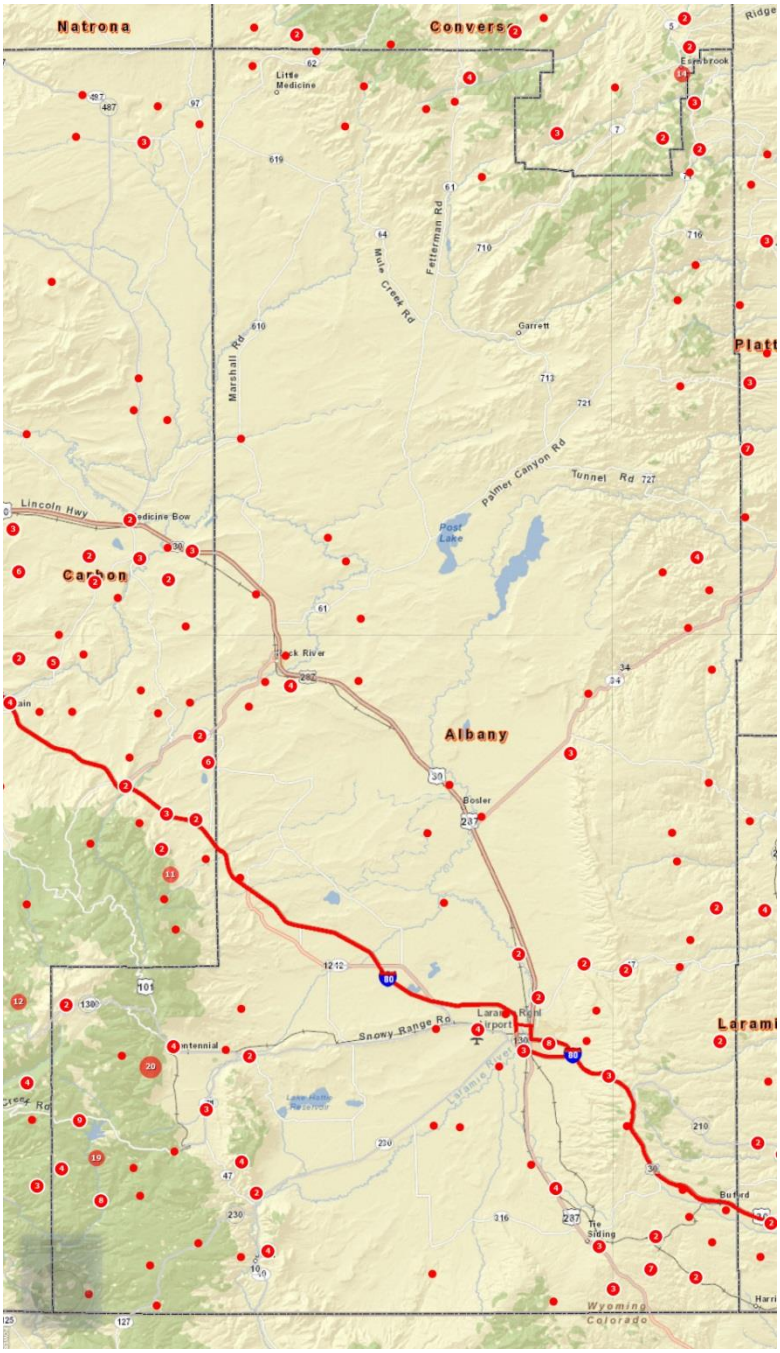


Figure 4-38 Abandoned Mines near Rock River and Laramie

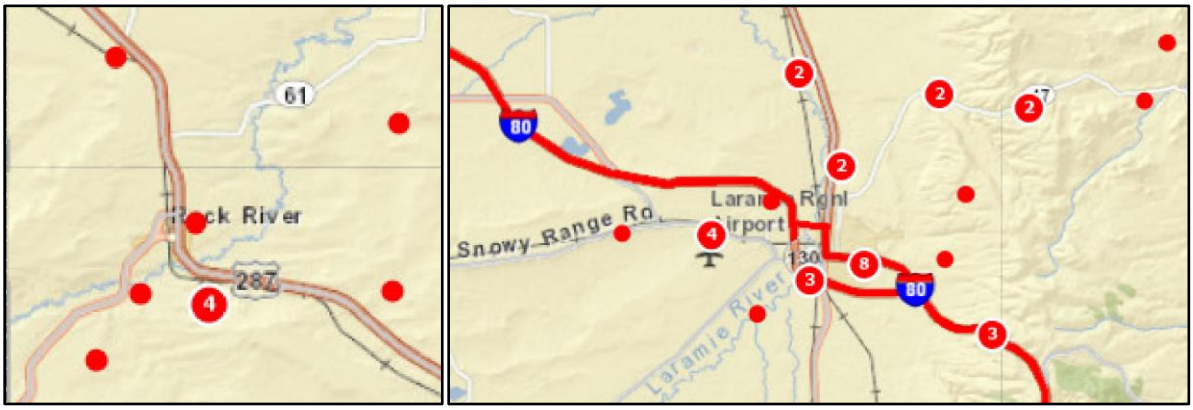


Figure 4-39 Mined out Areas and History of Subsidence

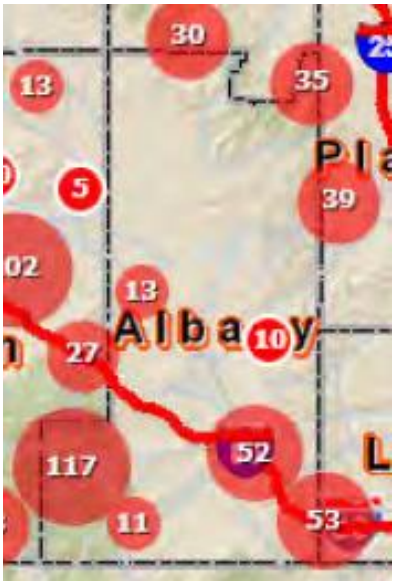


Figure 4-40 Subsidence Susceptibility (subsistence-prone underworkings)

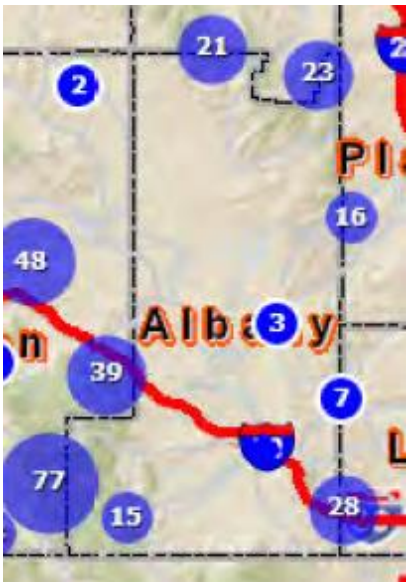


Table 4-19 Locations of Subsidence Mitigation Projects [44]

Project Name	Location
PROJECT 17L PRIORITY 1 & 2 COAL SITES	Carbon County, Albany County
SOUTHEAST NON-COAL	Albany County, Laramie County, Platte County

[44] Source: Wyoming State Hazard Mitigation Plan

Project Name	Location
MISCELLANEOUS SMALL URANIUM SITES STATEWIDE	Albany County

Carbon County

The following summarizes locations of mined-out areas in Carbon County. Full detail can be found in Appendix C.

Underground Coal Mines

There are numerous abandoned underground coal mines in Carbon County. Although some may have been reclaimed, no development should be allowed at the sites until it can be shown that reclamation has occurred and that the reclamation has been successful. The coal mines below are organized by topographic quadrangle. Table 4-20 summarizes location information and full detail can be found in Appendix C.

Table 4-20 Underground Coal Mines in Carbon County

Quadrangle	Number of Mines
Arlington	1
Bolten Ranch 15’	7
Bradley Peak	3
Bridger Pass 15’	1
Bull Springs	2
Carbon	6
Como East	2
Como West	2
Cottonwood Rim	2
Dana	2
Difficulty	5
Doty Mountain 15’	3
Elk Mountain	13
Elmo Quadrangle	6
Foote Creek Lake	1
Grieve Reservoir	1
Halfway Hill	4
Hanna	6
Lone Haystack Mountain	1
McFadden	1
Muddy Gap	2
Overland Crossing	13
Pats Bottom	4
Pierce Reservoir	3
Poison Basin	5
Rawlins Peak 15’	4
Savery	6

Quadrangle	Number of Mines
Schneider Ridge	2
Seminoe Dam SW	2
Tenmile Spring	3
T L Ranch	6
Walcott	1
Wild Horse Mountain	2
Whiskey Peak	2
Underground Coal Mine Total	**124**

Underground Hard Rock Mines

There are a few abandoned underground hard rock mines and prospects in Carbon County. Although several have been reclaimed, no development should be allowed at the sites until it can be shown that reclamation has occurred and that the reclamation has been successful. The hard rock mines below are organized by topographic quadrangle. Approximate locations from: Hausel, W.D., 1997, Copper, lead, zinc, molybdenum, and associated metal deposits of Wyoming, Wyoming State Geological Survey Bulletin 70, 229. Table 4-21 summarizes these locations and full detail can be found in Appendix C.

Table 4-21 Underground Hard Rock Mines in Carbon County

Quadrangle	Number of Mines
Arlington	5
Barcus Peak	1
Blackhall Mountain	1
Bradley Peak	7
Bridger Peak	10
Coad Mountain	1
Divide Peak	2
Dudley Creek	2
Encampment	13
Ferris	2
Fletcher Peak	5
Gunst Reservoir	1
Indian Rocks	1
Keystone	1
Morgan	7
Overlook Hill	2
Red Mountain	17
Sharp Hill	2
Singer Peak	3
Solomon Creek	5
Spanish Mine	7
Seminoe Dam	1
Trent Creek	4

Quadrangle	Number of Mines
Underground Hard Rock Mine Total	100

Extent

Landslide

There is not a formal scale to measure landslide extent. Factors such as volume and size can be used to determine landslide extent. Characteristics determining extent can vary widely between the different landslide types as described above. Some landslides are slow moving (for example, a “creep” landslide), while others occur suddenly and quickly (“debris flows”).

Land Subsidence/Mine Collapse

Additionally, there is not a formal scale to measure land subsidence or mine collapse extent. However, size and age of the abandoned mine and geologic conditions may contribute to whether or not the abandoned mine will collapse.

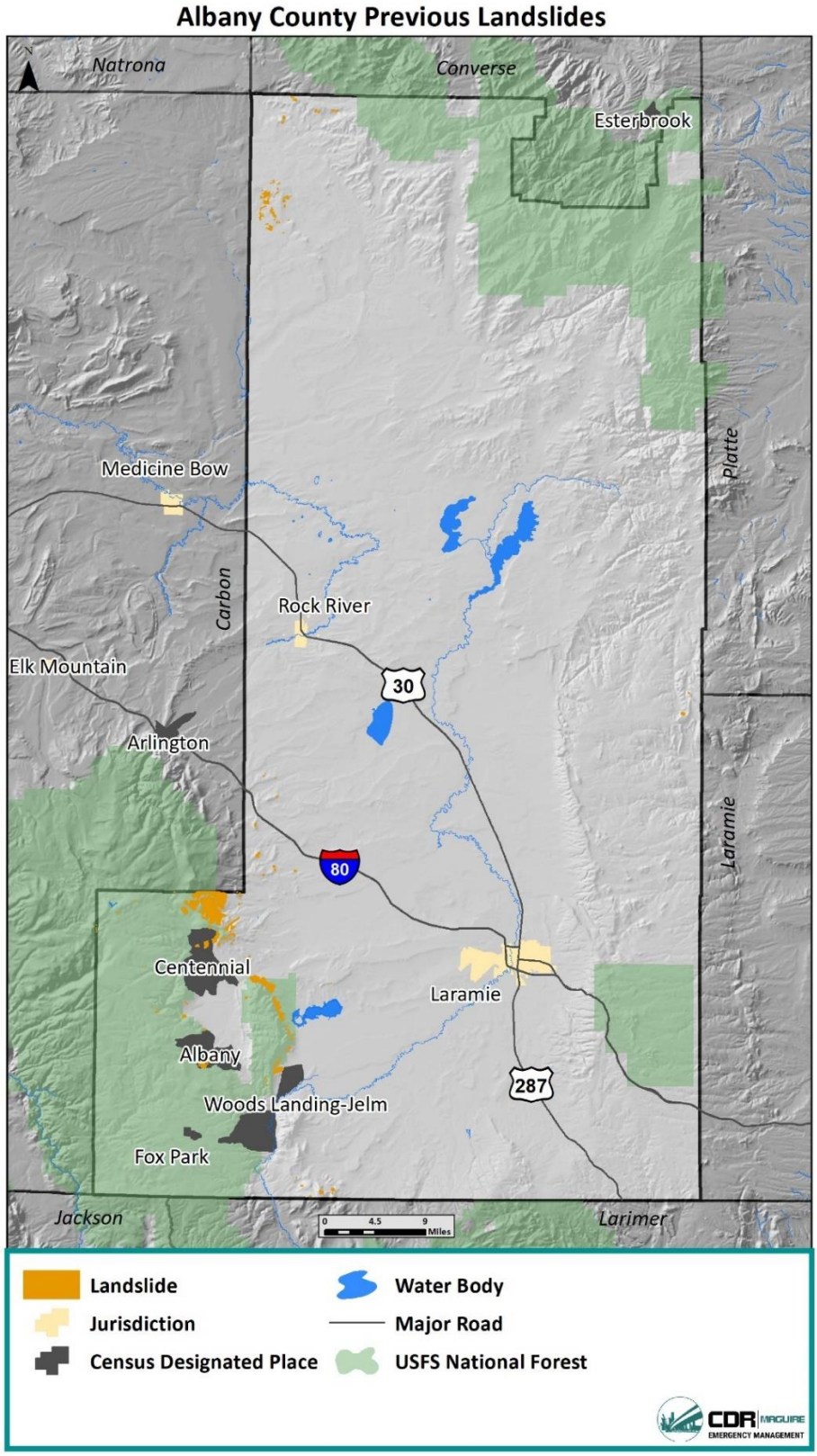
Previous Occurrences

Landslides

Albany County

Landslides were mapped over a 15-year period by the Geologic Hazards Section of the Wyoming State Geological Survey. Based on this data, as of 2004, 157 landslides have occurred in Albany County. These landslides are clustered in the southwest and northwest portions of the County, and none have occurred in Laramie or Rock River. Seven landslides have occurred in Centennial and many more just north of Centennial. Additionally, four landslides have occurred in Albany. Figure 4-41 shows these landslides on a map.

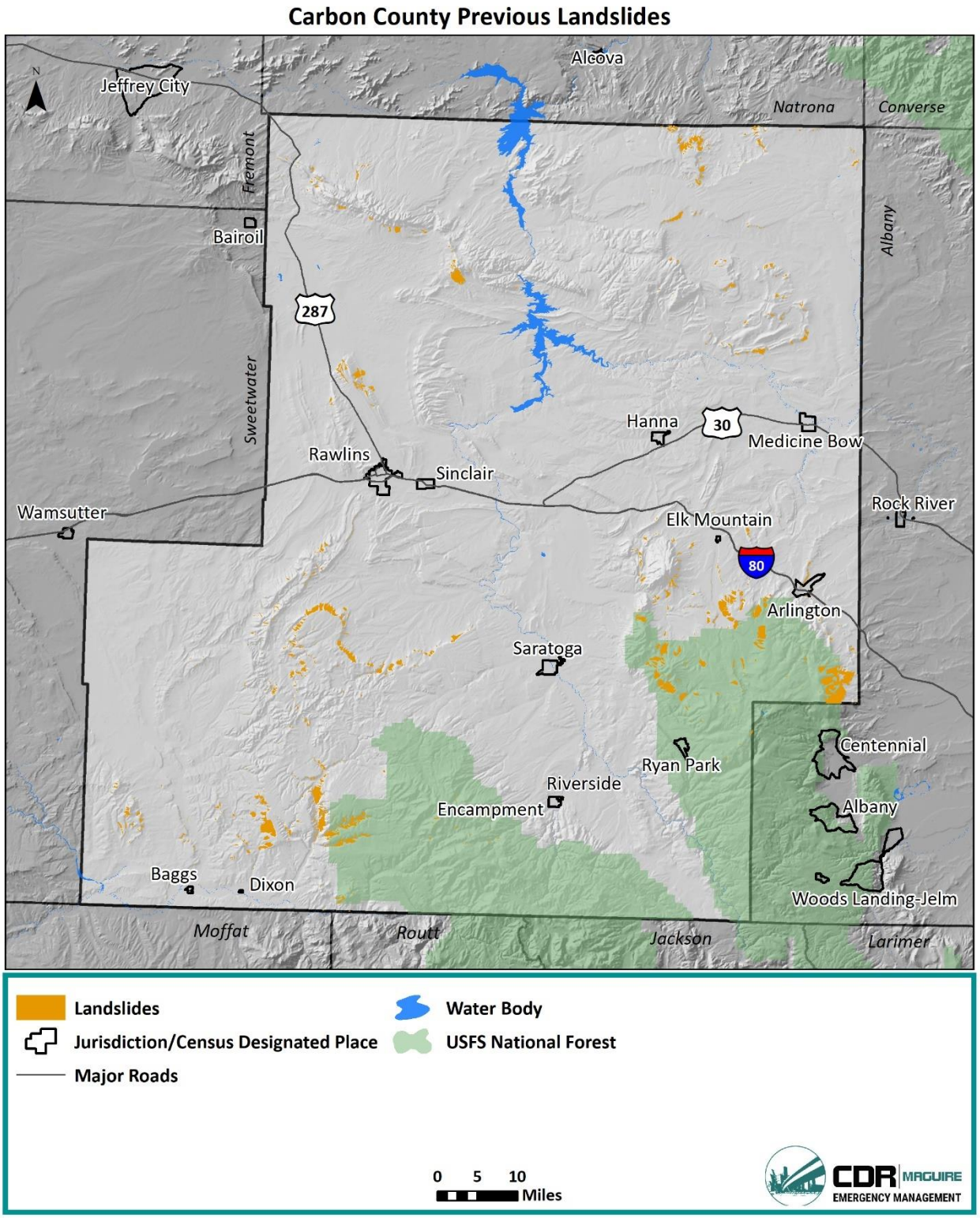
Figure 4-41 Landslides in Albany County[45]



Carbon County

Based on the Wyoming State Geological Survey landslide data for Carbon County, 1,539 landslides have occurred. These landslides have occurred across the entire county, following areas with steeper slopes. The only jurisdiction to experience a landslide is the Town of Elk Mountain. Additionally, in unincorporated Carbon County, Arlington has experienced four landslides. Figure 4-42 shows these landslides on a map.

Figure 4-42 Landslides in Carbon County[46]



Land Subsidence/Mine Collapse

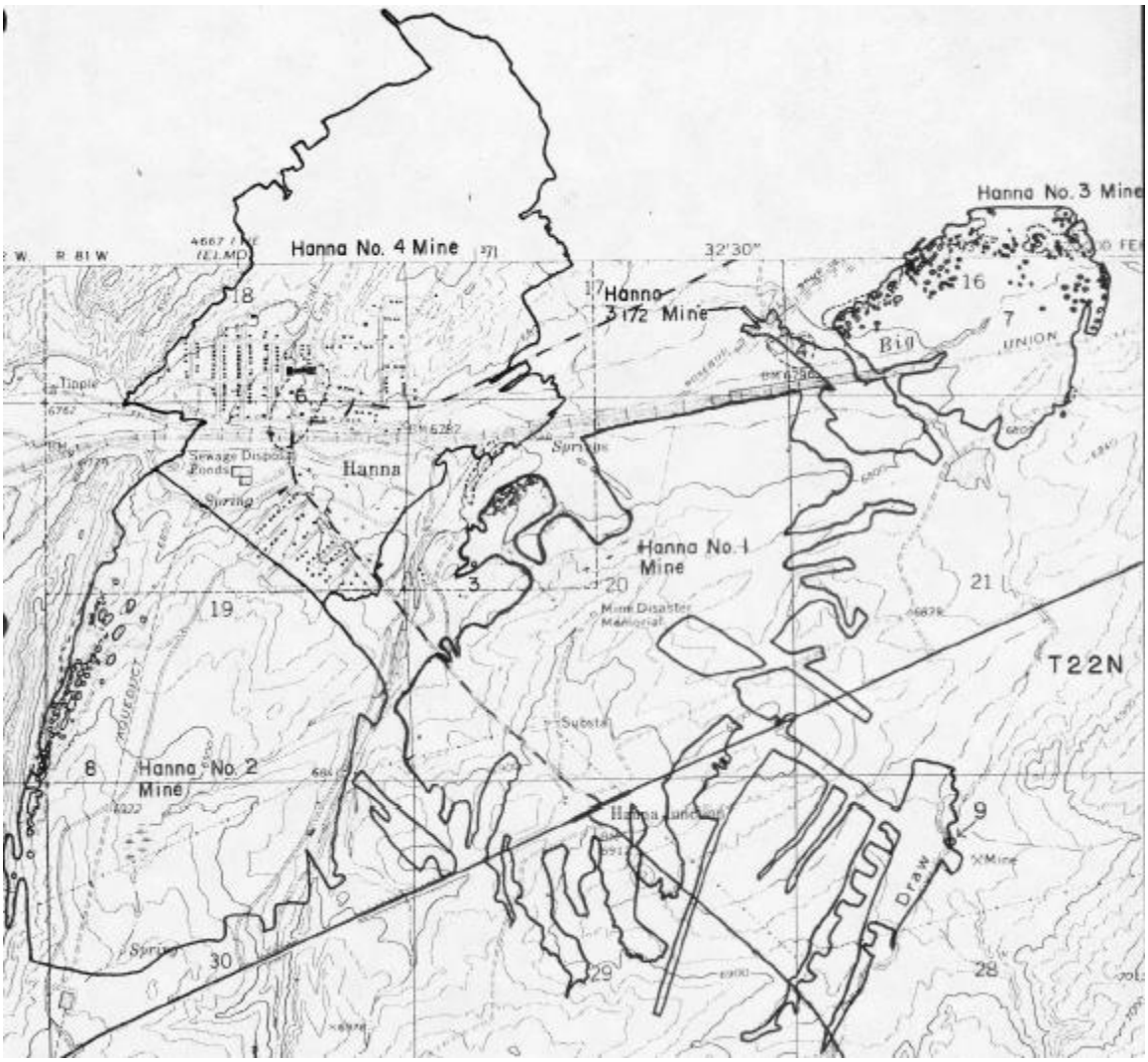
Albany County

There have been no reported historical problems created by mine subsidence in Albany County.

Carbon County

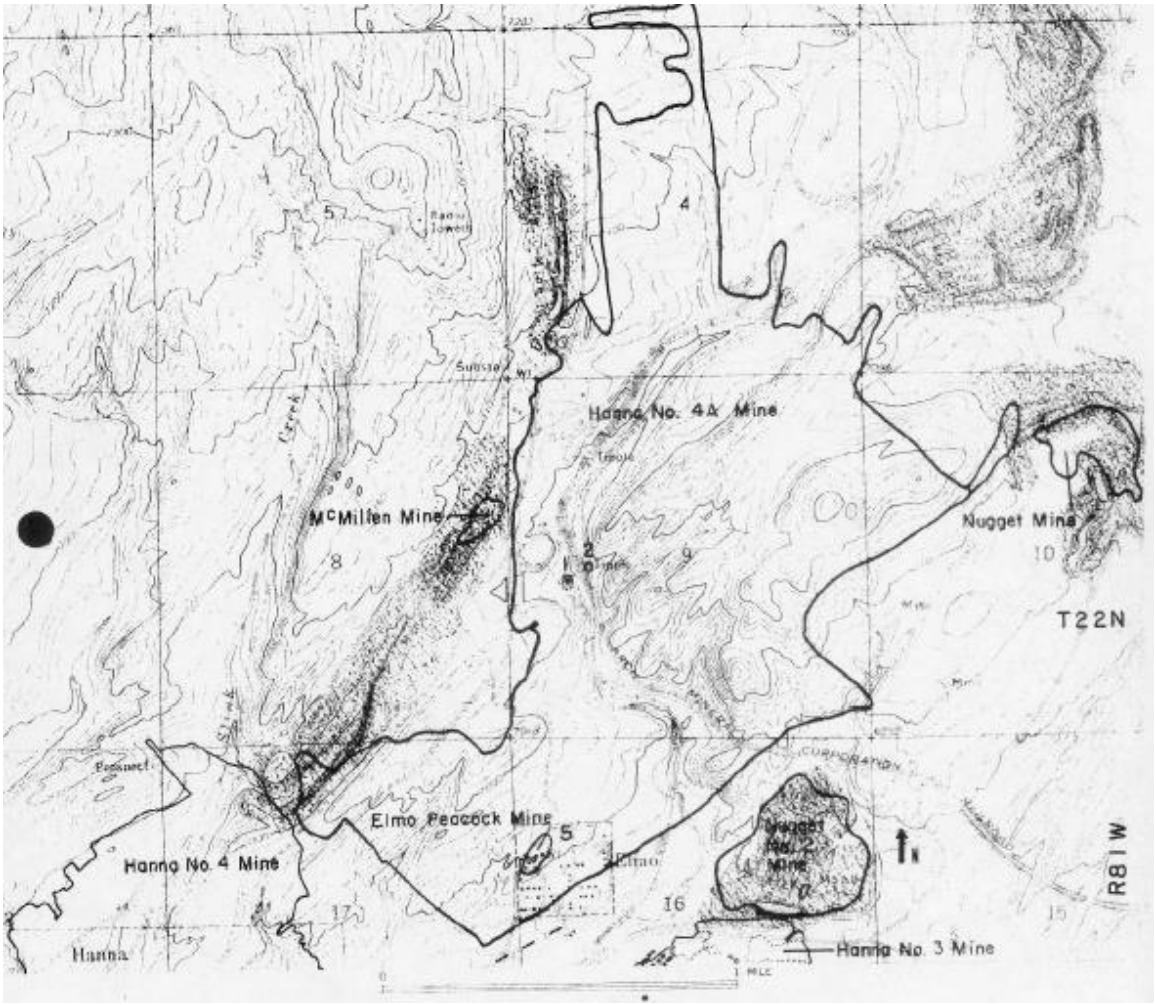
According to the WSGS report significant subsidence problems have occurred in Carbon County in Hanna and Elmo. Detailed mining maps of the Hanna and Elmo area are provided in Figure 4-43 and Figure 4-44, taken from a report titled Overview of Coal Mine Subsidence in Wyoming by James C. Case of the WSGS.

Figure 4-43 Mined-out areas and subsidence near Hanna



[46] http://www.wrds.uwyo.edu/wrds/wsgs/hazards/landslides/county/county.html

Figure 4-44 Mined-out areas and subsidence near Elmo



Subsidence has been associated with these mines since 1955. The numbers below correspond to the numbers on the Hanna and Elmo maps and provide more detail on the subsidence problems in the area.

Figure 4-45 Subsidence Problems near Hanna and Elmo

Number	Date	Description of Subsidence
1	1955	A 300 to 400 foot wide pit that was 10 to 20 feet deep opened up just after the Hanna 4A mine was closed in 1954. The collapse destroyed a tipple above it. It was felt that the collapse was due to the effects of excessive precipitation in the area.
2	1983	Arch Mineral Corporation's tipple was deformed and tilted due to subsidence. Drilling in the area showed a 30-foot void at a depth of 200 feet.
3	1984	A subsidence pit opened near the High School in July, 1984.
4	Post-1947	There is evidence of continuous subsidence in this area that overlies the Hanna 3½ mine. 1947 aerial photos shows no evidence of ponding or troughs. Later photos do show evidence of ponding.
5	1980s	A pit opened up under a driveway in Elmo. It is probably associated with the Peacock Mine.
6	Unknown	An area of continuous subsidence is suspected in the vicinity of the old High School.
7	Unknown	A major zone of subsidence pits is present over the Hanna No. 3 Mine.
8	Unknown	A major zone of subsidence pits is present over the Hanna No. 2 mine. It is suspected that many occurred shortly after the cessation of mining.
9	Unknown	A large pit/mine entrance was present in this area. A stream was flowing into the opening in 1981.

The State Mine Inspector's Reports from 1888-1948 indicated a number of problems in the Hanna area mines that could affect future stability. These included pillars removed in portions of the mines (Hanna No. 2) and several fires and explosions (Hanna No. 1, 3, 3 1/2). In 1903, 169 men were killed in a mine explosion. Five years later 59 men were killed in a series of fires and explosions in the Hanna mine in 1908. A large cave-in some 60 feet in length was found near the east entrance after the fire was extinguished.

Probability

Landslide

Albany County

Based on the available Wyoming Geological Survey landslide data, in the 15-year study timeframe there were 157 landslides in Albany County. This equates to a 100% annual occurrence, or a highly likely probability. It should be noted that there are more landslides that have occurred since this documented time period. Additionally, many of these landslides are not damaging events.

Carbon County

Based on the available Wyoming Geological Survey landslide data, in the 15-year study timeframe there were 1,539 landslides in Carbon County. This equates to a 100% annual occurrence, or a highly likely probability. It should be noted that there are more landslides that have occurred since this documented time period. Additionally, many of these landslides are not damaging events.

Land Subsidence/Mine Collapse

Albany County

There are no reported events for mine subsidence in Albany County. Further, many known locations have been remediated. While the potential for land subsidence exists, it is not a major threat. Therefore, the probability is categorized as "unlikely" (less than 1% annual probability).

Carbon County

In Carbon County, there have been nine reported events since 1955. This corresponds to a 14% annual chance of occurrence, or a "likely" probability. However, ongoing remediation efforts by the Wyoming DEQ lowers this chance of occurrence.

Vulnerability Assessment

Inventory Exposed/Impacts

Landslides

Albany County

Landslides are most likely to occur in the late spring or early summer coinciding with spring rains and snowmelt. This saturates the mountainous and/or steep terrain, which may cause it to give way. Impacts include destroyed structures, roads, and possible injuries and fatalities. Additionally, areas impacted by wildfire are more prone to post-fire debris flows, particularly within two years of the wildfire. Post-fire, it takes less rainfall to trigger debris flows from burned basins than from unburned areas.[47] Post-fire debris flows are particularly hazardous because they can occur with little warning, can exert great impulsive loads on objects in their paths, can strip vegetation, block drainage ways, damage structures, and endanger human life.[48]

The majority of Albany County resides in an area of Low Incident (less than 1.5% of land involved). This corresponds to low susceptibility. Although the risk is low, all current and future buildings, populations, and critical facilities should be considered at risk, particularly if in or near landslide hazard areas. One of the most landslide-prone areas is the Medicine Bow National Forest, and the Snowy Range within, which does not permit development. Structures near this area (namely those in Centennial, Albany, Bunker Hill, and Chalk Hills) should be considered at elevated risk.

[47] https://ca.water.usgs.gov/flooding/wildfires-debris-flow.html
[48] https://ca.water.usgs.gov/flooding/wildfires-debris-flow.html

Carbon County

Similarly, much of Carbon County resides in an area of low incident and low susceptibility. However, there have been numerous reported landslides in the county, and all current and future buildings, populations, and critical facilities should be considered at risk. Areas in the southwest portion of the County, near Dixon and Baggs, as well as areas near the Medicine Bow National Forest with steeper slopes have elevated risk to landslides. The Town of Elk Mountain is also particularly vulnerable if a landslide plugs the river and causes flooding. Additionally, areas in the northeast portion of the county have the highest risk to landslides, although little development at this time.

Land Subsidence/Mine Collapse

The greatest vulnerability associated with this hazard is the potential for collapse. This may result in damage to property or injury or death to people. Development would not be permitted in any known, un-remediated locations. However, unknown mining areas are possible.

If a possible abandoned mine is encountered, it is best to avoid it. Openings and shafts are often rotted out or unstable. The mine opening (known as a portal or adit) may seem stable, but rotting timbers and unstable rock formations make cave-ins a real danger. The darkness and debris in old mines make identification of the hazards difficult. Vertical shafts can be hundreds of feet deep. At the surface, openings can be hidden by vegetation or covered by rotting boards or timbers. Inside old mines, shafts can be camouflaged by debris or hidden by darkness in the mine.

Abandoned mines pose several threats beyond falling, including:

- Explosives and toxic chemicals: Blasting caps, dynamite, and chemicals were often left behind when the workings were abandoned. Explosives become unstable with age and can be detonated by the vibration of footsteps. Abandoned chemicals such as cyanide, arsenic, mercury and other deadly toxins may be present in leaking and deteriorating containers.
- Dangerous gases: Lethal concentrations of methane, carbon monoxide, carbon dioxide and hydrogen sulfide (to name a few) may accumulate in underground passages. Oxygen deficient air may cause suffocation. People have died within a few feet of the mine openings.
- Water: Impounded water may be highly alkaline or acidic (resulting in skin burns), as well as deep and cold (contributing to hypothermia).
- Spoils (rock and dirt) piles: These loose piles can collapse or slide, burying an unsuspecting victim.
- Equipment and buildings: Abandoned surface structures and old mine equipment may collapse on bystanders.
- Highwalls: These are the excavated vertical cliffs in surface pits and quarries. They can be unstable and prone to collapse. Highwalls may not be visible from the top, presenting a danger to off road drivers.
- Radon: Radon is a natural radioactive decay product and is a known cause of lung cancer. Radon can accumulate in high concentrations in poorly ventilated mines.
- Wildlife: Rattlesnakes, bears, mountain lions and other wildlife frequent old mine sites.
- Disorientation: There is no natural light inside of mine workings. Many workings meandered randomly as miners followed an ore vein. It is easy to become lost and disoriented in a maze of mine workings, especially if lighting equipment fails.
- Mine Fires Areas: Mine fires create surface hazards in abandoned coal mine areas. As fires burn within the seam, fissures can open to the surface delivering deadly gases into the atmosphere.

The area around the fissure may not be capable of supporting the weight of a human or vehicle and may collapse into the burning coal or the mine void.

Potential Losses

Landslide

Albany County

An exposure analysis was conducted using previous landslide GIS data and the State of Wyoming Property Tax Division parcel data. An intersect was conducted between parcels within one-half a mile from previous landslides to estimate potential losses based on previous landslide occurrences. It is important to note that this analysis only includes parcel information, rather than building footprints, and that government buildings are listed as "exempt" and therefore their value is not reflected in this analysis. This analysis resulted in 389 parcels at risk, all located in unincorporated Albany County. These parcels have an actual value of $62,272,595 and an assessed value of $5,915,891. The majority of these parcels are located in the southwest portion of the County near the Medicine Bow National Forest as well as the northwest portion of the County.

Carbon County

An exposure analysis was conducted using previous landslide GIS data and the State of Wyoming Property Tax Division parcel data. An intersect was conducted between parcels within one-half a mile from previous landslides to estimate potential losses based on previous landslide occurrences. It is important to note that this analysis only includes parcel information, rather than building footprints, and that government buildings are listed as "exempt" and therefore their value is not reflected in this analysis. This analysis resulted in 1,317 parcels at risk, with 148 located in Elk Mountain and 1,169 located in unincorporated Carbon County. The parcels at risk in Elk Mountain are the result of one landslide that occurred at the southern border of the Town. Based on this analysis, the entire town of Elk Mountain is considered vulnerable to losses. The parcels have an assessed value of $1,486,966 and an actual value of $15,652,072. The parcels in unincorporated Carbon County have an assessed value of $10,102,650 and an actual value of $106,330,119. This totals to an assessed value of $11,589,616 at risk and an actual value of $121,982,191 at risk across the County. Areas at risk are distributed throughout the entire County.

Land Subsidence/Mine Collapse

There has been property and infrastructure damage associated with mine subsidence in Wyoming communities. The dollar amounts of the damage are not readily available.

An indirect measure of the impacts is the existing cost of mitigating the hazards. The Wyoming Abandoned Mine Lands (AML) Program at Wyoming Department of Environmental Quality (DEQ) had a 2017 budget of close to $300 million. spent $303.4 million through 2013 mitigating the effects of mine subsidence alone, as part of the abandoned mine reclamation program.

Land Use and Development

Landslide

The severity of landslide problems is directly related to the extent of human activity in hazard areas. 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.

Albany County

In Albany County, areas near the Medicine Bow National Forests, such as Centennial and Albany have experienced past landslides and future development in these areas is susceptible to landslides. Unincorporated Albany County has experienced increased population and is expected to continue to increase. This increases risks in these areas to landslides.

Carbon County

In Carbon County, there are small landslide areas near Elk Mountain, Baggs, Dixon, and Arlington in unincorporated Carbon County. Although not currently experiencing population growth, in Carbon County population can vary widely based on energy development. Future development in these areas should be cautious to prevent landslide damage to property or people.

Land Subsidence/Mine Collapse

Businesses seeking to lay pipelines, electrical transmission lines, develop a well site, or build another type of business structure in an area subject to subsidence hazards are typically referred to the AML of the Wyoming DEQ during the environmental review process. This contact helps ensure new, developing infrastructure can be routed around problem areas, or if more efficient and possible, the area can be mitigated for subsidence hazards before structures or individuals are exposed to the hazard.

Locations where mine subsidence may occur are located throughout the state in both populated and unpopulated areas. Development in locations where mine subsidence occurs certainly has the potential to impact individual homes or neighborhoods. While it is believed all mined out areas in Wyoming have been mapped, it is unknown if all locations of potential subsidence have been located. The uncertainty regarding the locations of more potential subsidence areas means there is the possibility development may occur in a subsidence-prone location without the knowledge of contractors or developers prior to development.

4.5.8. Severe Thunderstorm (Including Lightning and Hail)

Description

The description of severe thunderstorms includes the descriptions of thunderstorms, lightning and hail, as defined below.

Thunderstorm

Three conditions need to occur for a thunderstorm to form. First, it needs moisture to form clouds and rain. Second, it needs unstable air, such as warm air that can rise rapidly (this often referred to as the “engine” of the storm). Third, thunderstorms need lift, which comes in the form of cold or warm fronts, sea breezes, mountains, or the sun’s heat. When these conditions occur simultaneously, air masses of varying temperatures meet, and a thunderstorm is formed. These storm events can occur singularly, in lines, or in clusters. Further, they can move through an area very quickly or linger for several hours.

Straight-line winds, which in extreme cases have the potential to cause wind gusts that exceed 100 miles per hour, are responsible for most thunderstorm wind damage. One type of straight-line wind, the downburst, can cause damage equivalent to a strong tornado and can be extremely dangerous to aviation.

According to the National Weather Service, more than 100,000 thunderstorms occur each year, though only about 10% of these storms are classified as "severe." A severe thunderstorm occurs when the storm produces one of three elements: 1) Hail of three-quarters of an inch; 2) tornado; 3) winds of at least 58 miles per hour.

Lightning

Lightning is a discharge of electrical energy resulting from the buildup of positive and negative charges within a thunderstorm, creating a "bolt" when the buildup of charges becomes strong enough. This flash of light usually occurs within the clouds or between the clouds and the ground. A bolt of lightning can reach temperatures approaching 50,000 degrees Fahrenheit. Lightning rapidly heats the sky as it flashes but the surrounding air cools following the bolt. This rapid heating and cooling of the surrounding air causes the thunder which often accompanies lightning strikes. While most often affiliated with severe thunderstorms, lightning may also strike outside of heavy rain and might occur as far as 10 miles away from any rainfall.

Hail

Hailstorms are a potentially damaging outgrowth of severe thunderstorms. Early in the developmental stages of a hailstorm, ice crystals form within a low-pressure front due to the rapid rising of warm air into the upper atmosphere and the subsequent cooling of the air mass. Frozen droplets gradually accumulate on the ice crystals until they develop to a sufficient weight and fall as precipitation. Hail typically takes the form of spheres or irregularly-shaped masses greater than 0.75 inches in diameter. The size of hailstones is a direct function of the size and severity of the storm. High velocity updraft winds are required to keep hail in suspension in thunderclouds. The strength of the updraft is a function of the intensity of heating at the Earth's surface. Higher temperature gradients relative to elevation above the surface result in increased suspension time and hailstone size.

Hailstone size can range a great deal in size from 5 millimeters (mm) (approximately pea-sized) to greater than 100mm (approximately melon-sized).

Location

Thunderstorms, lightning, and hail have the potential to occur everywhere throughout Region 3. Figure 4-46 shows the annual average number of days with a thunderstorm event across the nation.[49] Southern Wyoming averages approximately 40 to 50 annual days with thunderstorms.

[49] https://www.weather.gov/jetstream/tstorms_intro

Figure 4-46 Annual Average Number of Days with a Thunderstorm Event

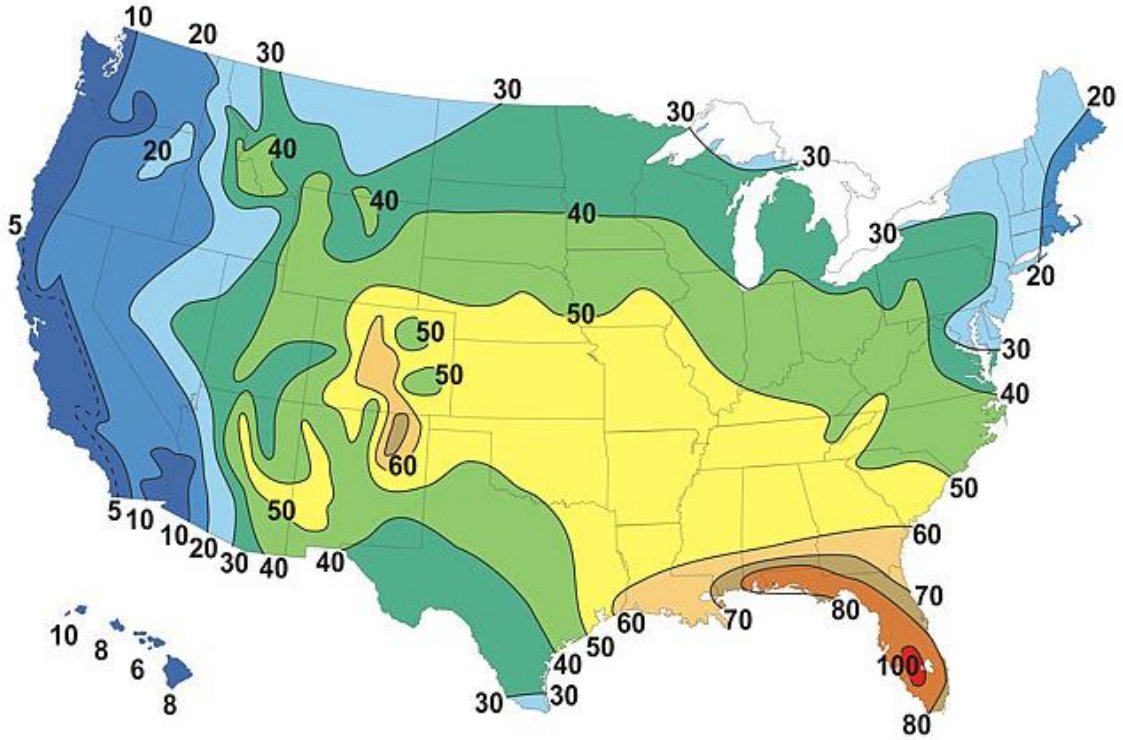
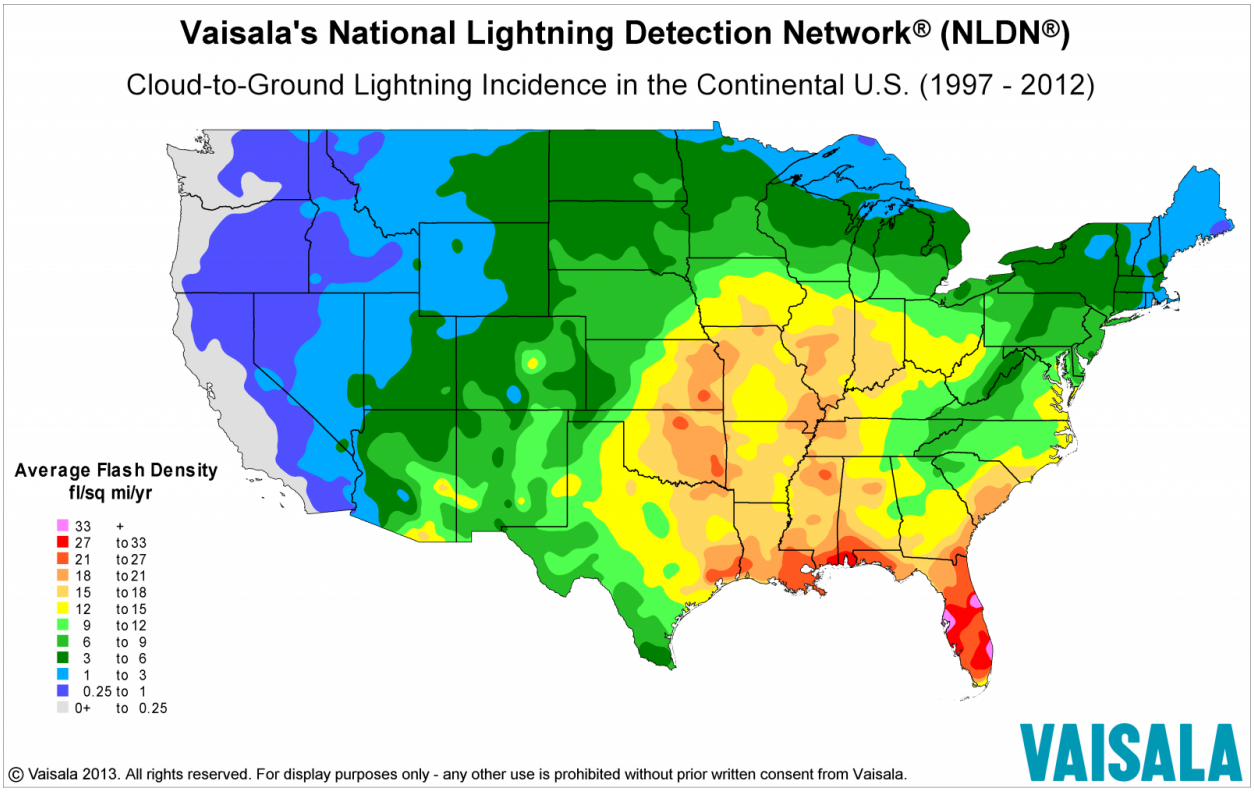


Figure 4-47 shows the average flash density for lightning across the United States, from 1997 to 2012.[50] Southern Wyoming experiences approximately one to six flashes/square mile/year. Generally, the eastern plains experience a higher lightning flash density than higher elevations, however, since 1995, all of the lightning fatalities in Wyoming have occurred in the mountains.[51]

[50] https://www.weather.gov/images/riw/Flash_Density_1997-2012.png
[51] https://www.weather.gov/cys/severe_weather_awareness_week_thurs

Figure 4-47 Average Lightning Flash Density, 1997 to 2012



The southeastern corner of Wyoming, where Colorado, Wyoming, and Nebraska meet, is known as Hail Alley. This area receives more hail storms than other areas of the country. While, Region 3 is not directly in Hail Alley, the entire Region is still susceptible to damaging hail storms, with Albany County being closer to Hail Alley than Carbon County. Figure 4-48 shows the average number of hail days per year across the United States.[52]

[52] https://www.accuweather.com/en/weather-news/colorado-buried-under-inches-o/34701

Figure 4-48 Average Number of Hail Days per Year

Extent

As mentioned previously, a thunderstorm is considered "severe" when the storm produces one of three elements: 1) Hail of three-quarters of an inch; 2) Tornado; 3) Winds of at least 58 miles per hour. Hail is typically measured on the TORRO hail intensity scale, as described in Table 4-22 below.[53]

Table 4-22 TORRO Hail Intensity Scale

	Intensity Category	Typical Hail Diameter (mm)	Probable Kinetic Energy, J-m^2	Typical Damage Impacts
H0	Hard Hail	5	0-20	No damage
H1	Potentially Damaging	5-15	>20	Slight general damage to plants, crops
H2	Significant	10-20	>100	Significant damage to fruit, crops, vegetation
H3	Severe	20-30	>300	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	25-40	>500	Widespread glass damage, vehicle bodywork damage

[53] http://www.torro.org.uk/site/hscale.php

	Intensity Category	Typical Hail Diameter (mm)	Probable Kinetic Energy, J-m^2	Typical Damage Impacts
H5	Destructive	30-50	>800	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	40-60		Bodywork of grounded aircraft dented, brick walls pitted
H7	Destructive	50-75		Severe roof damage, risk of serious injuries
H8	Destructive	60-90		Severe damage to aircraft bodywork
H9	Super Hailstorms	75-100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	>100		No damage

Previous Occurrences

Thunderstorms

Albany County

Previous occurrences of thunderstorms are presented as occurrences of thunderstorm wind, as reported by the National Centers for Environmental Information (NCEI). According to the NCEI, a total of 57 thunderstorm wind events were reported in Albany County between 1964 and 2018, including 47 separate days. Of these, 34 occurred in unincorporated areas, 22 occurred in Laramie/Laramie Regional Airport, and one occurred in Rock River. A total of $49,000 in property damages was reported, all of which occurred in Laramie. Magnitude, reported as wind speed (mph), ranged from 57 mph to 90 mph. These events did not result in any deaths or injuries. It is likely that additional events occurred that were not reported. According to county-wide SHELDUS data, from 1960 to 2018, severe storm/thunderstorm events have caused $516,615 in property damages, adjusted to 2017 dollars in Albany County.

Carbon County

According to the NCEI, a total of 78 thunderstorm wind events were reported in Carbon County between 1964 and 2018, including 68 separate days. Of these, 1 occurred in Baggs, 1 in Dixon, 2 in Elk Mountain, 1 in Hanna, 17 in Rawlins, 2 in Saratoga, 2 in Sinclair, and 52 in unincorporated Carbon County. A total of $150,500 in property damages was reported, which $150,000 occurred in Rawlins and $500 in Hanna. Magnitude, reported as wind speed (mph), ranged from 57 mph to 89 mph. These events resulted in no deaths and three injuries, all from one event in Rawlins. It is likely that additional events occurred that were not reported. According to county-wide SHELDUS data, from 1960 to 2018, severe storm/thunderstorm events caused $85,253 in property damages, adjusted to 2017 dollars.

Lightning

Albany County

Lighting is a regular occurrence in Albany County. However, there is limited data on the occurrences. Using data from the NCEI, the previous plan, and web searches, a total of 18 damaging lightning events

were found between 1950 and 2018. This is largely a gross underestimation of the amount of lightning strikes that occur annually in the county. The reported events resulted in four deaths and $318,025 in damages, with $309,275 occurring in unincorporated Albany County and $8,750 occurring in Laramie. Additionally, four injuries and four fatalities were reported. It is very likely damages were much higher given several structural fires and electronics damage. Further, it should also be noted that lightning strikes have occurred before and since the timeframe available here. According to county-wide SHELDUS data, there has been $13,720 in crop damages and $582,815 in property damages, adjusted to 2017 dollars from 1960 to 2018.

Carbon County

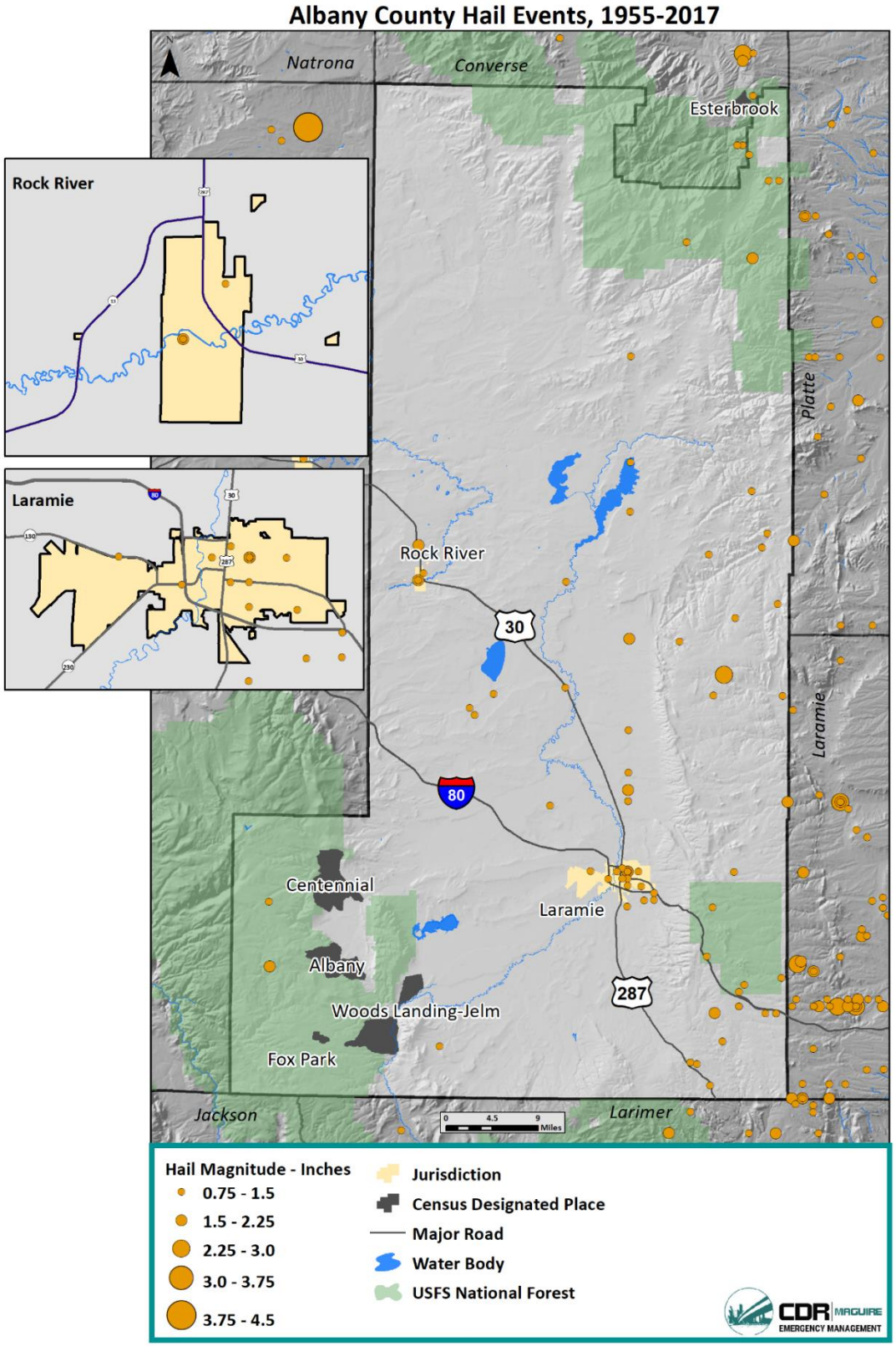
Utilizing data from the previous plan, web searches, and NCEI, in Carbon County there have been 11 lightning events that have caused damage, injuries, or fatalities from 1950 to 2018. These events caused $10,760 in damages, with $3,835 in Encampment, $6,000 in Saratoga, $275 in Medicine Bow, $275 in Baggs, and $275 in unincorporated Carbon County. A total of five injuries and five deaths were also reported. As noted previously, this is an underestimation of the total amount of lightning strikes that occur in Carbon County. According to county-wide SHELDUS data, there has been $13,655 in crop damages and $100,506 in property damages, adjusted to 2017 dollars from 1960 to 2018.

Hail

Albany County

According to the NCEI data, a total of 85 hail events were reported in Albany County between 1944 and 2018. Of these, 46 occurred in unincorporated areas, 35 occurred in Laramie, and 4 occurred in Rock River. A total of $61,000 in damages was reported, of which a majority ($60,500) occurred in Laramie. Magnitude, reported as hailstone size, ranged from 0.75 inches to 4.5 inches. These events did not result in any deaths or injuries. It is likely that additional events occurred that were not reported. According to county-wide SHELDUS data, Albany County has experienced $100,029 in crop damages and $115,348 in property damages, adjusted to 2017 dollars, from hail from 1960 to 2018. Figure 4-49 shows previous hail events in Albany County based on Storm Prediction Center data.

Figure 4-49 Albany County Previous Hail Events[54]



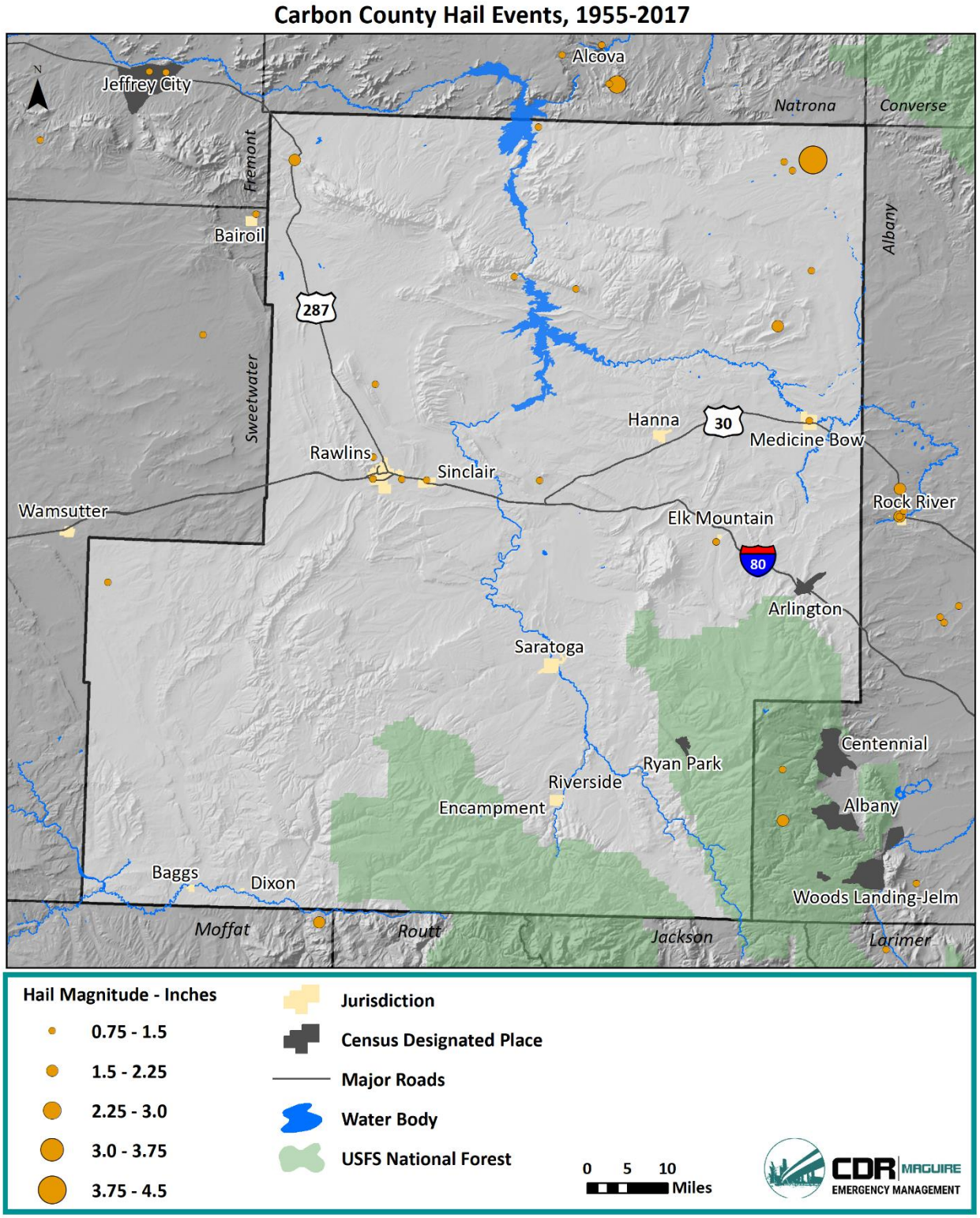
Carbon County

According to the NCEI data, a total of 24 hail events were reported in Carbon County between 1958 and 2018. Of these, 2 events occurred in Elk Mountain, 2 in Hanna, 2 in Medicine Bow, 5 in Rawlins, 1 in Sinclair, and 12 in unincorporated Carbon County. No damages are reported in the NCEI database, however, SHELDUS data reports $579,257 in property damage and $2,191 in crop damage adjusted to 2017 dollars. Magnitude, reported as hailstone size, ranged from 0.75 inches to 1.75 inches. These events did not result in any deaths or injuries. It is likely that additional events occurred that were not reported. Figure 4-50 shows previous hail events on a county-wide map based on storm prediction center GIS data.[55]

A detailed description of damage-causing or significant thunderstorm, lightning, and hail events for each County can be found in Appendix C, beginning on page 342.

[54] https://www.spc.noaa.gov/gis/svrgis/
[55] https://www.spc.noaa.gov/gis/svrgis/

Figure 4-50 Carbon County Previous Hail Events



Probability

Albany County

Overall, in Albany County the probability of thunderstorm, lightning, and hail events are as follows:

- Thunderstorm: greater than 100% chance of occurrence any given year – highly likely
- Lightning: 26% chance of occurrence any given year – likely
- Hail: greater than 100% chance of occurrence any given year – highly likely

Carbon County

The probability in Carbon County is as follows:

- Thunderstorm: greater than 100% chance of occurrence any given year – highly likely
- Lightning: 16% chance of occurrence any given year – likely
- Hail: 32% chance of occurrence any given year – likely

It should be noted that past reported lightning events largely under-represents all lightning strikes that occur in Albany and Carbon counties. It is more accurate to assume lightning has a 100% probability of striking in any given year in Albany and Carbon counties, which corresponds with a highly likely probability.

Vulnerability Assessment

Inventory Exposed/Impacts

All current and future populations, structures (including infrastructure) and critical facilities are at risk to thunderstorms, lightning, and hail. Due to the nature of lightning, those working outside or enjoying outdoor activities are at greatest risk for life-threatening lightning hazard impacts. Outdoor enthusiasts are susceptible to direct lightning strikes and/or to wildfire started by lightning. Specific vulnerabilities for structural assets will be greatly dependent on their individual design and the mitigation measures in place, where appropriate. However, potential impacts from this hazard are summarized below.

Thunderstorms/thunderstorm wind may cause several impacts including:

- Property damage
- Blown off roof
- Vegetative debris
- Power outage
- Hazardous driving conditions

Lightning may cause several impacts including:

- Structural fire
- Wildfire
- Vegetative debris (downed trees and limbs)
- Human death/injury
- Livestock death/injury
- Damage to electronics
- Power outages due to strikes on transformers.

Hail may cause several impacts including:

- Property damage, especially to roof and exposed metal and glass
- Crop damage
- Vehicle damage
- Human / livestock injury

Potential Losses

Thunderstorm

Albany County

Based on county-wide SHELDUS data, damage estimates of $516,615 (2017 dollars) have been reported for the thunderstorm hazard for Albany County. Annualizing these losses over the available time period of 1960 to 2018 results in an annual damage estimate of approximately $8,907 for the county. Losses from thunderstorms impact the entire county, however, due to the population and structures exposed, the City of Laramie is likely to continue to experience higher reported losses from thunderstorms. Thunderstorms also have the potential to cause significant losses to agriculture in Albany County.

Carbon County

In Carbon County, between 1960 and 2018 there was an estimated $85,253 in damages, resulting in an annual damage estimate of $1,469. Additionally, SHELDUS reports $27,004 (adjusted to 2017 dollars) in crop indemnity payments from thunderstorms from 1989 to 2017 in Carbon County. Future property and crop losses can be expected, and a single event is capable of causing substantial damage. It is evident thunderstorms can cause losses throughout the entire county, however, due to the population and number of structures exposed, the City of Rawlins will likely continue to experience higher losses from thunderstorms in the county.

Additionally, although no deaths or injuries have been reported in either county, any given thunderstorm has the potential to cause deaths or injuries in the future.

Lightning

Lightning is responsible for more deaths and injuries across Wyoming each year than from any other thunderstorm phenomena. Wyoming is first in number of lightning deaths and injuries per capita (1959 to 2012) in the United States. In Albany County, four deaths and two injuries have been reported due to lightning from 1950 to 2018, and five deaths and five injuries due to lightning in Carbon County. With continued interest in outdoor recreation across both counties, people will continue to be at risk to injury and death from lightning in the future.

Albany County

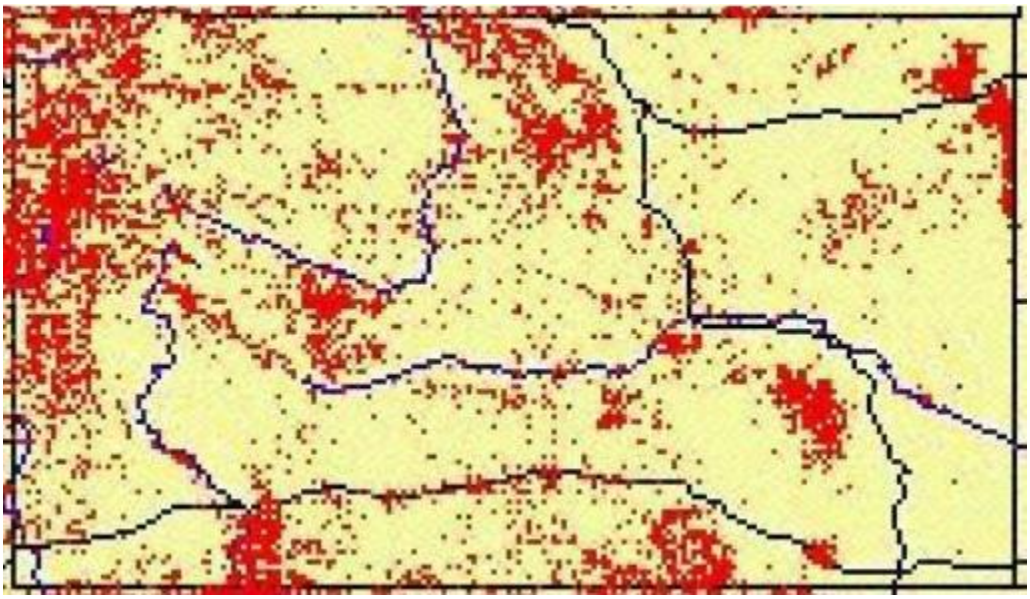
Damage estimates of $13,720 in crop damages and $582,815 in property damages (2017 dollars) have been reported for lightning events in Albany County from 1960 to 2018. Annualizing these losses over the available time period results in an annual damage estimate of approximately $236 in crop damages and $10,048 in property damages for the county.

Carbon County

In Carbon County, during this same time period there was an estimated $13,655 in crop damages and $100,506 in property damages from lightning across the county. This results in $235 in annual crop damages and $1,732 in annual property damages.

Additionally, lightning is the leading cause of wildland fires in Wyoming and is indirectly responsible for millions of dollars of fire damage. Whether in a drought or wet period, Wyoming's hot and windy summers can cause rapid changes to the fire risk over grasslands and forests. Figure 4-51 depicts a 31-year record of lightning-caused wildfires, from 1970-2000, provided by the Wyoming Climate Atlas.[56] The worst events occurred in July and August 1988, when, according to the U.S. Bureau of Land Management, lightning ignited 29 fires, setting 4,159 acres ablaze. These fires resulted in a total of $780,330 in 1988 dollars in damage, which equates to 1,667,360 in 2019 dollars.

Figure 4-51 Lightning Caused Wildfires in Wyoming from 1970-2000



Hail

Future property and crop losses can be expected, and a single event is capable of causing substantial damage. Additionally, although no deaths or injuries have been reported, any given hail event has the potential to cause deaths or injuries in the future.

Albany County

County-wide SHELDUS data estimates $100,029 in crop damages and $115,348 in property damages, adjusted to 2017 dollars, from hail from 1960 to 2018 in Albany County. Annualizing these losses over the available time period results in an annual damage estimate of $1,724 of crop damages and $1,988 of property damages for the county. Losses from hail impact the entire county, however, due to the population and structures exposed, the City of Laramie is likely to continue to experience higher

[56] http://www.wrds.uwyo.edu/sco/climateatlas/severe_weather.html#71

reported losses from hail. Hail events also have the potential to cause significant losses to agriculture in Albany County.

Carbon County

In Carbon County, $2,191 in crop damages and $579,257 in property damages, adjusted to 2017 dollars, were reported during the same time period, resulting in $37 in annualized crop damages and $9,987 in annualized property damages. Additionally, SHELDUS reports $3,916 (adjusted to 2017 dollars) in crop indemnity payments from hail in Carbon County from 1989 to 2017. Although no jurisdictional loss information was reported for Carbon County, areas with higher populations and structures exposed, such as Rawlins, are at higher risk to hail losses. Additionally, agricultural areas can experience significant losses from hail events.

Land Use and Development

Albany County

An increase in population puts more people at risk to thunderstorm, hail, and lightning impacts. All jurisdictions have experienced an increase in population in Albany County, and the population is projected to continue to grow through 2030. People and structures are vulnerable to thunderstorm, lightning, and hail events throughout the entire county. Additionally, the continued interest in outdoor recreation will continue to put people at risk to lightning strikes in Albany and Carbon counties.

Carbon County

Carbon County population is expected to remain relatively constant, although fluctuations due to changes in the energy industry are common. New residents and development related to population changes are vulnerable to thunderstorm, hail, and lightning events across the County.

4.5.9. Tornado

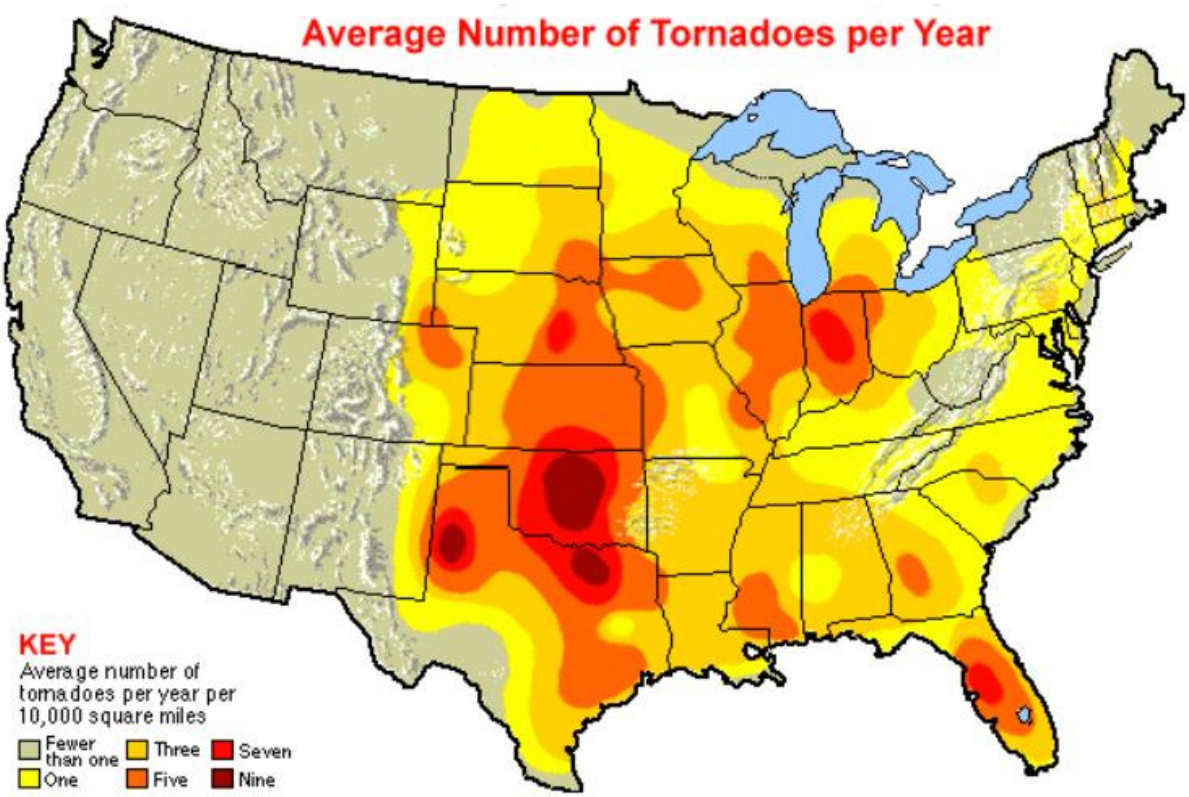
Description

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. Tornadoes are most often generated by thunderstorm activity (but sometimes result from hurricanes and other tropical storms) when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The damage caused by a tornado is a result of the high wind velocity and wind-blown debris, also accompanied by lightning or large hail.

Location

The Wyoming Climate Atlas notes that Wyoming lies just west of “Tornado Alley”. Further, it reports that the average length of a tornado in Wyoming is 3.05 miles with an average width of 79 yards. They are more common in open spaces (such as the plains in “Tornado Alley”). Tornadoes are possible anywhere in Albany and Carbon counties. Once a touchdown occurs, it may only affect a small area, or could travel for miles, leaving substantial destruction in its wake. Figure 4-52 shows tornado activity across the United States. It is evident that southeast Wyoming is subject to tornado events, but the number of tornadoes decreases moving west.

Figure 4-52 Average Number of Tornadoes per Year in the United States[57]



Extent

Tornadoes are most likely to form in the late afternoon and early evening. Most tornadoes are a few dozen yards wide and touchdown briefly, but even small short-lived tornadoes can inflict tremendous damage. Highly destructive tornadoes may carve out a path over a mile wide and several miles long. According to the National Weather Service, tornado wind speeds normally range from 40 miles per hour to more than 300 miles per hour. The most violent tornadoes have rotating winds of 250 miles per hour or more, are capable of causing extreme destruction, and can turning normally harmless objects into deadly missiles. Tornado magnitude is reported according to the Fujita and Enhanced Fujita Scales. Tornado magnitudes prior to 2005 were determined using the traditional version of the Fujita Scale, Table 4-23. Tornado magnitudes that were determined in 2005 and later were determined using the Enhanced Fujita Scale, Table 4-24.

[57] https://scied.ucar.edu/webweather/tornadoes/where-tornadoes-happen

Table 4-23 Fujita Scale (effective prior to 2005)

F-Scale Number	Intensity	Wind Speed	Damage
F0	GALE TORNADO	40–72 MPH	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.
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 re-enforced concrete structures badly damaged.
F6[58]	INCONCEIVABLE TORNADO	319–379 MPH	These winds are very unlikely. The small area of damage they might produce would probably not be recognizable along with the mess produced by F4 and F5 wind that would surround the F6 winds. Missiles, such as cars and refrigerators would do serious secondary damage that could not be directly identified as F6 damage. If this level is ever achieved, evidence for it might only be found in some manner of ground swirl pattern, for it may never be identifiable through engineering studies.

Table 4-24 Enhanced Fujita Scale (effective 2005 and later)

EF-Scale Number	Intensity Phrase	3 Second Gust (Mph)	Damage
EF0	GALE	65–85	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.

[58] F6 is not always included but has been used to describe extremely strong tornadoes that far surpass F5 levels.

EF-Scale Number	Intensity Phrase	3 Second Gust (Mph)	Damage
EF1	MODERATE	86–110	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.
EF2	SIGNIFICANT	111–135	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
EF3	SEVERE	136–165	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
EF4	DEVASTATING	166–200	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
EF5	INCREDIBLE	Over 200	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 re-enforced concrete structures badly damaged.

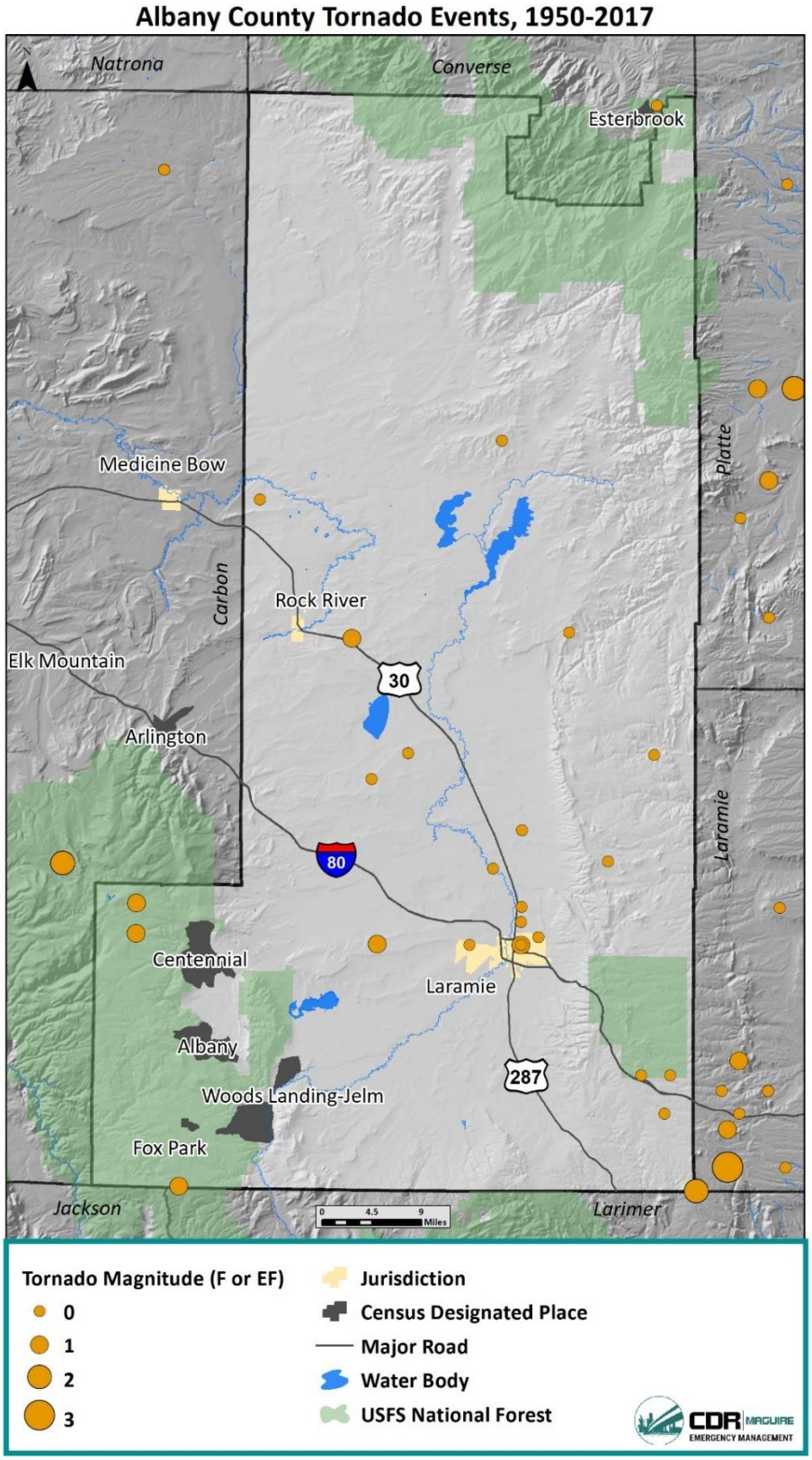
Previous Occurrences

Albany County

According to the NCEI, there have been 26 recorded tornadoes in Albany County from 1950 to 2018. Of these events, 4 occurred in Laramie, 1 in Rock River, and 21 in unincorporated Albany County. These events resulted in $350,150 in reported damages, with all damages occurring in or near Laramie. Two injuries and zero deaths have been reported. The highest magnitude tornado was an EF3, which occurred on June 6, 2018 north of Laramie. The NWS-Cheyenne team found galvanized steel utility poles bent 90 degrees at the base and wooden power poles snapped by this EF3 tornado about 10 miles north of Laramie. Winds in the tornado were estimated up to 150 mph. This tornado also spurred a brief but intense EF2 satellite tornado in the vicinity of Antelope Ridge Subdivision.[59] County-wide SHELDUS data reports $444,222 in property damages, adjusted to 2017 dollars, during this time frame. Figure 4-53 shows previous tornadoes in Albany County according to the Storm Prediction Center GIS data.[60]

[59] https://weather.com/storms/tornado/news/2018-06-07-wyoming-tornado-laramie-albany-county-june-6
[60] https://www.spc.noaa.gov/gis/svrgis/

Figure 4-53 Albany County Previous Tornado Events



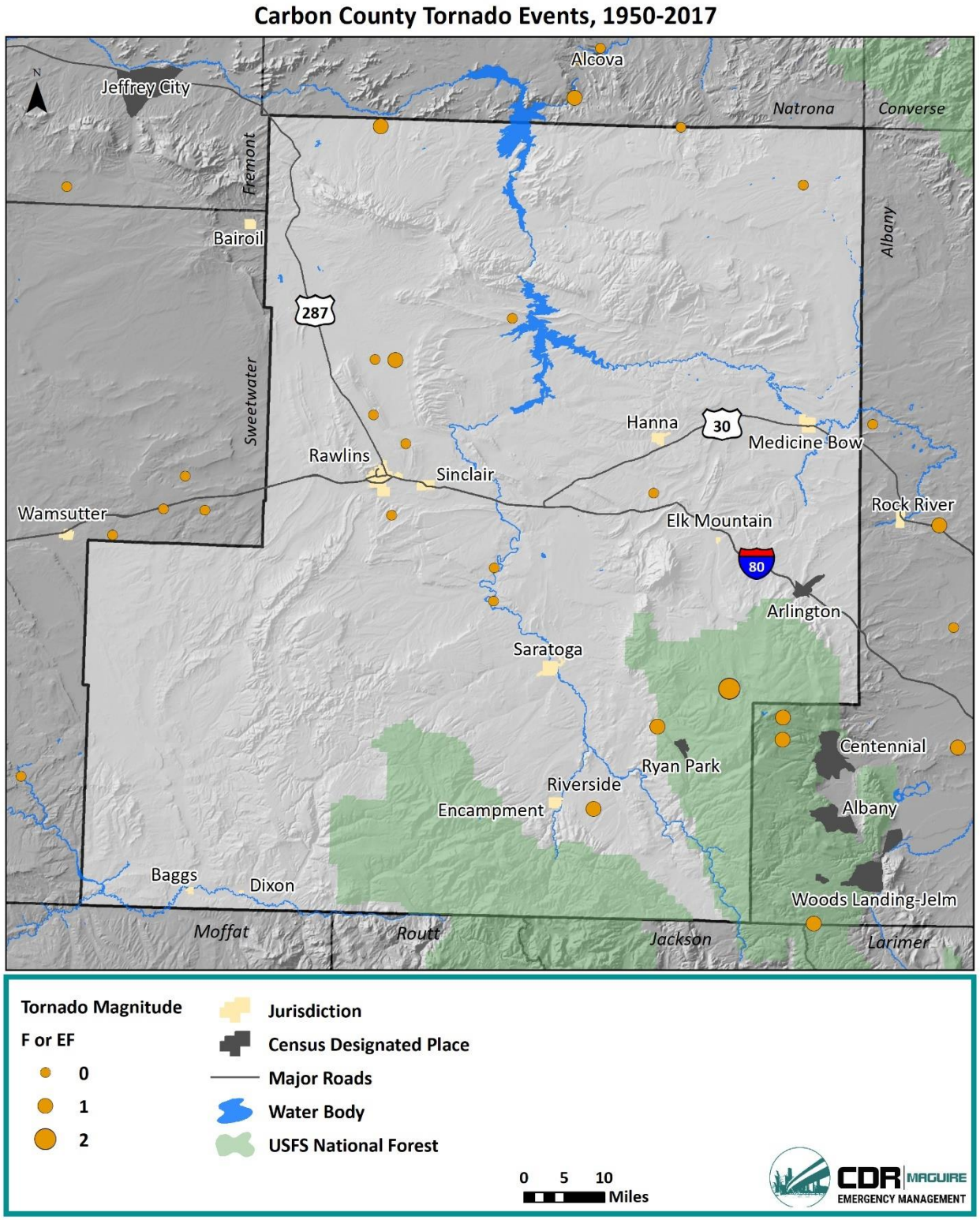
Carbon County

In Carbon County there have been 16 recorded tornadoes from 1950 to 2018. Of these events, 1 occurred in Medicine Bow, 1 in Rawlins, and 14 in unincorporated Carbon County. These events resulted in $300,150 in reported damages, however, no location information is associated with these damages. No deaths or injuries have been reported. The highest magnitude tornado was an F2 on July 2, 1976 in unincorporated Carbon County. County-wide SHELDUS data reports $256,525 in damages, adjusted to 2017 dollars. Figure 4-54 shows previous tornadoes in Carbon County according to the Storm Prediction Center GIS data.[61]

A full description of previous occurrences for both counties can be found in Appendix C.

[61] https://www.spc.noaa.gov/gis/svrgis/

Figure 4-54 Carbon County Previous Tornado Events



Probability

Albany County

From 1950 to 2018, there have been 26 reported tornadoes in Albany County, meaning there is a 38% chance of annual occurrence, or a likely probability.

Carbon County

In Carbon County, there have been 16 reported tornadoes during the same time frame, meaning there is a 23% chance of annual occurrence, or a likely probability.

Vulnerability Assessment

Inventory Exposed/Impacts

Historical evidence shows that both Albany and Carbon Counties are vulnerable to tornado activity. This hazard can result from severe thunderstorm activity or may occur separately due to changing weather conditions. It cannot be predicted where a tornado may touch down, so all existing and future buildings, facilities, and populations are considered to be exposed to this hazard and could potentially be impacted. Potential tornado impacts are presented by tornado severity in Table 4-24 (Extent subsection) and summarized below:

- Human death or injury
- Livestock death or injury
- Crop and farm damage
- Property damage (torn off roofs, blown out windows)
- Blown mobile homes and unanchored structures (sheds, campers, etc.)
- Vegetative debris (downed trees and limbs)
- Power outage
- Driving hazard (overturned tractor trailers and flying debris)
- Vehicular damage
- Water contamination
- Fire following gas leaks
- Critical facility damage
- Associated hail, lightning, strong winds

Potential Losses

Future property and crop losses can be expected, and a single event is capable of causing substantial damage. Additionally, deaths and injuries will continue to be a potential impact from tornadoes in both counties. The availability of sheltered locations such as basements, buildings constructed using tornado-resistant materials and methods, and public storm shelters all help minimize tornado impacts. The population needs to be aware of how to seek shelter during a tornado and avoid behaviors or decisions that place them in greater danger. Additionally, the National Weather Service issues tornado watches (conditions are favorable for a tornado) and warnings (a tornado has been sighted or indicated by weather radar nearby) to reduce risk of tornado impacts on the public.

Albany County

Based on county-wide SHELDUS data, damage estimates of $444,222 (2017 dollars) have been reported for the tornado hazard for Albany County. Annualizing these losses over the available time period of

1950 to 2018 results in an annual damage estimate of approximately $6,532 for the County. The City of Laramie will continue to be at a high risk for losses based on number of previous occurrences and previous reported damages, although all areas of the county are at risk. Additionally, tornadoes can cause substantial agricultural damage.

Carbon County

In Carbon County, between 1950 and 2018 there was an estimated $256,525 in damages, resulting in an annual damage estimate of $3,772. Location-specific damage information was not available for Carbon County. However, it can be assumed areas with higher populations, structures, or agricultural areas are at highest risk to potential tornado losses.

Land Use and Development

Increased population and development can mean greater damage in the event a tornado strikes. Above-ground energy related development (wind turbines and oil and gas wells) could be subject to damage from tornadoes. Tornado shelters and basements become more important the greater the population in order to help prevent loss of life in the event of a tornado. Future residential development would benefit from including basements and/or tornado shelters in new structures to help protect life safety.

Older homes, which are often subject to less advanced building codes, suffer increased vulnerability to tornadoes over time. Mobile homes, which are most often occupied by low-income, socially vulnerable residents, are the most dangerous places during a tornado. Studies indicate that 45% of all fatalities during tornadoes occur in mobile homes, compared to 26% in traditional site-built homes.[62]

Albany County

All jurisdictions have experienced an increase in population in Albany County, and the population is projected to continue to grow through 2030. People and structures are vulnerable to tornadoes throughout the entire county.

Carbon County

Carbon County population is expected to remain relatively constant, although fluctuations due to changes in the energy industry are common. New residents and development related to population changes are vulnerable to tornadoes across the County.

4.5.10. Wildland Fire

Description

A wildfire is any fire occurring in a wildland area (i.e. grassland, forest, brush land), except for fire under prescription.[63] Wildfires are part of the natural management of forest ecosystems but may also be caused by human factors. Nationally, over 80% of forest fires are started by negligent human behavior

[62] Ashley, W.S., A.J. Krmenec, and R. Schwantes, 2008: Vulnerability due to nocturnal tornadoes. *Weather and Forecasting*, 23, 795 – 807.

[63] Prescription burning, or "controlled burn," undertaken by land management agencies is the process of igniting fires under selected conditions, in accordance with strict parameters.

such as smoking in wooded areas or improperly extinguishing campfires. The second most common cause for wildfire is lightning.

There are three classes of wildland fires: surface fire, ground fire and crown fire. A surface fire is the most common of these three classes and burns along the floor of a forest, moving slowly and killing or damaging trees. A ground fire (muck fire) is usually started by lightning or human carelessness and burns on or below the forest floor. Crown fires spread rapidly by wind and move quickly by jumping along the tops of trees. Wildland fires are usually signaled by dense smoke that fills the area for miles around. The behavior of wildfire is influenced by three factors, the interaction between fuels (such as needles, leaves, and twigs), weather, and topography.

Many individual homes and cabins, subdivisions, resorts, recreational areas, organizational camps, businesses and industries are located within high wildfire hazard areas, known as the Wildland-Urban Interface (WUI). The term "WUI" is widely used within the wildland fire management community to describe any area where buildings are constructed close to or within a boundary of natural terrain and fuel, where high potential for wildland fires exists. According to the Wyoming Forest Fire Action Plan, the WUI is a threat that is significant and expanding. Further, the increasing demand for outdoor recreation places more people in wildlands during holidays, weekends, and vacation periods. Unfortunately, wildland residents and visitors are rarely educated or prepared for wildfire events that can sweep through the brush and timber and destroy property within minutes.

Wyoming wildland fires are managed and supported to varying extents through cooperative efforts by the:

- Bureau of Land Management (BLM)
- Geospatial Multi-Agency Coordination (GeoMAC)
- Wyoming Fire Academy
- Wyoming Wildland Fire Plan Action Team
- National Park Service (NPS) Fire Management Program
- US Fish and Wildlife Service (FWS) Fire Management Branch
- National Interagency Fire Center (NIFC)
- Bureau of Indian Affairs (BIA) Fire and Aviation Management
- USDA Forest Service (USFS) Fire and Aviation Management
- Wyoming State Fire Marshalls Office
- Wyoming Office of Homeland Security (WOHS)
- Wyoming State Forestry Division
- County and Local Fire Departments/Districts

Location

The entirety of Region 3 is susceptible to wildfire, though certain areas are more at risk than others. The Region has a semi-arid climate and is very rural in character, leading to a greater chance for wildland fires. Both Albany and Carbon counties have heavy fuel continuity across forested areas, coupled with a history of wind driven fires. The National Forest lands experience frequent fires.

Additionally, there are several WUI areas in the Region where development is at higher risk of wildfire. The Silvis Lab (University of Wisconsin), produces wildland urban interface data. This data was used to map WUI areas in the Region.

Silvis defines interface areas and intermix areas as follows:

- Interface areas: Areas with housing in the vicinity of contiguous wildland vegetation. Housing density between 6.2 and 742 structures/census block combined with wildland vegetation less than equal to 50% AND within 2.4 kilometers of areas with at least 75% wildland vegetation.
- Intermix areas: Areas where housing and vegetation intermingle. Housing density between 6.2 and 741 structures/census block and wildland vegetation is greater than 50%.[64]

Albany County

Figure 4-55 shows wildfire hazard potential across Albany County. Wildfire potential generally increases moving east, and is highest in the northeast corner of the county. However, there are pockets of high potential in the southwest corner of the county, in the Medicine Bow National Forest.

[64] http://silvis.forest.wisc.edu/data/wui-change/

Figure 4-55 Albany County Wildfire Hazard Potential, 2014[65]

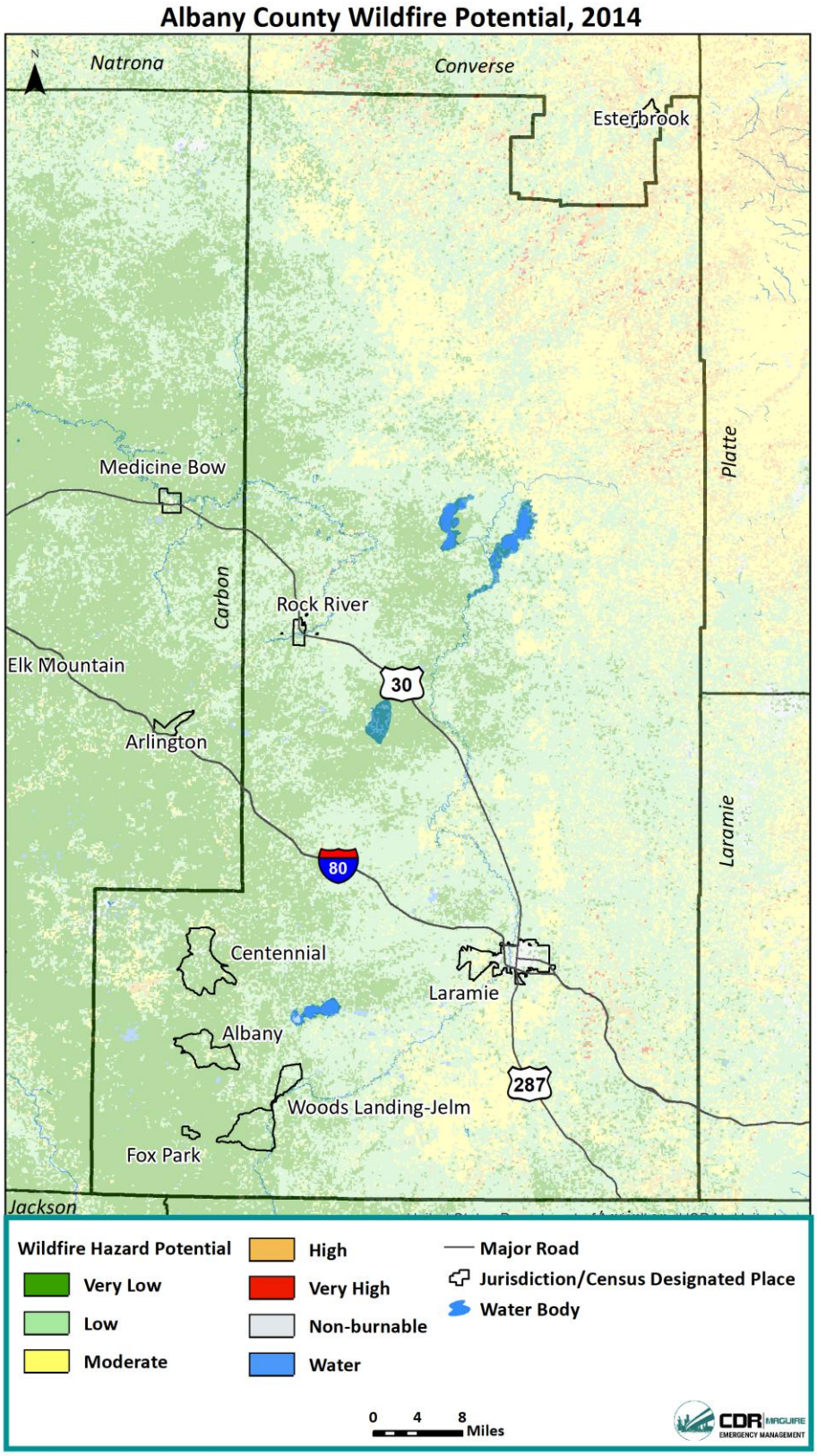
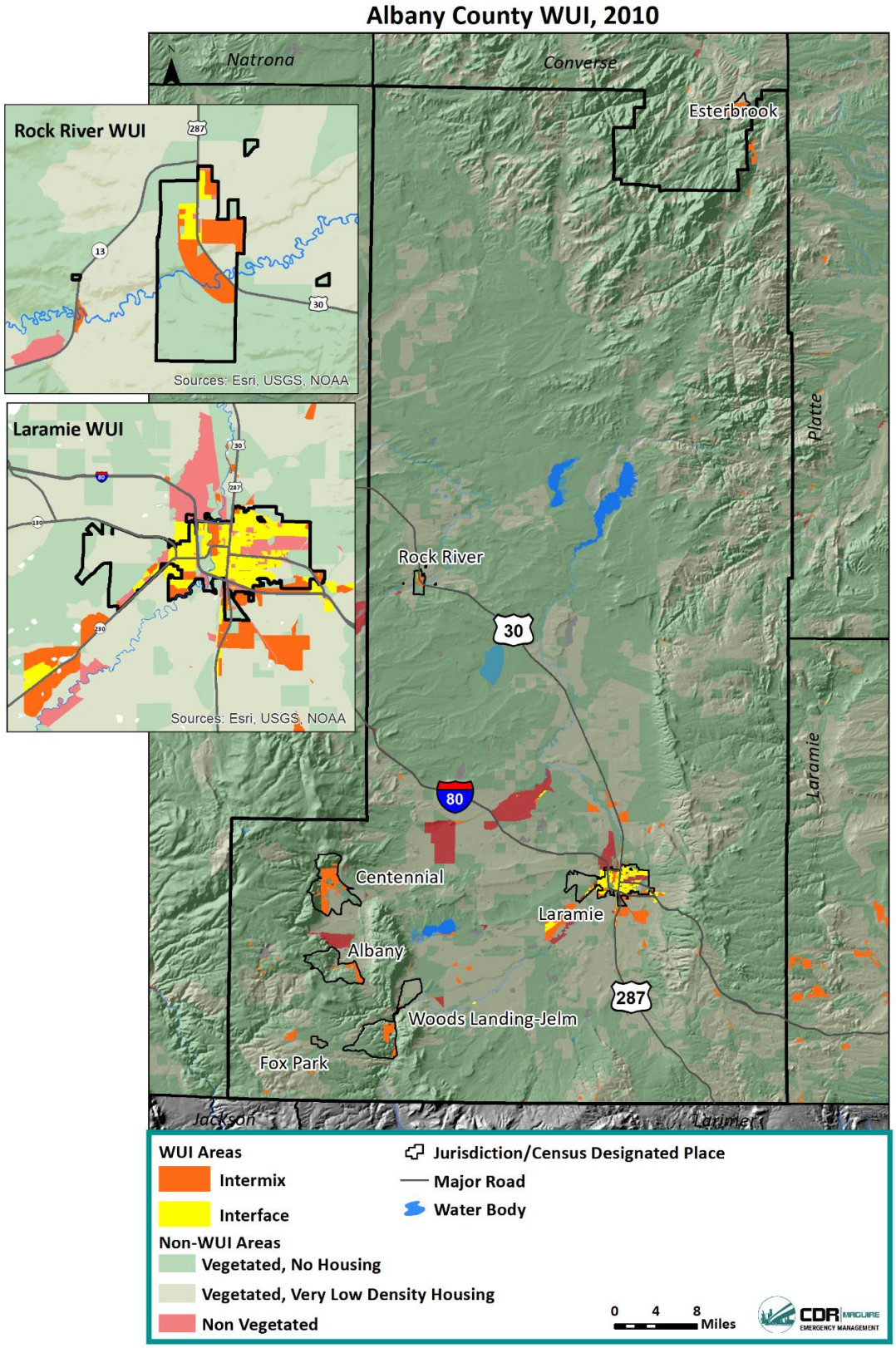


Figure 4-56 shows the WUI areas for Albany County. Many unincorporated areas, such as Centennial, Fox Park, and Albany, have portions of the community in the WUI, particularly in the WUI intermix areas. These communities are near the vegetated areas of the Medicine Bow National Forest. Additionally, Laramie has considerable portions of the community in WUI interface areas, and parts of the community in the WUI intermix areas along the southern border. There are also areas of WUI intermix just outside of the city boundaries. Rock River contains WUI interface and intermix areas in the central and northeastern portion of the town.

Figure 4-56 Albany County WUI, 2010[66]



Carbon County

Figure 4-57 shows wildfire hazard potential in Carbon County. The southern portion of the county has moderate to high wildfire potential, as well as areas within the Medicine Bow National Forest in the southeast portion of the county. Additionally, the north/northeast portion of the county also has moderate to high wildfire potential. The central areas of the county have the lowest wildfire potential.

[66] http://silvis.forest.wisc.edu/data/wui-change/

Figure 4-57 Carbon County Wildfire Hazard Potential, 2014[67]

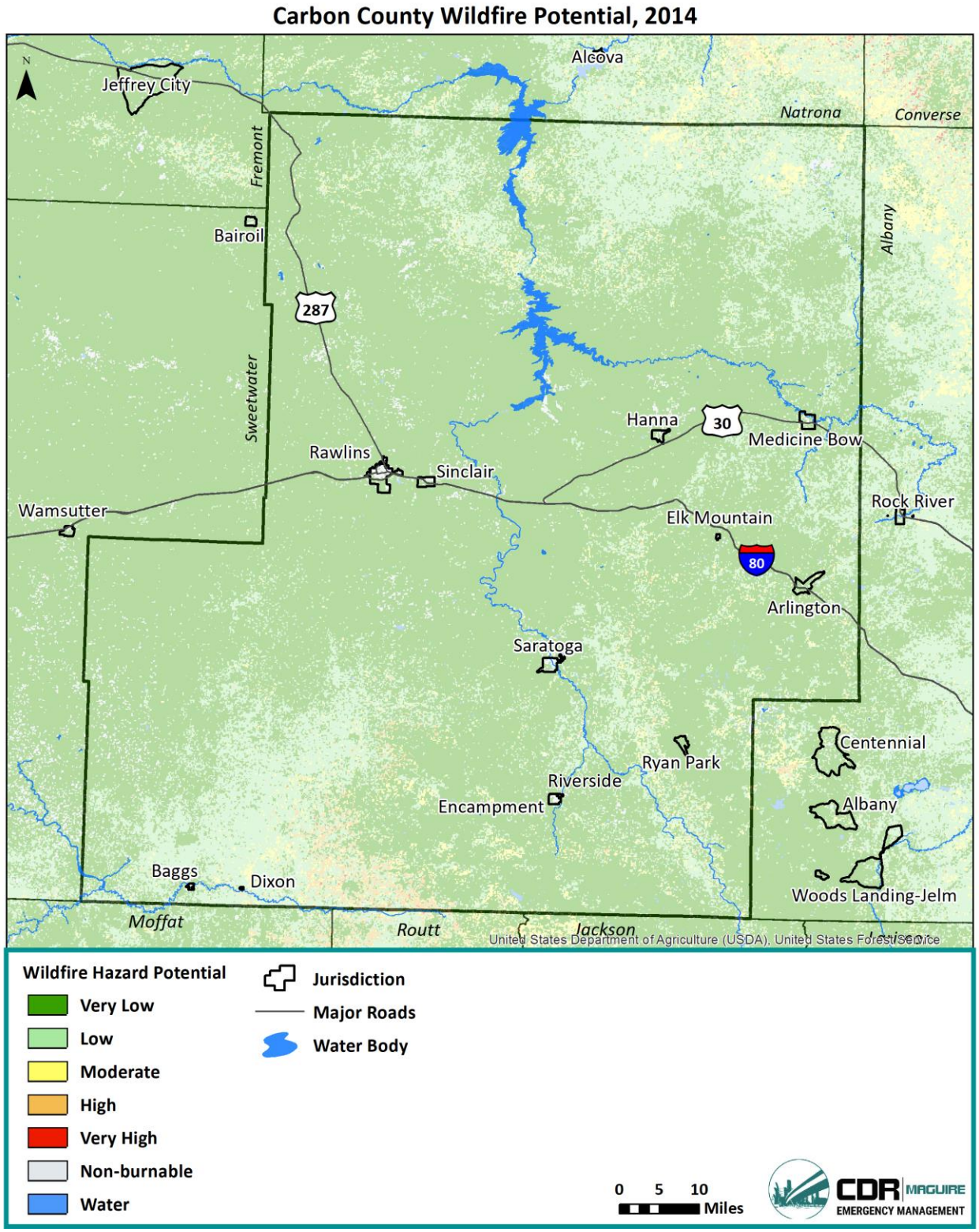
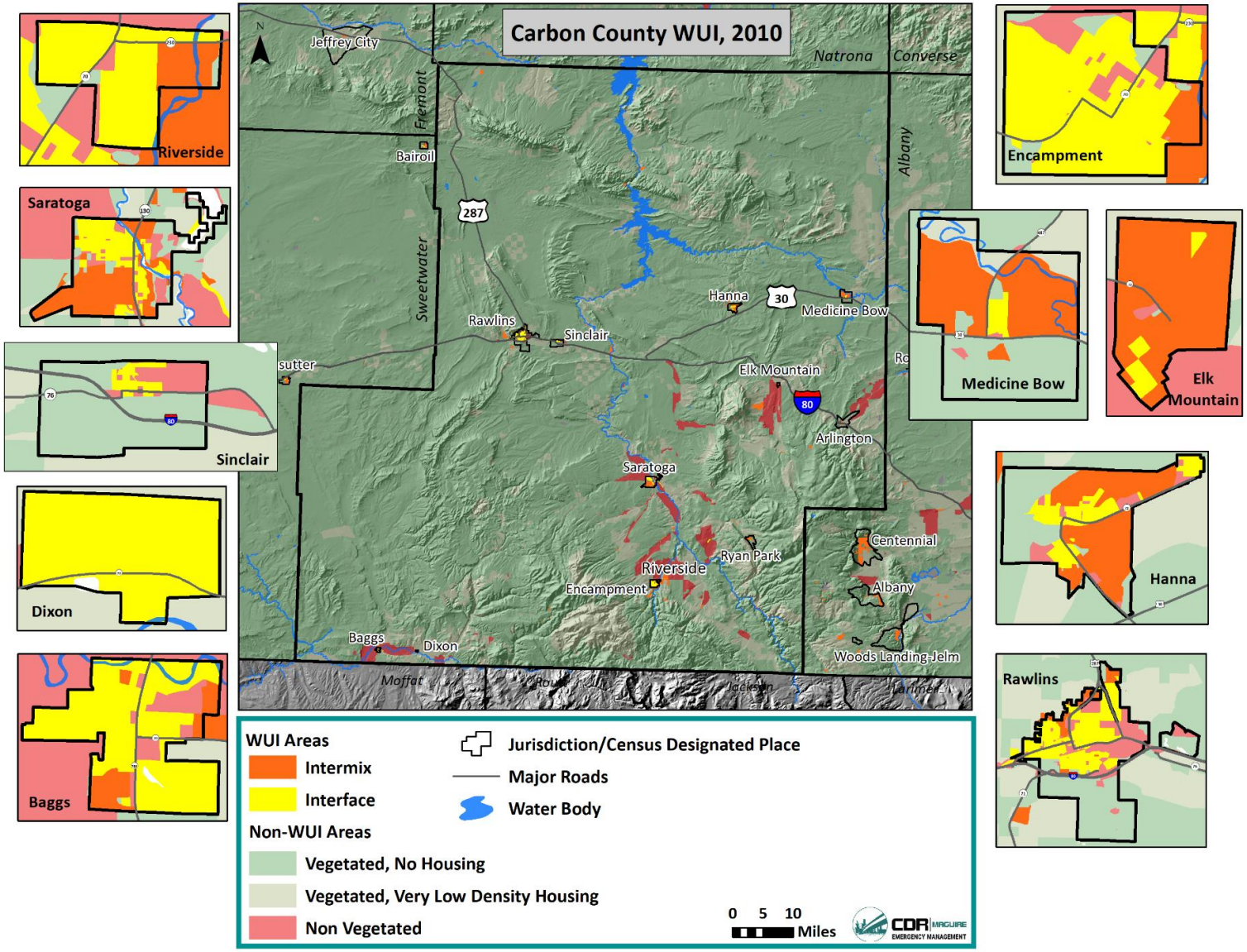


Figure 4-58 shows the WUI areas for Carbon County. Much of unincorporated Carbon County is not in a WUI area due to being largely undeveloped. However, all of the jurisdictions contain land in the WUI interface or intermix, or both. With the exceptions of Rawlins and Sinclair, the jurisdictions have a significant portion of their land area in the WUI.

[67] https://www.arcgis.com/home/item.html?id=fc0ccb504be142b59eb16a7ef44669a3

Figure 4-58 Carbon County WUI, 2010



Extent

Wildfire extent can be described in terms of size and type of fire. According to the National Wildfire Coordinating Group, there are seven classes of wildfire sizes, categorized from A-G:[68]

- Class A - one-fourth acre or less;
- Class B - more than one-fourth acre, but less than 10 acres;
- Class C - 10 acres or more, but less than 100 acres;
- Class D - 100 acres or more, but less than 300 acres;
- Class E - 300 acres or more, but less than 1,000 acres;
- Class F - 1,000 acres or more, but less than 5,000 acres;
- Class G - 5,000 acres or more.

Different types of fires, as detailed in the "Description" section, demonstrate different characteristics that impact how the fire spreads. A surface fire burns along the floor of a forest, moving slowly and killing or damaging trees; a ground fire burns on or below the forest floor; and crown fires spread rapidly by wind and move quickly by jumping along the tops of trees.

Previous Occurrences

Data from the United States Geological Society (USGS) was consulted to determine historic fires in the Region. This data compiles wildfire data from a variety of agencies including the Bureau of Indian Affairs, Bureau of Land Management (BLM), NOR, United States Forestry Service (USFS), U.S. Fish and Wildlife Service, and National Park Service. Wildfires are compiled from 1980 through 2016. It should also be noted that this data has not been spatially verified.[69]

Albany County

Figure 4-59 shows previous wildfires in Albany County from 1980 to 2016. It is evident that the majority of wildfires have occurred in or near the forested areas of the Medicine Bow National Forest in the southwest and northeast corners of the county. In total, there have been 948 wildfires during this time period. All of these wildfires occurred in unincorporated Albany County. Table 4-25 shows the number of wildfires by size class. The majority of wildfires have been less than 1,000 acres in size, however, Albany County has experienced 14 wildfires greater than 1,000 acres. Of all wildfires, 269 were human caused, 677 from natural causes, and one is an undetermined cause. In addition, Albany County has received five Fire Management Assistance (FMAG) Declarations for wildfires, as described in Table 4-26. Significant historical wildfires are described in more detail in Appendix C.

Table 4-25 Previous Wildfires by Size Class in Albany County

County	Size Class	Acres	Count
Albany	A	0 - 0.25	522
Albany	B	0.25 - 10	342
Albany	C	10 - 100	46
Albany	D	100 - 300	8

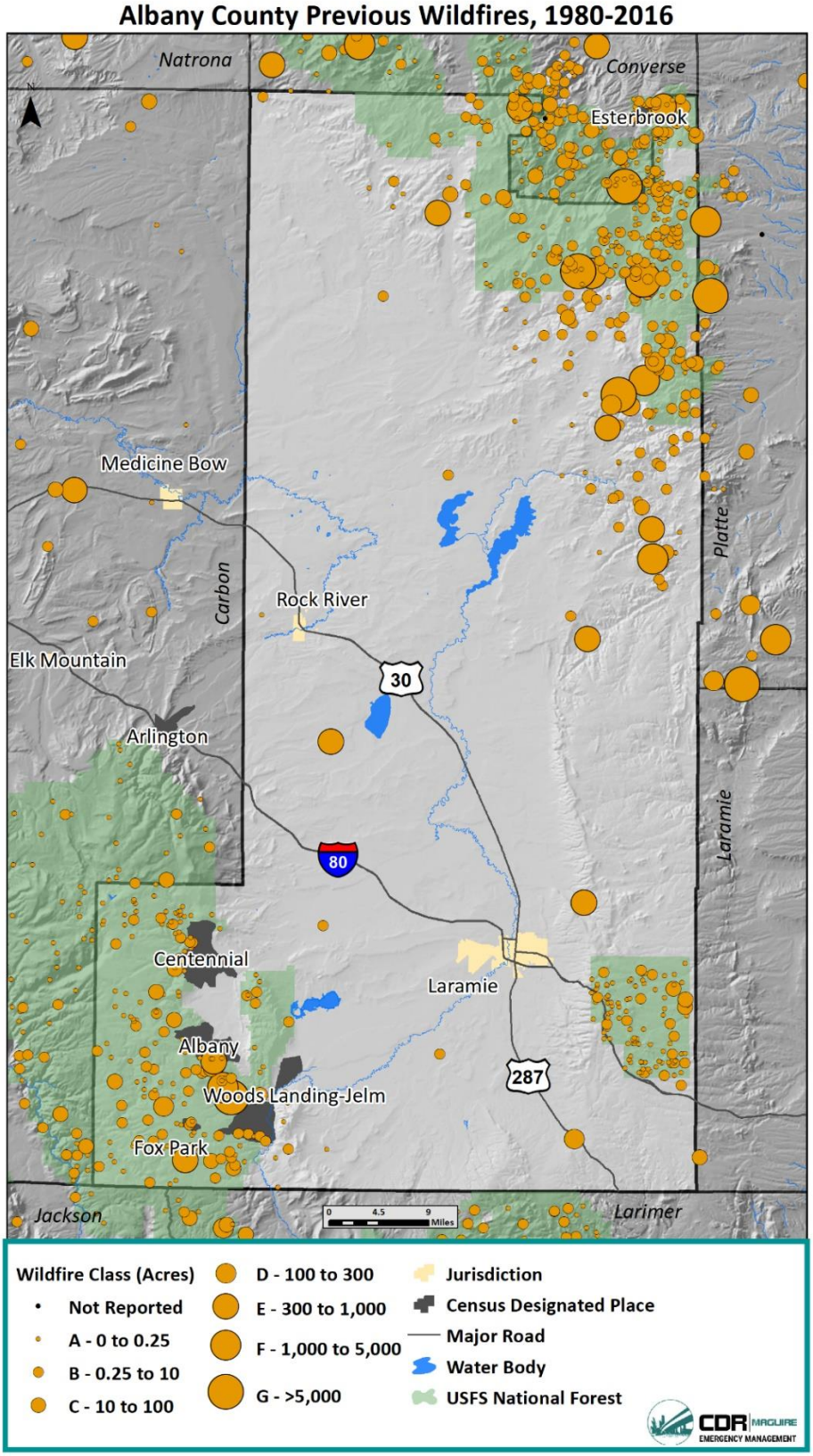
[68] https://www.nwcg.gov/term/glossary/size-class-of-fire%C2%A0
[69] https://wildfire.cr.usgs.gov/firehistory/data.html

County	Size Class	Acres	Count
Albany	E	300 – 1,000	14
Albany	F	1,000 – 5,000	7
Albany	G	> 5,000	7
Albany	NR	Not Reported	2
Grand Total			**948**

Table 4-26 FMAG Declarations in Albany County

Location	Date	Description	Disaster Number
Albany County	June – July 2002	Wyoming Hensel Fire	FM-2427
Albany County	June-July 2002	Wyoming Reese Mountain Fire	FM-2436
Albany County	June-July 2012	Wyoming Arapaho Fire	FM-2992
Albany County	July 2012	Wyoming Squirrel Fire	FM-2993
Albany County	June 2018	Wyoming Badger Creek Fire	FM-5241

Figure 4-59 Albany County Previous Wildfires



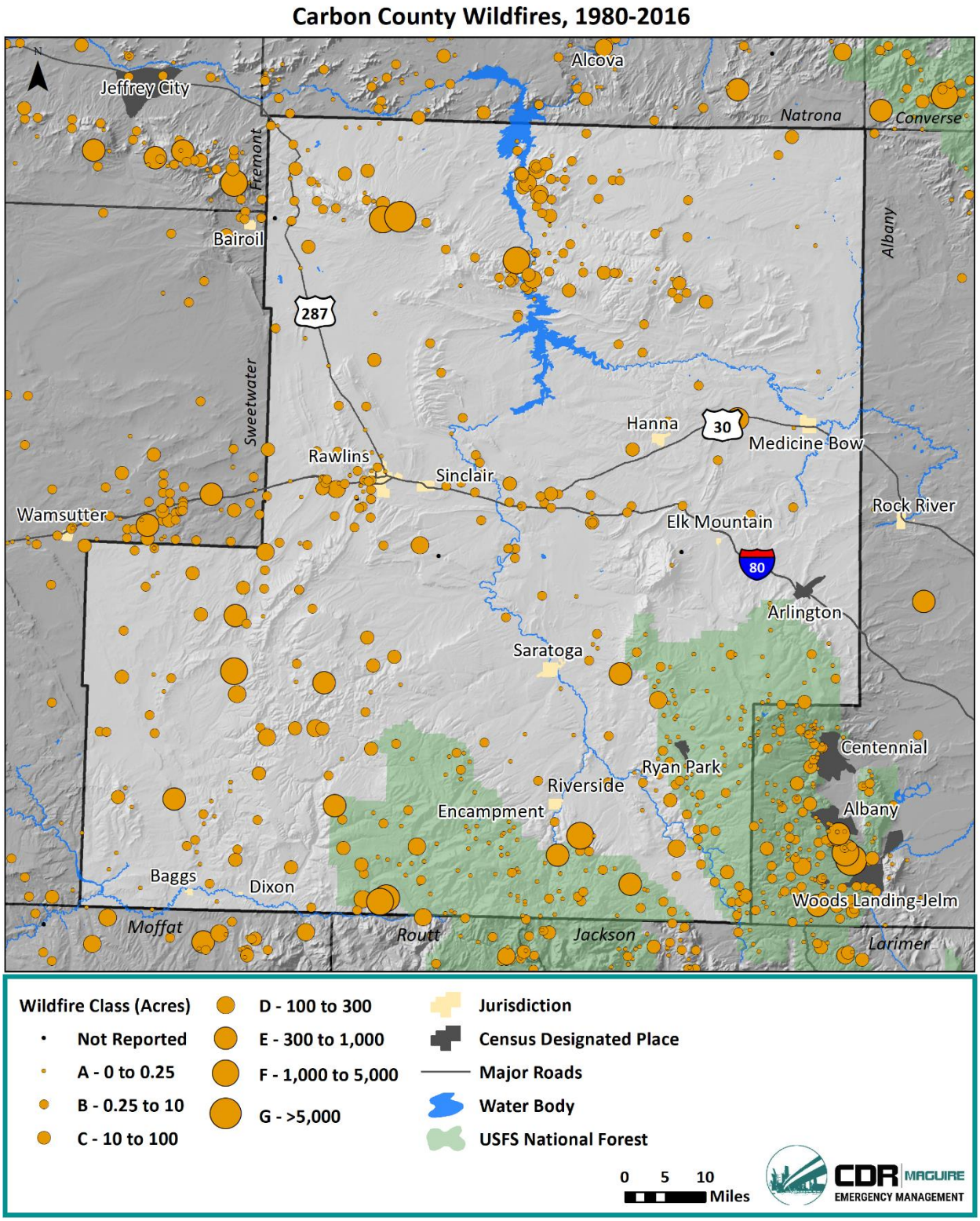
Carbon County

Figure 4-60 shows previous wildfires in Carbon County from 1980 to 2016. Wildfires have occurred throughout the entire county. In total, there have been 1,067 wildfires during this time period. The majority of these wildfires occurred in unincorporated Carbon County, however, there have been six wildfires that have occurred within Rawlins, and five that have occurred within one mile of Rawlins. Table 4-27 shows the number of wildfires by size class. The majority of wildfires have been less than 1,000 acres in size, however, Carbon County has experienced 11 wildfires greater than 1,000 acres. Of all wildfires, 441 were human caused and 624 were ignited by natural causes. Significant historic wildfires are described in more detail in Appendix C, Table 9-13.

Table 4-27 Previous Wildfires by Size Class in Carbon County

County	Size Class	Acres	Count
Carbon	A	0 - 0.25	512
Carbon	B	0.25 - 10	405
Carbon	C	10 - 100	84
Carbon	D	100 - 300	24
Carbon	E	300 – 1,000	20
Carbon	F	1,000 – 5,000	9
Carbon	G	> 5,000	2
Carbon	NR	Not Reported	11
Grand Total			**1,067**

Figure 4-60 Carbon County Previous Wildfires



Probability

Albany County

According to the USGS historical fire data, in Albany County there have been 948 fires from 1980 to 2016. This equates to a 100% chance of wildfire occurrence annually, or a highly likely probability.

Carbon County

In Carbon County there have been 1,067 fires during this time period, also equating to a 100% chance of wildfire occurrence annually, or a highly likely probability.

Vulnerability Assessment

Inventory Exposed/Impacts

Wildfire causes several impacts including structure damage or loss, reduced air quality due to smoke, timber damage and loss, hazardous driving conditions due to smoke and ash, evacuations, accelerated erosion and increased flood risk. Several factors influence wildfire vulnerability in the Region:

- *Climatic conditions*: In times of drought, wildfires may ignite easier and spread faster. Further, water resources may be less available, which could hinder wildfire fighting capabilities. Wind can exacerbate conditions and lead to unpredictable wildfire burn patterns. Rain, conversely, can help with the firefighting efforts. Climate change impacts may also increase fire seasons with fires starting earlier and lasting longer.
- *Fuel*: The past 100 years of forest fire suppression has led to heavy vegetation growth and thus greatly increased the potential fuel-load for a wildfire to burn. As the WUI has grown into these densely packed forests, the potential for catastrophic wildland fires has increased as well. Additionally, the mountain pine beetle epidemic that has impacted much of the Rocky Mountains contributes to fuel loads in Wyoming forests. Although the epidemic has slowed in recent years, this is mostly due to the fact that many of the trees have already been impacted. The bark beetle epidemic in progress will be a long-term problem for fire managers. Fire danger will initially increase due to the standing dead trees. The initial risk will decrease after a few years, but then increase again as the trees begin to fall in large numbers, probably in about 10 years. The dead trees left after epidemics are a source of fuel accumulation that will, in time, burn unless removed (http://www.firewisewyoming.com/index.html). Reducing fuel load can be accomplished through integrated forest management techniques such as prescribed burns and mechanical thinning.
- *Location*: Areas abutting vegetated areas are most prone to wildfire impacts (known as the WUI). As described in the Location section (see Figure 4-56 and Figure 4-58), each jurisdiction in both Albany and Carbon Counties have a portion of their land area located in the WUI.
- *Season:* Wildfires are most common in the summer months. Lightning is more common and fuel is drier during these months.

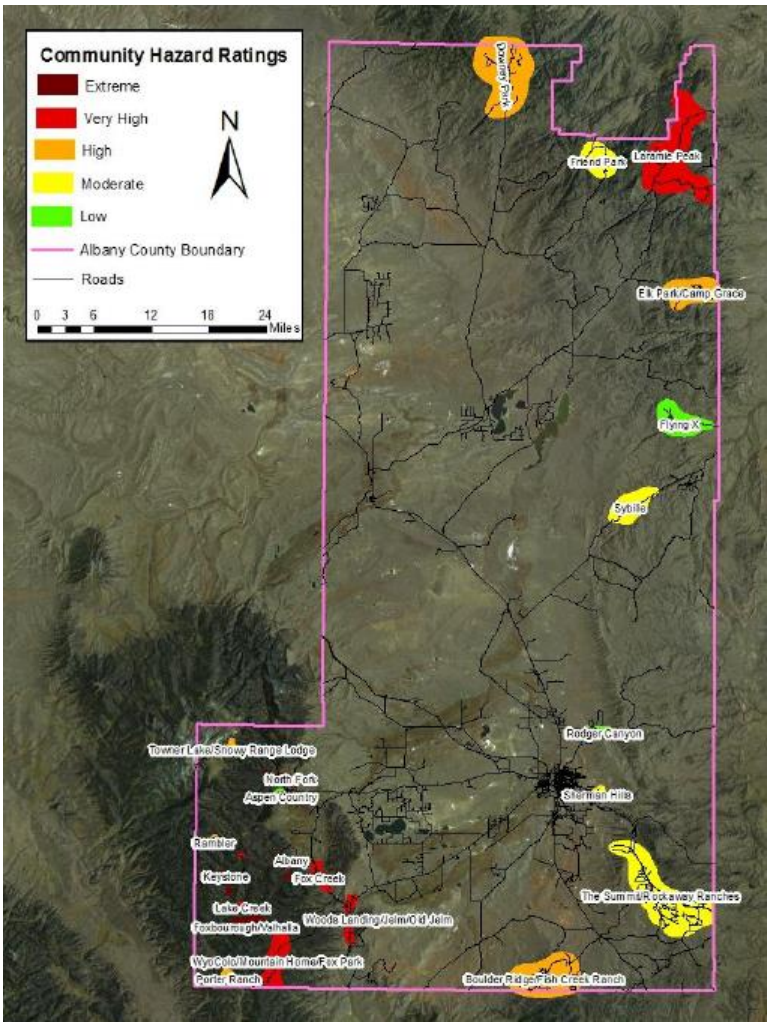
All current and future buildings and populations in Region 3 should be considered at risk to wildfire. However, some communities are at higher risk due to their location in the WUI or proximity to areas with high wildfire potential.

Albany County

In Albany County, communities' wildfire risk was examined in detail in the 2013 Community Wildfire Protection Plan (CWPP). Risk was rated based on factors such as potential for wildfire; fuel availability,

composition, and proximity to structures; defensible space; and factors such as response feasibility and time. Overall, community hazard rankings are the highest in southwest corner, near the Medicine Bow National Forest. Additionally, Laramie Peak in the northeast corner has a "very high" ranking. The communities of Wold, Foxborough/Valhalla, and Keystone in southwest Albany County near the Medicine Bow National Forest have the highest community hazard ranking, of extreme risk. The CWPP also noted special-use cabins of particular concern. These are cabins that are operated using a special use permit within National Forest Land. Many of these cabins are located in dense forests that are difficult for the county to mitigate against wildfire due to their location on federally-owned land. Figure 4-61 shows the community hazard rankings on a county-wide map.[70] A detailed summary of community hazard rankings from the CWPP are included in Appendix C.

Figure 4-61 Albany County 2013 CWPP Community Wildfire Hazard Ratings



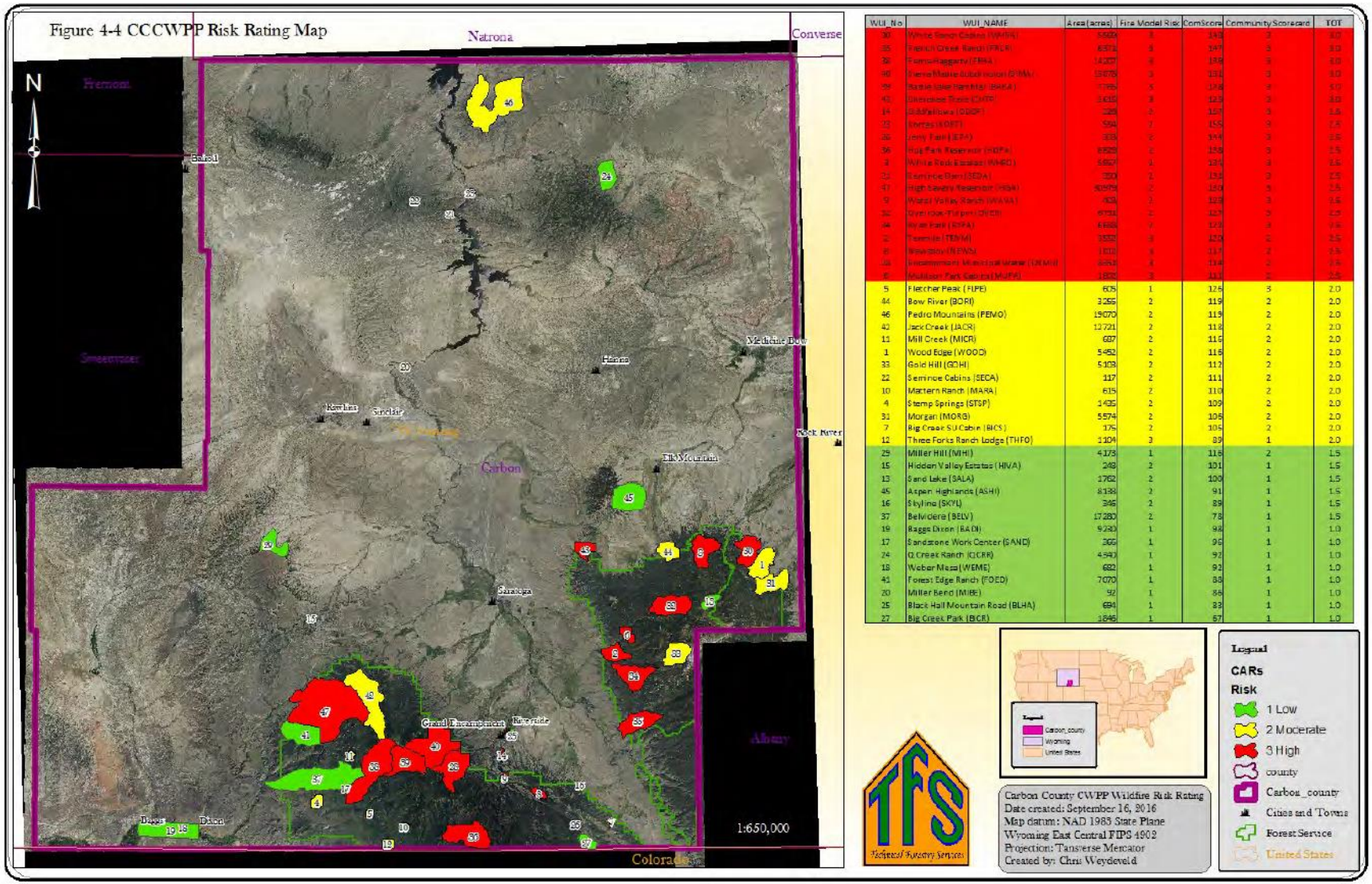
[70] Albany County 2013 CWPP

Carbon County

In Carbon County, the 2016 Carbon County Community Wildfire Protection Plan (CWPP) identifies 47 at-risk communities. These communities were classified and ranked based on wildland fire hazard and risk, structure ignitability, and community layout into a high, medium, or low risk wildfire classification. Thirty-six of the identified at-risk communities are within or adjacent to the Medicine Bow National Forest and the remaining 11 at-risk communities are within or adjacent to Bureau of Land Management administered lands. The majority of these communities are located in the southeast corner of the county. Figure 4-62 shows the results of the communities at-risk in Carbon County.[71] The unincorporated community of Ryan Park was noted as particularly high risk, and the USFS is currently going through the CATEX process to begin logging this summer to thin fuels around the area.

[71] Carbon County 2016 CWPP

Figure 4-62 Carbon County CWPP Rankings



WUI_No	WUI_NAME	Area (acres)	Fire Model Risk	ComScore	Community Scorecard	TOT
30	White Ranch Cabins (WHRA)	5482	3	148	3	3.0
35	French Creek Ranch (FRCR)	6371	3	147	3	3.0
36	Frame Haggarty (FRHA)	14107	3	139	3	3.0
50	Sierra Madre Subdivision (SIMA)	15078	3	131	3	3.0
39	Battle Lake Ranchettes (BALA)	1786	3	128	3	3.0
43	Shoshone Basin (SHB)	1432	3	123	3	3.0
14	Bill Mallows (BMP)	289	2	157	3	2.5
23	Vortex (VORT)	594	2	155	3	2.5
26	Jerry Fork (JEFA)	838	2	144	3	2.5
56	Hog Park Reservoir (HOPA)	6529	2	133	3	2.5
3	White Rock Estates (WHRO)	5957	2	124	3	2.5
21	Sunrise Dam (SEDA)	200	2	123	3	2.5
47	High Savery Reservoir (HISA)	30979	2	120	3	2.5
9	Water Valley Ranch (WAVA)	401	2	123	3	2.5
32	Overlook Turpin (OVER)	6731	2	127	3	2.5
34	Rose Park (ROPA)	6666	2	123	3	2.5
2	Freemile (FREMI)	3332	2	120	3	2.5
6	Brewster (BEWS)	1103	2	117	3	2.5
28	Encampment Municipal Water (EMW)	6242	2	114	3	2.5
8	Muddy Park Cabins (MUPA)	1832	2	113	3	2.5
5	Fletcher Peak (FIPE)	605	1	125	3	2.0
44	Bow River (BORI)	3255	2	119	2	2.0
46	Pedro Mountains (PEMO)	19070	2	119	2	2.0
42	Jack Creek (JACR)	12721	2	118	2	2.0
11	Mill Creek (MICR)	697	2	116	2	2.0
1	Wood Edge (WOOD)	5452	2	116	2	2.0
33	Gold Hill (GOHI)	5103	2	112	2	2.0
22	Seminoe Cabins (SECA)	117	2	111	2	2.0
10	Mattern Ranch (MARA)	615	2	110	2	2.0
4	Stemp Springs (STSP)	1435	2	109	2	2.0
31	Morgan (MORG)	5574	2	105	2	2.0
7	Big Creek SU Cabin (BICS)	175	2	105	2	2.0
12	Three Forks Ranch Lodge (THFO)	1104	3	89	1	2.0
29	Miller Hill (MIHI)	4173	1	116	2	1.5
15	Hidden Valley Estates (HIVA)	248	2	101	1	1.5
13	Sand Lake (SALA)	1762	2	100	1	1.5
45	Aspen Highlands (ASHI)	8138	2	91	1	1.5
16	Skyline (SKYL)	346	2	89	1	1.5
37	Belvidere (BELV)	17280	2	78	1	1.5
19	Baggs Dixon (BADI)	9230	1	98	1	1.0
17	Sandstone Work Center (SAND)	366	1	96	1	1.0
24	Q Creek Ranch (QCRR)	4540	1	92	1	1.0
18	Weber Mesa (WEME)	682	1	92	1	1.0
41	Forest Edge Ranch (FOED)	7070	1	88	1	1.0
20	Miller Bend (MIBE)	92	1	86	1	1.0
25	Black Hall Mountain Road (BLHA)	694	1	83	1	1.0
27	Big Creek Park (BICR)	1846	1	67	1	1.0

The county, communities within, state agencies, and federal agencies each coordinate together to combat wildfires. They share fire stations, apparatuses, volunteers, and equipment. In addition to local resources, Wyoming Division of Forestry, the BLM, and the USFS fight fires in the Region, either by assisting local resources in the case of the state, or having primary responsibility on federal lands. Currently, the Wyoming Forest Action Plan and the Western Wildfire Risk Assessment are considered the primary strategic plans that address wildland fire management in the State.

Potential Losses

Albany County

An exposure analysis was conducted using WUI GIS data and the State of Wyoming Property Tax Division parcel data. An intersect was conducted between parcels within the defined WUI intermix and interface areas in Albany County (Figure 4-56 – Location section) to estimate potential losses. It is important to note that this analysis only includes parcel information, rather than building footprints, and that government buildings are listed as "exempt" and therefore their value is not reflected in this analysis.

This analysis resulted in 2,663 parcels located in the WUI intermix, with an actual value of $490,677,078 and an assessed value of $46,628,412. Of these, 626 are located in the City of Laramie with an actual value of $157,474,486 and an assessed value of $14,964,100, 77 parcels are located in the Town of Rock River with an actual value of $5,131,614 and an assessed value of $487,504, and 1,960 are located in unincorporated Albany County with an actual value of $328,070,978 and an assessed value of $31,176,808. Many of these parcels are located in the southwest portion of the County, as well as in areas around the City of Laramie. There is also a cluster of parcels in the WUI intermix in the very northeast portion of the County.

This analysis resulted in 10,035 parcels located in the WUI interface, with an actual value of $2,766,817,681 and an assessed value of $262,987,067. Of these, 9,357 are located in the City of Laramie with an actual value of $2,660,314,874 and an assessed value of $252,867,847, 162 parcels are located in the Town of Rock River with an actual value of $5,802,287 an assessed value of $551,215, and 516 located in unincorporated Albany County with an actual value of $100,700,520 and an assessed value of $9,568,005. It is evident most of the parcels and value of buildings located in the WUI interface are located within the City of Laramie.

Additionally, wildfires can cause injuries and loss of life. Additionally, smoke from wildfires can cause health impacts to surrounding locations, particularly to populations with respiratory diseases.

Carbon County

An exposure analysis was conducted using WUI GIS data and the State of Wyoming Property Tax Division parcel data. An intersect was conducted between parcels within the defined WUI intermix and interface areas in Carbon County (Figure 4-58– Location section) to estimate potential losses. It is important to note that this analysis only includes parcel information, rather than building footprints, and that government buildings are listed as "exempt" and therefore their value is not reflected in this analysis. Table 4-28 shows the number of parcels, actual value, and assessed value of parcels in the WUI intermix and interface by jurisdiction. Unincorporated Carbon County has the highest number of parcels in the WUI intermix, with 958, as well as the highest actual value of parcels, at $143,311,366. Rawlins has the highest number of parcels in the WUI interface, with 6,268, as well as the highest actual value at $1,080,212,674.

Table 4-28 Carbon County Parcels in the WUI

	WUI Intermix			WUI Interface		
Jurisdiction	#	Actual	Assessed	#	Actual	Assessed
Sinclair	0	$0	$0	242	$25,299,304	$2,443,941
Saratoga	315	$53,225,721	$5,060,662	1,042	$147,489,000	$14,014,098
Riverside	39	$4,405,839	$418,560	175	$14,455,267	$1,373,256
Rawlins	427	$76,650,184	$7,281,755	6,268	$1,080,212,674	$102,620,606
Medicine Bow	196	$15,802,850	$1,501,272	188	$7,630,387	$724,848
Hanna	363	$28,031,007	$2,663,008	539	$22,840,487	$2,169,875
Encampment	38	$2,458,766	$233,585	662	$56,422,266	$5,360,197
Elk Mountain	125	$13,342,175	$1,267,519	29	$3,510,470	$333,504
Dixon	0	$0	$0	82	$5,970,043	$567,155
Baggs	44	$4,408,960	$418,852	253	$21,931,928	$2,085,835
Unincorporated Carbon County	958	$143,311,366	$13,615,262	123	$67,079,846	$6,372,581
Total	**2,505**	**$341,636,868**	**$32,460,475**	**9,603**	**$1,452,841,672**	**$138,065,896**

Additionally, wildfires can cause injuries and loss of life. Additionally, smoke from wildfires can cause health impacts to surrounding locations, particularly to populations with respiratory diseases.

Land Use and Development

Development in rural areas puts a strain on emergency response. Additionally, new developments in WUI areas should use Firewise principals to reduce their risk to wildfires, such as defensible space, adequate driveways conditions, and turn around areas for emergency vehicles. Increased development in WUI areas may also put a strain on water resources in the event of a wildfire.

Additionally, the continued interest in outdoor recreation will continue to put people at risk to wildfire strikes in Albany and Carbon counties.

Albany County

All jurisdictions have experienced an increase in population in Albany County, and the population is projected to continue to grow through 2030. People and structures are vulnerable to wildfires throughout the entire county, however, communities in unincorporated Albany County near the Medicine Bow National Forest, northern Albany County, and areas surrounding Laramie are at a higher risk due to living amongst the WUI. Based on the 2008 Albany County Master Plan, the County is directing growth to areas near existing communities to reduce the impact of rural residential development on resources. According to a study by Headwater Economics, Albany County's Wildland Urban Interface (WUI) is 93.3% undeveloped. These areas roughly correspond to the non-WUI vegetated, no housing and non-WUI vegetated, very low-density housing areas on Figure 4-56 Albany County WUI, 2010 (implying areas with vegetation but currently mostly undeveloped). As growth is directed in these areas and they develop, wildfire risk and firefighting costs increase. Additionally, just outside of the City of Laramie are designated as high-growth areas for future development. This area is also part of the WUI and has experienced past wildfires. The Laramie Regional Airport (west) and new Cirrus Sky Technology Park (north), reside in this area, for example. These amenities may spur further growth in this area.

Carbon County

Carbon County population is expected to remain relatively constant, although fluctuations due to changes in the energy industry are common. New residents and development related to population changes are vulnerable wildfires, particularly development in the WUI. Based on the 2010 Carbon County Comprehensive Land Use Plan, the County is directing growth to areas near existing communities to reduce the impact of rural residential development on resources. According to Headwater Economics, Carbon County's WUI is 96.9% undeveloped.

4.5.11. Wind/Windblown Deposits

Description

Wind is the movement of air from areas of high pressure to areas of low pressure, or can be the result of microbursts associated with temperature variations in the atmosphere, usually associated with thunderstorms or dry thunderstorms. Wind, because of its constant presence in Wyoming, is taken in stride by the population and often overlooked as a hazard. However, wind is a damage-causing hazard and warrants review in the Region 3 Hazard Mitigation Plan.

Windblown deposits are fine-grained materials such as sands and silts that are mobilized by wind. Wyoming has some of the most significant windblown deposits in the U.S. Strong winds can mobilize and significantly move sand or silt grains in much of Wyoming. Many of the mapped deposits in Wyoming are somewhat stabilized, but a significant number are still active.

Location

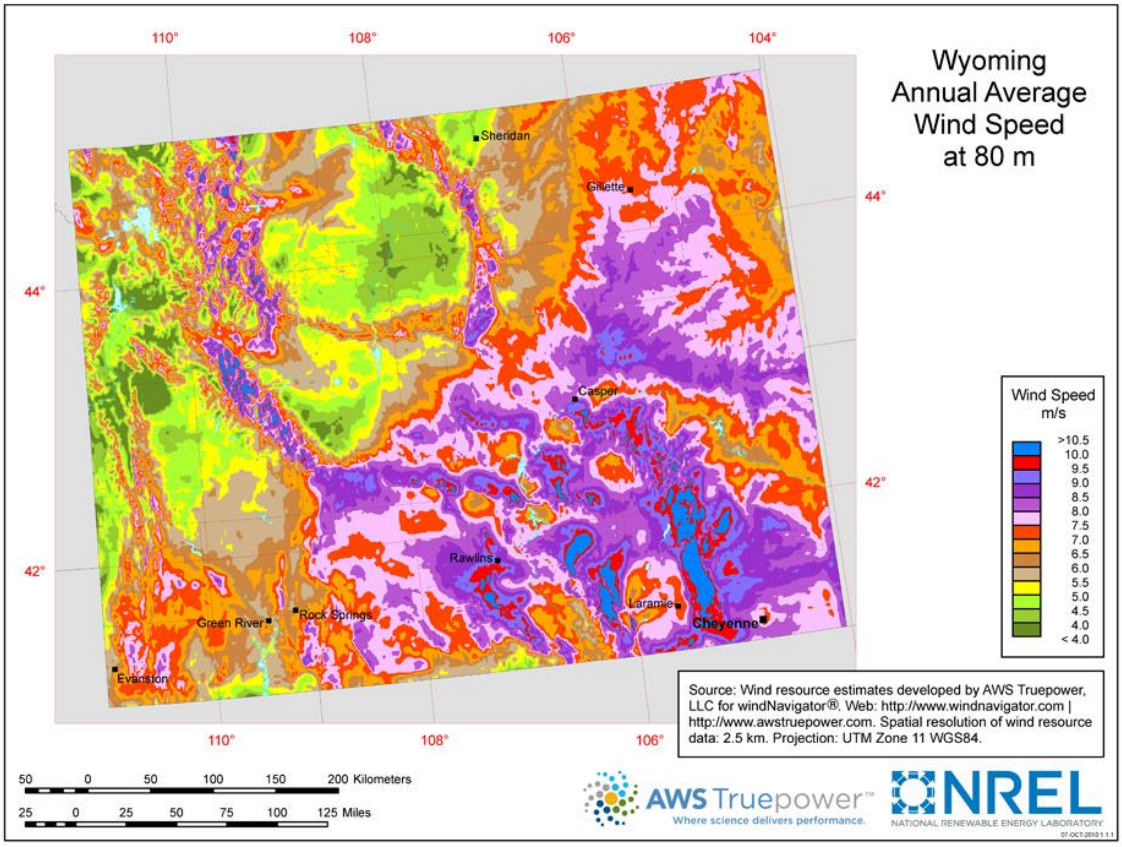
Wind

Wind is atmospheric in nature and can impact the entire planning area. The open plains permit strong winds that blow with little resistance. In many areas, trees have a permanent lean to the east or southeast due to wind.

Figure 4-63 shows the annual average wind speed at 80 meters in Wyoming.[72] It is evident southeast Wyoming has some of the highest average wind speeds in the state.

[72] https://windexchange.energy.gov/maps-data/142

Figure 4-63 Wyoming Annual Average Wind Speed at 80 meters



Albany County

Just west of Laramie is The Big Hollow, the second largest wind basin in the world. The 40 square mile basin was created entirely by wind erosion. It is approximately 9 miles long and 165 feet deep. It's listed on the National Natural Landmarks program through the National Park Service.

Carbon County

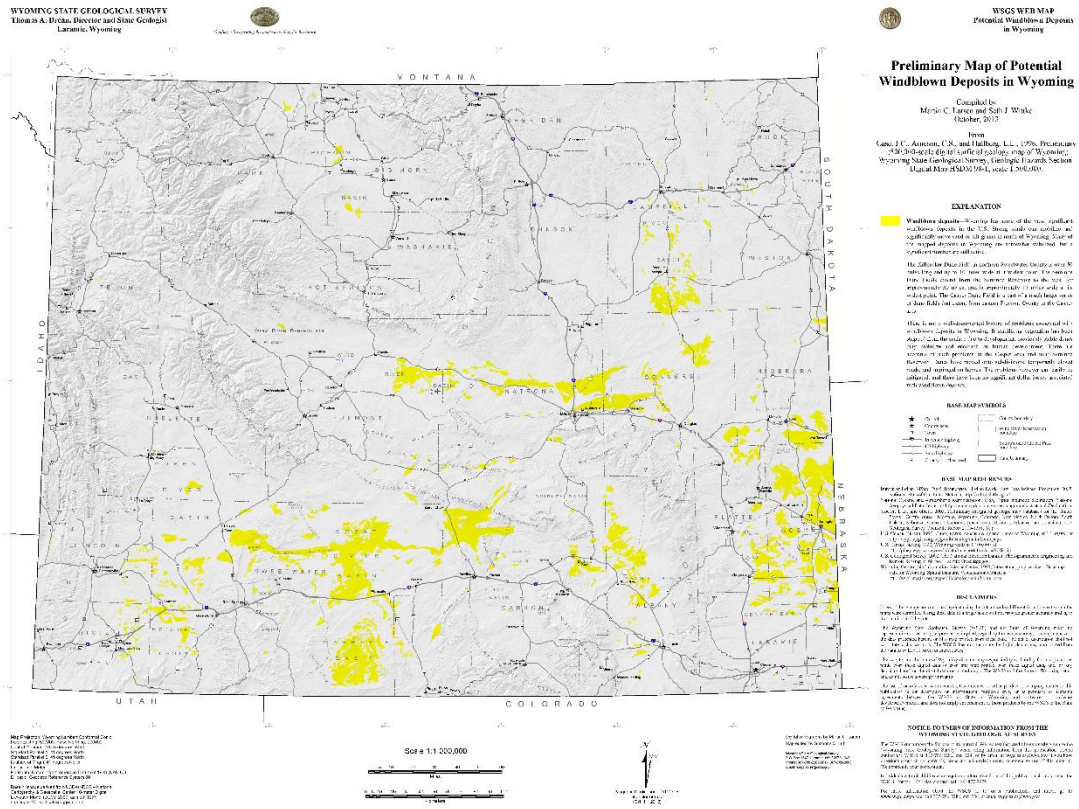
Located in Wyoming's "wind zone", Carbon County is in a gap in the Rocky Mountains that acts as a funnel that concentrates westerly winds as low pressure and storm fronts pass through. It is the short-lived but strong wind gusts associated with thunderstorms and dry microbursts that tend to cause damage in the county.

Windblown Deposits

Figure 4-64 shows potential windblown deposits mapped by the Wyoming Geological Survey.[73]

[73] http://www.wsgs.wyo.gov/docs/wsgs-web-windblown-deposits-map.pdf

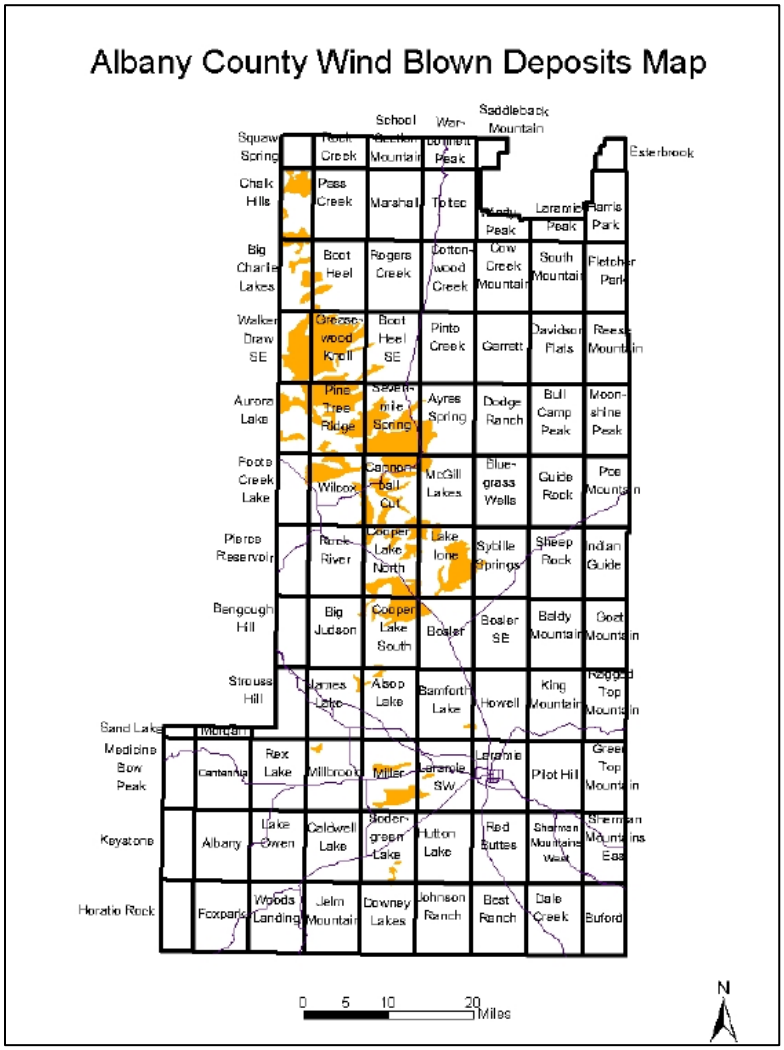
Figure 4-64 Wyoming Windblown Deposits



Albany County

Areas of windblown deposits are minimal but present in Albany County. In Albany County, windblown deposit locations are located north-north west from Cooper Lake South to Squaw Spring. In addition, there are areas located west of Laramie. Figure 4-65 shows the windblown deposits on a county scale from the Wyoming State Hazard Mitigation Plan.

Figure 4-65 Windblown Deposits in Albany County[74]

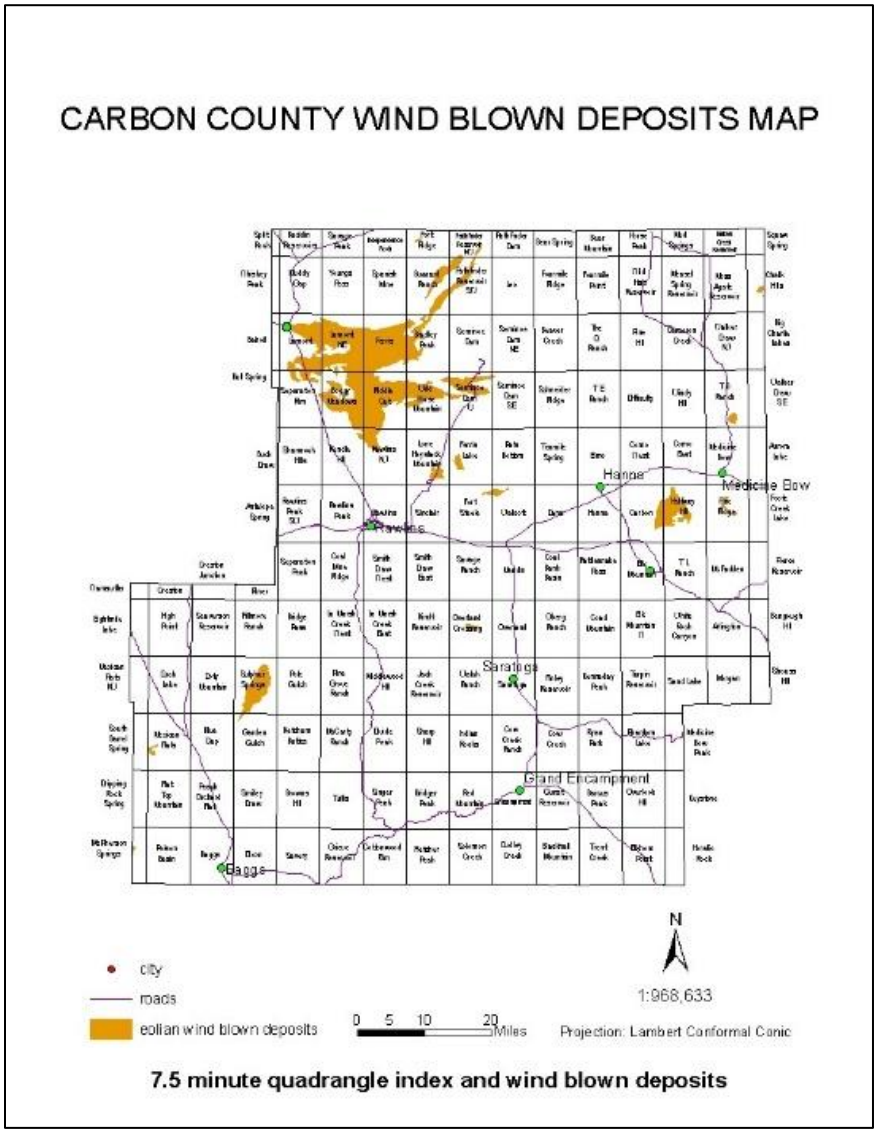


Carbon County

In Carbon County, the Seminoe Dune Field extends from the Seminoe Reservoir to the west for approximately 30 miles and is approximately 15 miles wide at its widest point. Figure 4-66 shows the windblown deposits on a county scale from the Wyoming State Hazard Mitigation Plan.

[74] Wyoming State Hazard Mitigation Plan

Figure 4-66 Windblown Deposits in Albany County[75]



Extent

Wind can be categorized by the Beaufort Wind Scale as shown below.[76]

Table 4-29 Beaufort Wind Scale

Appearance of Wind Effects			
Force	**Wind (Knots)**	**WMO Classification**	**On Land**
0	Less than 1	Calm	Calm, smoke rises vertically

[75] Wyoming State Hazard Mitigation Plan
[76] https://www.spc.noaa.gov/faq/tornado/beaufort.html

Appearance of Wind Effects			
Force	**Wind (Knots)**	**WMO Classification**	**On Land**
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vanes
2	4-6	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	7-10	Gentle Breeze	Leaves and small twigs constantly moving, light flags extended
4	11-16	Moderate Breeze	Dust, leaves, and loose paper lifted, small tree branches move
5	17-21	Fresh Breeze	Small trees in leaf begin to sway
6	22-27	Strong Breeze	Larger tree branches moving, whistling in wires
7	28-33	Near Gale	Whole trees moving, resistance felt walking against wind
8	34-40	Gale	Twigs breaking off trees, generally impedes progress
9	41-47	Strong Gale	Slight structural damage occurs, slate blows off roofs
10	48-55	Storm	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	56-63	Violent Storm	
12	64+	Hurricane	

Previous Occurrences

Wind

Albany County

Winds are nearly constant in Albany County ranging from 1 mph to 24 mph from nearly all directions. Wind speeds average 12.4 miles per hour (Laramie), which is the second highest in the state. However, the highest average speed is in March, when average winds are 14 miles per hour. The NCEI began reporting high wind events in 2009, and from 2009 to 2018, 3,101 events were reported on 443 separate days. High wind events are reported by weather zone, making it difficult to determine precise locations of past events. However, Table 4-30 shows previous occurrences by zone. No damage information was associated with this data. One fatality was reported due to a tractor trailer accident caused by wind. Rock River also reported an event that blew over an empty train (no hazmat risk). Wind events on several occasions also caused semi-trucks to roll over, causing injuries. The strongest event reported was a gust of 92 miles per hour in October 2012 in the Snowy Range zone, and again in February 2017 in the central Laramie range. SHELDUS reports 86 damage-causing wind events from 1960 to 2018, resulting in $4,127,308 in property damages and $161,881 in crop damages, adjusted to 2017 dollars.

Table 4-30 Albany County Previous Wind Events

Zone Name	# of Events
Central Laramie Range and Southwest Platte County	316
Laramie Valley	205
North Laramie Range	37
North Snowy Range Foothills	1,275

Zone Name	# of Events
Shirley Basin	54
Snowy Range	4
South Laramie Range	672
South Laramie Range Foothills	538
Total	**3,101**

Carbon County

In Carbon County, from 2009 to 2018, 1,683 events were reported on 363 separate days. No deaths and one injury have been reported during this time period, and reports of several incidences of semi-truck rollovers were documented from wind. Table 4-31 shows previous high wind events by zone. No damage information was associated with this data. The strongest event reported was a gust of 92 miles per hour in October 2012 in the Snowy Range zone. SHELDUS reports 79 damage-causing wind events from 1960 to 2018, resulting in $1,187,028 in property damages and $61,090 in crop damages, adjusted to 2017 dollars.

Table 4-31 Carbon County Previous Wind Events

Zone Name	# of Events
Central Carbon County	103
Ferris/Seminoe/Shirley Mountains	83
North Snowy Range Foothills	1,393
Shirley Basin	58
Sierra Madre Range	2
Snowy Range	4
Southwest Carbon County	16
Upper North Platte River Basin	24
Total	**1,683**

Windblown Deposits

Persistent wind in Albany and Carbon counties makes windblown deposits more likely to cause damage because of the force of the wind carrying the deposits. However, there is no well-documented history of problems associated with windblown deposits in Albany or Carbon County, or the rest of Wyoming.

Probability

The annual likelihood of a high wind event in both Albany and Carbon counties is 100%, therefore for both counties, the probability is highly likely.

Vulnerability Assessment

Inventory Exposed/Impacts

All current and future buildings and populations are at risk to wind and windblown deposits.

Wind can result in a variety of impacts to current and future buildings and populations including:

- Torn-off roofs and shingles
- Downed trees and limbs
- Debris generation

Windblown deposits, if disturbed, could be destabilized. In this case, the deposit will relocate if not re-vegetated. There is not a well-documented history of problems associated with windblown deposits in Wyoming. Destabilized dunes may cause nuisance problems that are easily fixed. Accounts of problems include dunes encroaching onto subdivision properties, temporarily closed roads, and impinged on homes. However, as development continues in Wyoming, more land is disturbed. Eventually, stabilized dunes will be disrupted, leading to nuisance problems with the windblown deposits.

Potential Losses

The availability of sheltered locations such as basements, buildings constructed using tornado-resistant materials and methods, and public storm shelters, all reduce the exposure of the population to wind events. However, there are also segments of the population that are especially exposed to the indirect impacts of high-wind events, particularly the loss of electrical power. These populations include the elderly or disabled, especially those with medical needs and treatments dependent on electricity. Nursing homes, Community Based Residential Facilities, and other special needs housing facilities are also vulnerable if electrical outages are prolonged, since backup power generally operates only minimal functions for a short period of time. In terms of property losses caused by any high-wind hazard, the actual damages will depend on the building density and quality of construction in the impacted area. Buildings that are close to large trees or overhead power lines are also at greater risk of suffering more extensive damages. Construction practices can help maximize the resistance of the structures to damage. In terms of crop losses, the actual damages that occur will depend on the type of crop and the growth stage of the plants. A wind storm in a rural area in the early spring when the plants are just emerging will have much less of an impact than a storm of the same intensity occurring later in the growing season when the plants are more susceptible to damage and when there is no time to replant if the crop is a total loss. High-wind events also have the potential to wreak havoc on above-ground infrastructure such as power and communication lines. Downed power and communications transmission lines, coupled with disruptions to transportation, create difficulties in reporting and responding to emergencies.

Jurisdictional-specific loss information is not available for either county. However, for both counties, the North Snowy Range Foothills zone, which stretches just north of the Medicine Bow National Forest crossing into both Albany and Carbon counties, has experienced the most previous high wind events according to NCEI data. Therefore, it can be determined that structures in the area are at a high risk to losses from high wind events. It is evident wind can cause significant damages to Albany and Carbon counties.

Albany County

According to SHELDUS data from 1960 to 2018, Albany County has experienced $4,127,308 in property damages and $161,881 in crop damages (2017 dollars), which equates to $71,160 in annual property losses and $2,791 in annual crop damages.

Carbon County

Carbon County experienced $1,187,028 in property damages during this time frame and $61,090 in crop damages (2017 dollars). This equates to $20,466 in annual property losses and $1,053 in annual crop losses.

Land Use and Development

All jurisdictions have experienced an increase in population in Albany County, and the population is projected to continue to grow through 2030. People and structures are vulnerable to wind events throughout the entire county.

Carbon County population is expected to remain relatively constant, although fluctuations due to changes in the energy industry are common. New residents and development related to population changes are vulnerable to wind events across the County.

Future development such as buildings and infrastructure will need to continue to follow building codes and design criteria for high winds.

As development continues in Wyoming and the Region, more land is disturbed. Currently stabilized dunes may be disrupted, leading to nuisance problems with windblown deposits. Because the level of damage has been historically low and the cost of damage is not expected to increase, it is believed that development in Wyoming has a limited impact of the risk presented by windblown deposits. Due to the limited nature of damage generated by windblown deposits, it is also believed the vulnerability of Wyoming residents is limited.

Windblown deposit maps should be considered when development is planned. Windblown deposits can inhibit transportation, affect agricultural lands and contribute to dust storms. Windblown deposits could temporarily block roads in the vicinity of Seminoe Reservoir, but at present the area is sparsely developed.

4.5.12. Winter Storm/Blizzard

Description

A winter storm is an event in which varieties of precipitation are formed that only occur at low temperatures, such as snow, sleet, freezing rain or ice. Blizzards are defined as a severe weather condition characterized by high winds and reduced visibilities due to falling or blowing snow. These storms can range from a few hours of moderate snowstorm to several days. They are typically accompanied by biting winds, poor visibility, sleet, and ice.

Snowstorms generally occur with the clash of different types of air masses, with differences in temperature, moisture, and pressure; specifically, when warm moist air interacts with cold dry air. Snow storms that produce a lot of snow require an outside source of moisture, such as the Gulf of Mexico or the Pacific Ocean. Blizzards are severe snow storms with winds in excess of 35 mph and visibility of less than a 1/4 mile for more than 3 hours. Freezing rain occurs when a layer of warm air hovers over a region, but the ground ambient temperature is sub-freezing.

Location

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 that 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 elsewhere within the planning area. All of Albany and Carbon Counties are subject to the winter storm hazard.

Extent

Winter storms are defined differently in various parts of the country relevant to their standard weather. Two inches of snow may create serious disruptions to traffic in areas where snowfall is not expected, however this may be considered a light dusting in regions where snowfall is typical, such as Wyoming. Therefore, there are multiple ways in which to measure a winter storm, based on snowfall, temperatures, wind speeds, societal impact, etc.

The National Weather Service specifies the following criteria for a blizzard:

- Sustained win or frequent gust of 16 meter per second (35 miles per hour) or greater,
- Sustained winds accompanied by falling or blowing snow
- Frequently reduced visibility to less than 400 meters (0.25 miles) for 3 hours or longer.

Previous Occurrences

Particularly bad storms occurred in 1886, 1949, 1980, 1996, and 1997. The data were derived from the monthly Storm Data reports from National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC). Other sources are unpublished reports from the Wyoming Office of Homeland Security, newspaper accounts, and periodicals from public libraries. The winter of 2007-08 was also bad for frequent winter storms. Numerous storms were severe enough and with enough blowing and drifting snow to required closure of Interstate 80. The emergency shelter was opened five times during this winter for stranded motorists and other needing shelter. The winter of 2008 experienced numerous severe winter storms and high winds. Interstate 80 was closed repeatedly, forcing shelters to be opened to accommodate stranded and vulnerable people. The storms also shut down access to oil fields.

Albany County

Winter storms, blizzards, and associated hazards are a common occurrence in Albany County, particularly October through April. The NCEI began reporting winter storm and blizzard events in 2009. From 2009 to 2018, there have been 581 total winter storm (558) and blizzard (23) events in Albany County. Winter weather events are reported by weather zone, making it difficult to determine precise locations of past events. However, Table 4-32 shows previous occurrences by zone. Significant blizzard events are described in Appendix C, as reported by the State Plan and the NCEI. No damages were recorded in the NCEI data, however, $120,000 in damages was attributed specifically to Albany County based on the State Hazard Mitigation Plan data, and $100,000 in Laramie. Additionally, there have been 44 recorded injuries and 3 deaths. Thirty of these injuries were the result of a bus accident in blizzard conditions in October of 1997. According to SHELDUS data from 1690 to 2018, there has been $2,298,217 in property damages and $582,265 in crop damages from winter storms in Albany County, adjusted to 2017 dollars.

Table 4-32 Albany County Previous Winter Storm Events

Zone Name	# of Events
Central Laramie Range and Southwest Platte County	31
Laramie Valley	57
North Laramie Range	36
North Snowy Range Foothills	63
Shirley Basin	26
Snowy Range	256
South Laramie Range	62
South Laramie Range Foothills	50
Total	**581**

Carbon County

The winter storm history in Carbon County extends from 1871 to present, however, NCEI data only dates back to 2009. Based on the NCEI data, Carbon County has experienced 726 winter storm (713) or blizzard (13) events. Table 4-33 describes these events by zone. No dollar loss damage information was associated with the NCEI data. A history of storms that caused damage, significant closure of highways, and/or impacts to the livestock industry between 1871 and 2018, as reported by the State Plan and the NCEI, are described in Appendix C. According to the State Plan data, $37,000 in losses have been reported specific to Carbon County. According to SHELDUS, from 1960 to 2018, Carbon County experienced $1,986,318 in property damages and $1,942 in crop damages, adjusted to 2017 dollars.

Table 4-33 Carbon County Previous Winter Storm Events

Zone Name	# of Events
Central Carbon County	33
Ferris/Seminoe/Shirley Mountains	21
North Snowy Range Foothills	63
Shirley Basin	25
Sierra Madre Range	290
Snowy Range	254
Southwest Carbon County	16
Upper North Platte River Basin	24
Total	**726**

Probability

Albany County

Utilizing the NCEI data with 581 winter storm and blizzard events from 2009 to 2018 in Albany County, there is a 100% probability of an event occurring annually. This corresponds to a probability of highly likely.

Carbon County

In Carbon County, with 726 events in the same time period, there is also a 100% probability of an event occurring annually (highly likely). The chance of occurrence is highest from October to May in both counties.

Vulnerability Assessment

Inventory Exposed/Impacts

Because winter storms are so prevalent in Wyoming, vulnerable populations can be significantly impacted. Impacts include inability to get from one location to another because of closed roads, making pharmacies and grocery stores inaccessible. The closure of Interstate 80 during winter storms can have significant impacts to the economy, both locally and nationally. Electrical outages are also prevalent during winter snowstorms and blizzards, limiting or eliminating household heating and cooking capability. Preparation for winter storms is needed to ensure successful weathering of the situation. Some winter storm preparations to be considered by residents include the creation and maintenance of adequate water and food within a 72-hour kit both in vehicles and at home, backup power generation capabilities, and backup household heating options. Winter storms are best weathered by sheltering in place during the storm, and attempting to go out only after the storm has ended.

Rural areas tend to be more susceptible to power outages in winter storms, and power outages in rural areas tend to be of greater duration than those in more populated areas. Rural locations are more likely to have livestock and farming economic factors, which can be significantly impacted by winter weather. Blizzards and winter storms have resulted in livestock deaths and livestock rescue efforts including hay drops by helicopter and snow removal efforts to give ranchers access to their livestock to minimize losses. An additional impact to the Region highlighted by the Planning Team is the cost of search and rescue operations for locating lost snowmobilers and other backcountry recreationists during winter storms.

Potential Losses

In addition to the losses listed below, WYDOT has given estimates as high as $10 million/day is lost to the national economy when Interstate 80 is closed during winter storms.[77]

Albany County

Utilizing SHELDUS data from 1960 to 2018, Albany County has experienced $2,298,217 in property damages and $582,265 in crop damages from winter storms (2017 dollars), which equates to $39,624 in annual property damages and $10,039 in annual crop losses.

Carbon County

Carbon County has experienced $1,986,318 in property damages and $1,942 in crop damages (2017 dollars), which equates to $34,246 in annual property damages and $33 in annual crop damages. Additionally, SHELDUS reports $31,755 (2017 dollars) in crop indemnity payments due to winter weather events for Carbon County from 1989 to 2017.

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[77] Planning Team

Land Use and Development

Winter storms and blizzards are particularly impactful on people unfamiliar with the hazard. This makes those areas of increased development more vulnerable and subject to risk from the hazard, assuming a percentage of those moving to developing areas are unfamiliar with winter storms, specifically the need to make preparations ahead of the storm and the need to shelter-in-place through a blizzard or winter storm. In areas of high development with an influx of families, education is critical to help prepare the community for the hazard.

With Albany County and its jurisdictions experiencing population growth since 2010, more people are at risk to winter weather and blizzards. In Carbon County, temporary workers moving into the county related to energy development may be more vulnerable to winter weather and blizzards if they are not properly prepared for the conditions that exist in Wyoming.

4.5.13. Communicable and Infectious Disease

Description

A communicable disease is an infectious disease that is transmissible from person to person by direct contact with an affected individual or the individual's discharges, or by an indirect means, such as a vector.[78] A communicable disease can be spread quickly across populations, leading to pandemic and epidemic outbreaks. An infectious disease is any disease that causes an infection. They may or may not be transmissible to other people. There are several communicable and infectious diseases relevant to the Region and the State of Wyoming, including influenza (the flu), meningitis, and the measles.

Influenza

This hazard risk assessment includes an analysis of pandemic flu risk in Albany and Carbon Counties. A pandemic can be defined as a disease that attacks a large population across great geographic distances. Pandemics are larger than epidemics in terms of geographic area and number of people affected. Epidemics tend to occur seasonally and affect much smaller areas. Pandemics, on the other hand, are most often caused by new subtypes of viruses or bacteria for which humans have little or no natural resistance. Consequently, pandemics typically result in more deaths, social disruption, and economic loss than epidemics.

Seasonal influenza (often referred to as the flu) is a common infection that affects large numbers of people in Wyoming every year. Influenza is an acute respiratory disease caused by influenza type A or B viruses. The typical features of seasonal influenza include abrupt onset of fever and respiratory symptoms such as cough, sore throat, as well as headache, muscle ache, and fatigue. For seasonal influenza, the incubation period ranges from 1 to 4 days and the clinical severity of infection can range from asymptomatic infection to primary viral pneumonia and death. Most people experience influenza as a very uncomfortable, but ultimately benign illness. However, the influenza virus can mutate, causing it to be much more dangerous to humans. Yearly seasonal influenza remains a significant disease in the U.S. and Wyoming, and seasonal epidemics can result in high morbidity and mortality, as well as create strains on the health care system and communities.

Unlike influenza viruses that have achieved ongoing transmission in humans, the sporadic human infections with avian A (H5N1) viruses are far more severe with high mortality. Initial symptoms include

[78] https://www.merriam-webster.com/medical/communicable%20disease

high fever and other influenza-like symptoms. It also appears that the incubation period in humans may be longer for avian (H5N1) viruses, ranging from 2 to 8 days, and possibly as long as 17 days. Diarrhea, vomiting, abdominal pain, chest pain, and bleeding from the nose and gums have also been reported. The disease often manifests as a rapid progression of pneumonia with respiratory failure ensuing over several days. With the increase in global transport, as well as urbanization, epidemics due to new influenza viruses are likely to occur in and around Albany and Carbon counties.

A new flu virus, which eventually became known as H1N1, came to the world's attention in March 2009. The symptoms of pandemic H1N1 2009 influenza were similar to those of seasonal influenza. Illness in most cases was mild but there were cases of severe disease requiring hospitalization and a number of deaths.

Meningitis

Meningitis is an inflammation of the protective membranes covering the brain and spinal cord. A bacterial or viral infection of the fluid surrounding the brain and spinal cord usually causes the swelling. However, injuries, cancer, certain drugs, and other types of infections also can cause meningitis.[79] There are several types of meningitis with different causes and treatments, including, bacterial, viral, fungal, parasitic, amebic, and non-infectious meningitis. This profile will focus on bacterial and viral meningitis.

Bacterial meningitis is very serious and can be deadly. Different bacteria cause bacterial meningitis depending on age, as described below.[80]

- Newborns: Group B Streptococcus, Streptococcus pneumoniae, Listeria monocytogenes, Escherichia coli
- Babies and children: Streptococcus pneumoniae, Neisseria meningitidis, Haemophilus influenzae type b (Hib), group B Streptococcus
- Teens and young adults: Neisseria meningitidis, Streptococcus pneumoniae
- Older adults: Streptococcus pneumoniae, Neisseria meningitidis, Haemophilus influenzae type b (Hib), group B Streptococcus, Listeria monocytogenes

Viral meningitis is the most common type of meningitis, an inflammation of the tissue that covers the brain and spinal cord. It is often less severe than bacterial meningitis, and most people get better on their own (without treatment).

Measles

Measles is a virus that starts with fever, runny nose, cough, red eyes, and sore throat. It's followed by a rash that spreads over the body. Measles is highly contagious and spreads through coughing and sneezing.

Location

The entire region is susceptible to communicable and infectious diseases. However, more densely populated areas are more vulnerable to diseases that spread person to person, such as the flu. Additionally, areas with higher numbers of the elderly and children are more vulnerable to the flu.

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[79] https://www.cdc.gov/meningitis/index.html
[80] https://www.cdc.gov/meningitis/bacterial.html

Meningitis and measles are a particular concern for the University of Wyoming student and staff population in Laramie due to the higher number of people in close quarters, and the highly contagious nature of these diseases.

Extent

The initial experience with the emerging pandemic of H1N1 prompted the World Health Organization (WHO) to redefine their phase descriptions for an influenza pandemic. Table 4-34 describes the State of Wyoming Department of Health Pandemic Influenza Response Plan (2013), correspond WHO pandemic influenza phases for Wyoming.

Table 4-34 Wyoming Pandemic Influenza Phases[81]

Corresponding WHO Period	WY Phase	Description
Phase 1	1	No new influenza virus subtypes have been detected in humans.
Phase 2 or 3	2	A novel influenza virus is known to have caused infection in humans (but NOT in U.S.), resulting in sporadic cases or small clusters, but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks.
Phase 3, 4, 5, or 6	3	Limited transmission in U.S. states excluding WY, or widespread transmission in other countries. May include isolated sporadic cases in WY, without evidence of transmission.
Phase 3, 4, 5, or 6	4	Widespread transmission in U.S. states excluding WY, may include limited transmission in WY
Phase 3, 4, 5, or 6	5	Increased and sustained transmission in WY population.
	Deceleration	Rates of pandemic influenza infection are decreasing
	Resolution	Pandemic influenza cases have ceased, or occur only sporadically

There is no formal extent scale for meningitis or measles. Both can have sudden onsets and spread quickly from person to person in densely populated areas and shared spaces.

Previous Occurrences

Albany County

There have not been any recorded cases of measles or meningitis (Neisseria meningitidis) in Albany County. The following table shows recorded flu cases since 2010. It is evident that the number of recorded flu cases are increasing annually, particularly since the 2014-2015 season. The 2017-2018 season had the highest number of events, at 411.

Table 4-35 Albany County Previous Flu Cases

Season	# Cases
2010-2011	53

[81] State of Wyoming Department of Health Pandemic Influenza Response Plan (2013)

Season	# Cases
2011-2012	30
2012-2013	108
2013-2014	31
2014-2015	185
2015-2016	200
2016-2017	378
2017-2018	411
Total	**1,396**

Carbon County

Communicable and Infectious Disease data was not available during the creation of this Plan for Carbon County. It can be assumed that meningitis and measles cases are not a primary concern for Carbon County, as they do not have a major university as Albany County does. However, flu cases are likely present every year in the County. Flu data is recommended for the next Plan update.

Probability

Albany County

In Albany County, there has not been any recorded cases of meningitis or measles, so their probability is unlikely. However, they are a low probability, but high impact event if outbreaks were to occur. There have been 1,396 cases of the flu from 2010 to 2018, resulting in a 100% chance of annual occurrence, or a highly likely probability.

Carbon County

Without precise previous occurrence data, it is difficult to determine probability for the County. However, it can be assumed flu cases occur every year, therefore there is a highly likely probability. However, the probability of meningitis and measles is unlikely.

Vulnerability Assessment

Inventory Exposed/Impacts

The entire population of both Albany and Carbon Counties is at risk to communicable and infectious diseases. Areas with denser populations are more vulnerable to the spread of communicable diseases. This includes all incorporated jurisdictions in the Region, since people tend to live and work in closer proximity to one-another. In Albany County, the City of Laramie is the most populated jurisdiction, and in Carbon County the City of Rawlins is the most populated jurisdiction. Additionally, students and staff at the University of Wyoming in Laramie are at a higher risk of communicable and infectious diseases, due to closer living quarters and more shared spaces, and are at a higher risk specifically for meningitis and measles than the rest of the Region.

Additionally, age is a factor in risk levels to communicable and infectious diseases, particularly the flu. Populations under 5 years old and above 65 years old may be at a higher risk. Additionally, babies are at an increased risk for bacterial meningitis compared to people in other age group. Children under 5 years old are at an increased risk for viral meningitis. In Albany County, only approximate 5% of the population is under 5 years. In Laramie, approximately 5.2% of the population is under 5 years, in Rock River 3.9%, and unincorporated Albany County 4%. In Laramie, approximately 8% of the population is 65 or older, in

Rock River 31%, and in unincorporated Albany County 22%. The higher amounts of population over 65 years in Rock River and unincorporated Albany County may make their populations more vulnerable to diseases such as the flu. A full breakdown of age distribution in Albany County can be found in Table 2-5 (Section 2: Community Profiles). In Carbon County, the Town of Dixon has the highest percent of its population under 5 years (15.6%). Additionally, the town of Riverside has the highest percent of its population over 65 (51%). These communities' populations may be more vulnerable to communicable and infectious and diseases. A full breakdown of age distribution in Carbon County can be found in Table 2-8 (Section 2: Community Profiles).

Populations with compromised immune systems are also more vulnerable to communicable and infectious diseases.

However, for some communicable and infectious diseases vaccines can help reduce the risk of infection. Vaccines are available for the flu, bacterial meningitis, and the measles. The measles vaccine is very effective; one dose of measles vaccine is about 93% effective at preventing measles if exposed to the virus. Two doses are about 97% effective.[82]

Potential Losses

Losses associated with communicable and infectious diseases are primarily the impact to people, causing sickness and death. Additionally, a widespread case of a communicable or infectious disease, such as a flu pandemic, can have a direct economic impact through costs such as response costs (hospitalizations, drug costs, etc.) and an indirect economic impact such as loss of productivity at work/school.

Land Use and Development

Increased population puts more people at risk to a communicable or infectious disease. Additionally, according to both Albany and Carbon Counties Comprehensive Land Use Plans, future development is being concentrated around existing jurisdictions. This leads to an increase in population density, which can increase vulnerability to disease.

Albany County

All jurisdictions have experienced an increase in population in Albany County, and the population is projected to continue to grow through 2030. The increased population is at risk to communicable and infectious diseases.

Carbon County

Carbon County population is expected to remain relatively constant, although fluctuations due to changes in the energy industry are common. New residents and development related to population changes are vulnerable to communicable and infectious diseases across the County.

[82] https://www.cdc.gov/measles/about/faqs.html#need-booster

4.5.14. Dam Failure

Description

Dam failure incidents involve unintended releases or surges of impounded water. Dam failure can be caused by earthquakes, blockages, animal activity (such as burrowing), landslides, lack of maintenance, improper operation, poor construction, vandalism, and terrorism. There are numerous public and private dams in Region 3, some of which could pose serious threat to the population if breached.

Dam failures can be arranged 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. According to the Association of State Dam Safety Officials, the average age of dams in the U.S. is 51 years. This means many dams are likely reaching their useful life cycle and are in need of maintenance.

Dams are classified through the U.S. Army Corps of Engineers (USACE) based upon hazard potential. This classification is based on the consequences if the dam were to fail, *not the potential of failure, or the existing condition of the dam*. The dams are rated (1) high, (2) significant, or (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.

- High Hazard Dam Failure: Dam would, in case of failure of the dam, likely cause loss of life.
- Significant Hazard Dam Failure: Dam would, in case of failure, likely cause significant property damage, but no loss of life.
- Low Hazard Dam Failure: Dam would likely cause only minimal property damage. Hazard potential classification is no guarantee of safety.

The Wyoming State Engineer's Office (WSEO) regulates dams over 20 feet high or with a storage capacity of 50 acre-feet or more, although smaller dams are also regulated if the potential for failure indicates a need. As a part of the regulatory process the WSEO inspects these dams once every five years as office policy (though state statute mandates every ten years). In addition, dam safety statues are in place at the state level.

Location

All dams in Albany and Carbon counties are listed in Appendix C.

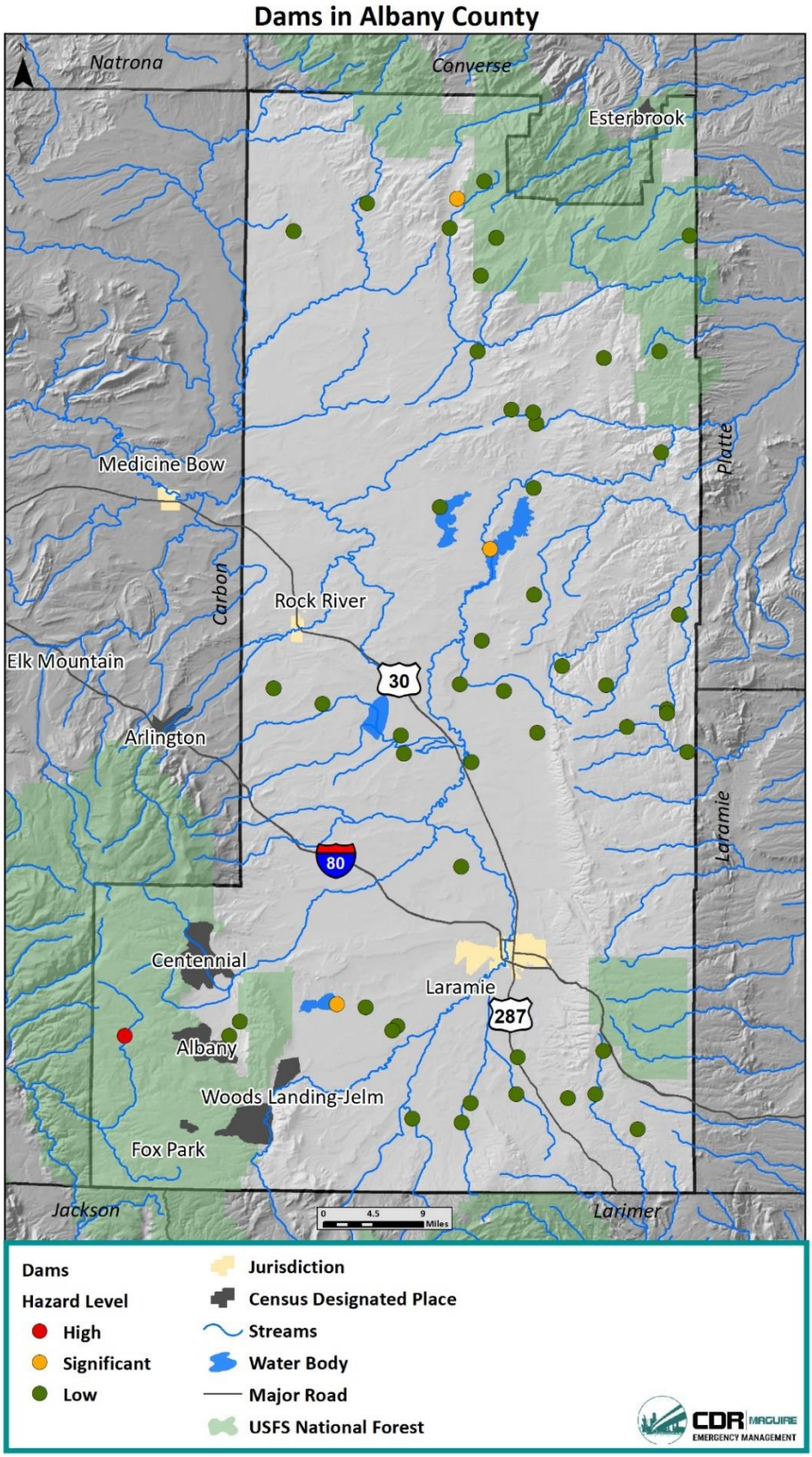
Albany County

In Albany County there are 94 dams according to the National Inventory of Dams (NID). Of these, 83 are privately owned, 3 are federally owned, 3 are state owned, 3 are locally owned, and 2 are not reported. According to the NID, Laramie is the closest town to 12 of these dams. The closest towns to the remaining 82 dams are either in unincorporated County or outside of the County. There is one high

hazard dam, three significant hazard dams, and 48 low hazard dams.[83] The Rob Roy dam is the only high hazard classified dam in the county, located near Keystone in unincorporated Albany County. Also of concern is Peirce Dam. Although this dam is located in Carbon County, is drains into Albany County (Rock River) and has failed in the past. Lastly, state dam safety officials note that in this area, water can drain in many directions, so it is difficult to determine exact risk areas without detailed studies. Figure 4-67 shows locations of dams in Albany County as well as their hazard rating.

[83] https://nid-test.sec.usace.army.mil/ords/f?p=105:113:4226223335537::NO:::

Figure 4-67 Dams in Albany County[84]

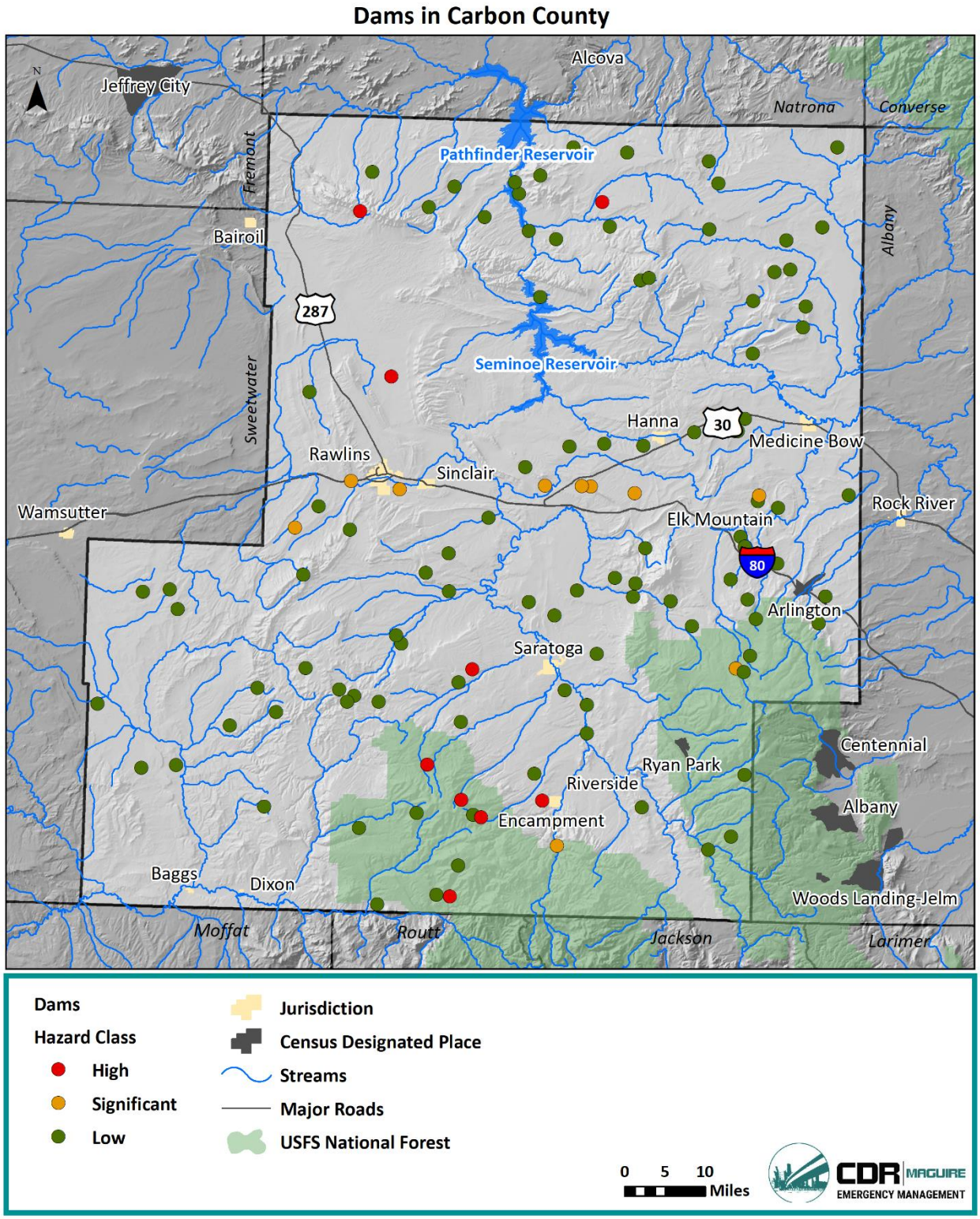


Carbon County

Carbon County has 119 dams in the county according to the NID. Of these, 91 are privately owned, 7 are federally owned, 3 are state owned, 11 are locally owned, and 7 are not disclosed. Baggs is the closest town to three dams, Elk Mountain the closes to one dam, Encampment the closest to one dam, Rawlins the closest to one dam, Riverside the closest to one dam, Saratoga the closes to 13 dams, and the remaining 99 nearest to locations are in unincorporated Carbon County or outside of the County. Nine are classified as a high hazard dam, 10 are classified as significant hazard, and 100 are classified as a low hazard.[85] Seminoe Reservoir is a significant sized reservoir located within the northern central portion of the county. Figure 4-68 shows locations of dams in Carbon County as well as their hazard rating.

[85] https://nid-test.sec.usace.army.mil/ords/f?p=105:113:4226223335537::NO:::

Figure 4-68 Dams in Carbon County[86]



Extent

As mentioned previously, extent can be measured using the ratings of high, significant, and low hazard dams.

Previous Occurrences

Albany County

There are three previous occurrences of dam failure in Albany County as shown in Table 4-36 below. No deaths or injuries were reported but damage to properties, including a bridge, occurred.

Table 4-36 Dam Failure in Albany County

Date	County	Location	Description
6/28/1955	Albany County	Double Four Ranch	On the 28th, the observer at the Double Four Ranch noted that cloudbursts west of Garrett on the headwaters of the North Laramie River the day before had caused damage, and that the river rose 6 – 8 feet about midnight, washing out a dam and flooding ditches in his locality.
6/10/1986	Albany and Carbon	35 NW Laramie	Pierce Dam Failed at 1941 MST, spilling its contents into Rock Creek. This was about 35 miles northwest of Laramie along the Albany and Carbon County line. A bridge over Rock Creek along Wyoming Highway 13 was undercut. There was some flooding of buildings and ranch lands where Rock Creek runs into the Medicine Bow River. 6.5 miles from Rock River.
June 2014	Albany County	Albany county/carbon county line	A dam breached near the Carbon County line. It was relatively insignificant and described as "over before it started," due to limited water in the dam.

Carbon County

Five documented dam failures occurred in Carbon County. Details of these events are provided in Table 4-37. One of these events occurred during above normal runoff in May of 1984, causing $5 million in damages within the county.

Table 4-37 Dam Failure in Carbon County

Date	County	Location	Reported Damages	Description
5/12/1984 to 5/17/1984	Carbon	North Platte River, tributaries near Saratoga, tributaries		Rain storms combined with snowmelt runoff on Little Snake River when water breached a dam. Damage to

[86] https://nid-test.sec.usace.army.mil/ords/f?p=105:19:10780076695057::NO:::

Date	County	Location	Reported Damages	Description
		near Little Snake River		rural property in Baggs. Greater than 100-year flood.
5/14/1984	Carbon	Baggs, Savery, Dixon, Little Snake River	$5,000,000	High runoff from melting snow in the mountains of southern Wyoming and northern Colorado; Burst small dam, 4-foot wall of water poured down canyon (sudden warm temps & heavy blanket of snow). $5 million damage to area; damage to water treatment plant, land crops, fences, irrigation systems, structures, livestock, 26 homes and trailers damaged. Recovery response was from Small Business Administration, Civil Defense, Red Cross, and Army Corps of Engineers. Runoff estimated at 500-year level.
5/16/1984	Carbon	Dixon		A greater than 100-year flood caused by snowmelt runoff augmented by an upstream reservoir failure had a discharge of 13,000 CFS.
6/10/1986	Albany and Carbon	35NW Laramie	$275,000	Pierce Dam failed at 1941 MST, spilling its contents into Rock Creek. This was about 35 miles northwest of Laramie along the Albany and Carbon County line. A bridge over Rock Creek along Wyoming Highway 13 was undercut. There was some flooding of buildings and ranch lands where Rock Creek runs into the Medicine Bow River.
1/1/1996	Carbon	None available		Ver Plancke Dam had a structural failure. The embankment slumped and failed. A 3-foot wall of water went over Wyoming Highway 230. Some ranch buildings and fences were damaged.

Probability

Determining a probability for dam failure is challenging without engineering expertise. However, it should be noted that recent monitoring and rehabilitation practices greatly reduce the risk of failure, though events such as earthquakes, terrorism or vandalism may result in an unexpected breach.

Albany County

In Albany County, three failures have occurred since 1955 (approximate annual probability of 4%). This puts the county at a "possible" probability for dam failure.

Carbon County

In Carbon County, there have been five dam failures since 1955, resulting in an approximate annual probability of 8%. This puts the county at a "possible" probability for dam failure.

Vulnerability Assessment

Inventory Exposed/Impacts

The impacts of a large dam failure could be catastrophic for the inundated areas, which are at the highest risk for death, injury, and property damage from flooding. Areas outside of the inundation zone could also be affected through utility disruption including water contamination, loss of water pressure, water shortage, power outtages, and irrigation water shortages. As dams in the county continue to age, increased monitoring and repairs may be necessary.

The U.S. Bureau of Reclamation controls most of the larger dams in the state, including Seminoe Dam in Carbon County. The Bureau of Reclamation dams and reservoirs all have inundation maps for a dam failure. In Carbon County, if Seminoe dam failed, the impacts would be most significant to the counties north and east of Carbon County, particularly Natrona and Converse Counties, including the City of Casper. The probability of such an event is low, but there is evidence of earthquake faults in the area (see earthquake section).

Potential Losses

Albany County

In Albany County, failure of a high-capacity dam could result in death, injuries, and millions in damages. Further vulnerability assessment is not completed here due to potential security concerns. Annualized losses could not be estimated due to a lack of data. Further, a separate safety plan is in place for high hazard dams. It was noted that Wheatland Dams 1,2, and 3 (located in Platte County) could impact County roads in Albany County. Additionally, a dam in Carbon County upstream from Rock River may impact the Town during a release.

Carbon County

With 27 high or significant dams within Carbon County there is a possibility of dam failure flooding in the future, with the potential for at least $1 million in flood damages and loss of life based on previous occurrences.

Land Use and Development

Although dam failures are a relatively low frequency hazard, future development could still be threatened if structures are built in inundation zones. Flooding due to a dam failure event is likely to exceed the special flood hazard areas regulated through local floodplain ordinances. Jurisdictions should consider the dam failure hazard when permitting development downstream of the high and significant hazard dams. Low hazard dams could become significant or high hazard if development occurs below them.

Regular monitoring of dams, exercising and updating of Emergency Action Plans (EAPs), and rapid response to problems when detected at dams are ways to mitigate the potential impacts of these rare, but potentially catastrophic, events.

Albany County

All jurisdictions have experienced an increase in population in Albany County, and the population is projected to continue to grow through 2030. Population growth in Albany County and its jurisdictions puts more people at risk if a dam were to fail.

Carbon County

Carbon County population is expected to remain relatively constant, although fluctuations due to changes in the energy industry are common. New residents and development related to population changes are vulnerable if a dam were to fail across the County.

4.5.15. Hazardous Material Release

Description

A general definition of hazardous material is: A substance or combination of substances which because of its 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.

The U.S. Department of Transportation (U.S. DOT), U.S. Environmental Protection Agency (EPA), and the Occupational Health and Safety Administration (OSHA) all have responsibilities in regards to hazardous materials and waste. Presented below are the various definitions and general responsibilities of each of the agencies.

The U.S. DOT, which has control over transported hazardous materials, uses the following definition: Hazardous material means a substance or material that the Secretary of Transportation has determined is capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and has designated as hazardous under section 5103 of Federal hazardous materials transportation law (49 U.S.C. 5103). The term includes hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, materials designated as hazardous in the Hazardous Materials Table (see 49 CFR 172.101), and materials that meet the defining criteria for hazard classes and divisions in part 173 of subchapter C of the chapter. The U.S. DOT has nine classes of hazardous material:

- Explosives
- Compressed Gasses: Flammable Gasses; Non-Flammable Compressed Gasses; Poisonous Gasses
- Flammable Liquids: Flammable (Flash Point Below 141 degrees); Combustible (Flash Point 141 degrees – 200 degrees)
- Flammable Solids; Spontaneously Combustible; Dangerous When Wet
- Oxidizers and Organic Peroxides
- Toxic Materials: Material that is Poisonous; Infectious Agents
- Radioactive Material
- Corrosive Material: Destruction of Human Skin; Corrode Steel at a Rate of 0.25 Inches Per Year
- Miscellaneous

The EPA also has responsibility for hazardous materials, chemicals, and wastes that have the potential to be released into the environment through stationary facilities. The EPA regulates hazardous waste through the Resource Conservation and Recovery Act (RCRA). Stationary containers, such as tanks, as well as portable storage containers, such as 55-gallon drums, are required to have a system that will protect the environment from this waste if a leak were to occur. Hazardous waste regulations appear in Title 40 of the Code of Federal Regulations (CFR.) Portable container containment is addressed under Subpart I, Use and Management of Containers (EPA 40 CFR 264.175). Facilities dealing with the storage of hazardous materials may also be required to have containment if they are to meet the Uniform Fire Code (UFC) standards. Within the UFC standards, Section 80, Division III refers to Hazardous Materials Storage Requirements pertaining to containers and tanks and Division IV refers to Spill Containment with regard to hazardous materials.

The Emergency Planning and Community Right-to-Know Act (EPCRA) requires certain regulated entities to report information about hazardous chemicals and substances at their facilities to Federal, state, and local authorities. The objective is to improve the facilities, or government agency's ability to plan for and respond to chemical emergencies, and to give citizens information about chemicals present in their communities. Presidents have issued Executive Orders to Federal agencies that mandate their compliance with certain EPCRA requirements. Part of EPA's mission is to ensure that Federal facilities comply with these requirements. Sections 301 and 303 of EPCRA mandate the creation of two organizations; The State Emergency Response Commission (SERC) and the Local Emergency Planning Committee (LEPC). Sections 311-312 of EPCRA require facilities to submit material safety data sheets or Tier II forms (lists of hazardous chemicals on-site (above threshold quantities)) to SERC's, LEPC's, and local fire departments.

In addition to EPCRA, there is a Risk Management Program (RMP). When Congress passed the Clean Air Act Amendments of 1990, it required EPA to publish regulations and guidance for chemical accident prevention at facilities using extremely hazardous substances. The RMP Rule was written to implement Section 112(r) of these amendments. The rule, which built upon existing industry codes and standards, requires companies of all sizes that use certain flammable and toxic substances to develop a Risk Management Program, which includes a(n):

- Hazard assessment that details the potential effects of an accidental release, an accident history of the last five years, and an evaluation of worst-case and alternative accidental releases;
- Prevention program that includes safety precautions and maintenance, monitoring, and employee training measures; and
- Emergency response program that spells out emergency health care, employee training measures, and procedures for informing the public and response agencies (e.g. the fire department) should an accident occur.

By June 21, 1999, a summary of the facility's risk management program (known as a "Risk Management Plan" or "RMP") was to be submitted to EPA, which will make the information publicly available. The plans must be revised and resubmitted every five years.

The Risk Management Program is about reducing chemical risk at the local level. This information helps local fire, police, and emergency response personnel (who must prepare for and respond to chemical accidents) and is useful to citizens in understanding the chemical hazards in communities. The EPA anticipates that making the RMPs available to the public stimulates communication between industry and the public to improve accident prevention and emergency response practices at the local level.

The Occupational Safety and Health Administration (OSHA), established under the Department of Labor by the OSHA Act of 1970, regulates the storage and use of toxic and hazardous substances as they relate to worker health and safety. OSHA regulations are found in Title 29 of the Code of Federal Regulations (CFR), Part 1910, Subpart H.

Region 3 communities are susceptible to accidents involving hazardous materials on roads, railroads, highways, and at fixed facilities that manufacture, use, or store dangerous chemical substances. A hazardous materials incident may occur at any time during routine business operations or as a result of a natural hazard. The release of hazardous materials can threaten people and natural resources in the immediate vicinity of the accident. Air releases can prompt large-scale population evacuations; spills into water or onto the ground can adversely affect public water and sewer systems.

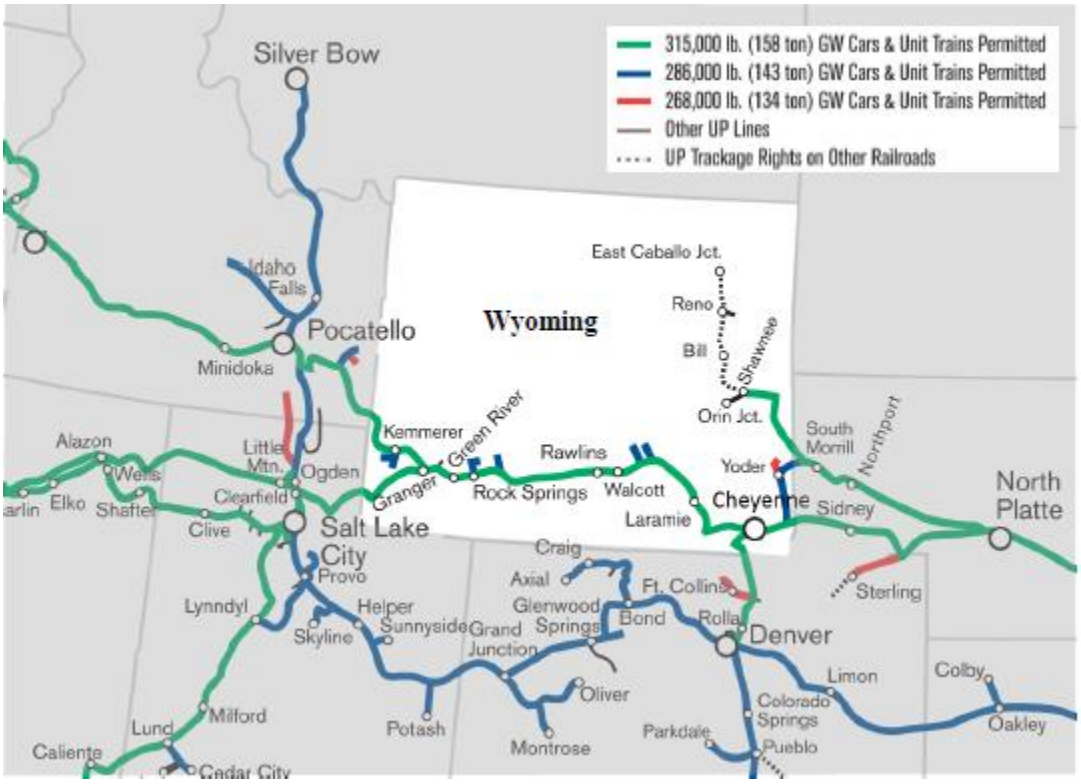
Location

Albany County

In Albany County there are no facilities that contain extremely hazardous chemicals as reported by the RMP. It was reported in the Wyoming state emergency response commission report that 35 facilities in Albany County store hazmat.[87] Additionally, the Planning Team noted the University of Wyoming also stores hazardous chemicals. Hazmat spills can also occur via roads, air, water travel, or rail travel, and from fixed sites that use or produce hazardous materials. Further, there are also several underground pipelines in the county that transport oil and gas. Transportation accidents on Interstate 80 and Highway 287 (refer to Figure 2-1 - Albany County basemap) are a significant hazard. Many trucks transport hazardous materials so there is the potential for a hazardous materials component in any transportation accident. Additionally, the Union Pacific Railroad (UPRR) network has 874 miles of track in Wyoming. Figure 4-69 shows the Union Pacific routes in Wyoming. The route passes through Albany County and directly through Laramie and Rock River.[88]

[87] Wyoming Commodity Flow Study for Albany County, January 2017
[88] Wyoming Commodity Flow Study for Albany County, January 2017

Figure 4-69 Union Pacific Railroad



Carbon County

A listing of RMP facilities present in Carbon County is presented in Table 4-38 below. No additional information is available for these sites for this report because of Homeland Security concerns. Transportation related hazmat incidents are also of a concern to Carbon County along Interstate 80 and Highway 287. Additionally, the UPRR passes through Carbon County, Sinclair Rawlins, and Medicine Bow.

Table 4-38 RMP Facilities in Carbon County

County	Site	Location
Carbon	Bairoil OC CO_2 Plant	Bairoil
Carbon	Big Medicine Bow Unit	Medicine Bow
Carbon	Colorado Interstate Gas Co. - Rawlins Station	Sinclair
Carbon	Wamsutter LLC Echo Springs Plant	Wamsutter
Carbon	Sinclair Wyoming Refinery	Sinclair
Carbon	Wamsutter Stabilization Facility (Carbon County)	Wamsutter

Extent

The extent for a hazmat release can vary widely based on the chemical released, amount, weather, and location of release.

Albany County

According to the 2017 Albany County Commodity Flow Study, it is estimated that a maximum of 7,879,869 gallons/day are traveling through Albany County via Interstate 80 and Highway 287 by truck. Truck trailer is the most common type used to transport hazmat. The most common type of hazmat being transported by truck is Class 3 (flammable liquids). For railroad transportation, data showed that Class 3 hazmat (flammable liquids) are also the most common transported hazmat with a percentage of nearly 50% of transported hazmat. Nearly 30% of total shipped hazmat were Alcohols, not otherwise specified (n.o.s). Moreover, Alcohols, n.o.s represents 45% of residue shipment counts. Only 0.75% of the shipped hazmat total loads were considered as Toxic Inhalation Hazard (TIH), such as Ammonia, Chlorine, Chloropicrin, Methyl Bromide, and Sulfur Dioxide.

Carbon County

Although no specific information is available for Carbon County, it was noted in the Albany County Commodity Flow Study that Wyoming's energy industries, oil and gas, uranium, coal and other extracted minerals, are the main sources of hazmat being transported in Wyoming. Additionally, the top five commodities shipped in 2015 by rail by volume were coal, soda ash, non-metallic minerals, fertilizers, and cement. It can be assumed these are sources of hazmat being transported through Carbon County by truck (particularly along Interstate 80) and by rail.

Previous Occurrences

The U.S. Coast Guard (USCG) National Response Center (NRC) data was reviewed for previous hazmat release events in the Region from 1990 to 2018. It should be noted that the NRC is not a response agency. It serves as an emergency call center that fields initial reports for pollution and railroad incidents and forwards that information to appropriate federal/state agencies for response. The spreadsheets posted to the NRC website contain initial incident data that has not been validated or investigated by a federal/state response agency.[89]

Albany County

According to the NRC, from 1990 to 2018, Albany County has experienced 80 hazmat release events. Laramie was reported as the nearest city for 58 of these events, Rock River for 8 events, and 14 events in unincorporated Albany County. Fifty-nine of these events were transportation related (air, roadway, pipeline, and railroad), 18 were from fixed facilities or storage tanks, and three unknown. An additional source of hazmat release information related to transportation incidents is the Pipeline and Hazardous Materials Safety Administration (PHMSA) incidents reports database. According to this source, there have been 75 hazmat incidents in Albany County from 1973 to 2018. Summary details of these events are described in Table 4-39 below. It is evident many hazmat incidents occur near Laramie, and rail and highway incidents are the most prevalent. Additionally, it was noted during the planning team meeting #2 that an industrial site located 2.5 miles south of Laramie has released arsenic in the groundwater exceeding the Wyoming Department of Environmental Quality's (WYDEQ) cleanup levels. The WYDEQ Voluntary Remediation Program is now overseeing the site's investigation and cleanup.

[89] http://nrc.uscg.mil/Default.aspx

Table 4-39 Albany County Previous Hazmat Release Events

		Mode						
Jurisdiction	# Incidents	Air	Highway	Rail	Other	Injuries	Fatalities	Damages
Laramie	68	1	30	36	1	11	0	$159,458
Bolser	2	0	0	2	0	2	0	$300,000
Buford	2	0	1	1	0	0	0	$269,190
Lookout	1	0	0	1	0	0	0	$600
Red Buttes	2	0	0	2	0	0	0	$340,000
Total	**75**	**1**	**31**	**42**	**1**	**13**	**0**	**$1,069,248**

Carbon County

The NRC recorded 336 hazardous materials incidents in Carbon County between 1990 and 2018. Sinclair was the nearest town for 167 of these events, which is unsurprising given the presence of the Sinclair Oil Refinery, the Semi-Truck and Trailer Repair, the railroad, and Interstate 80. The majority of the events in or near Sinclair were fixed, as opposed to transportation or mobile, including several incidents at the refinery. The events at the refinery frequently involved equipment failure or malfunction. There was also a handful of storage tank, mobile, pipeline, and railroad incidents in or near Sinclair. Overall, fixed incidents accounted for 196 of the 336 hazmat events in Carbon County. According to the PHMSA incidents reports database, there has been 46 reported transportation related hazmat incidents in Carbon County from 1990 to 2018. A summary of these events is provided in Table 4-40 below. The majority of these incidents occurred near Rawlins, and highway incidents were the most prevalent. In January 2019, an accident on Interstate 80 near Wolcott caused a hazmat release that shut down both Interstate 80 and Highway 287, effectively shutting down access from Laramie to Rawlins for almost 24 hours. Due to the recency of the incident, this event is not included in the summarized events below.

Table 4-40 Carbon County Previous Hazmat Release Events

		Mode						
Jurisdiction	# Incidents	Air	Highway	Rail	Other	Injuries	Fatalities	Damages
Carbon	1	0	1	0	0	0	0	$8,000
Casper	2	0	2	0	0	0	0	$2,700
Creston	1	0	1	0	0	0	0	$2,300
Elk Mountain	1	0	1	0	0	0	0	$15,915
Fort Fred Steele	1	0	1	0	0	0	0	$1,100
Hanna	8	0	4	4	0	0	0	$498,000
Rawlins	21	0	16	5	0	0	1	$353,786
Riverside	1	0	1	0	0	0	0	$0
Saratoga	1	0	1	0	0	0	0	$25
Shirley Basin	1	0	1	0	0	0	0	$250
Sinclair	5	0	5	0	0	0	0	$73,940
Smiles NW of Arlington	1	0	1	0	0	0	0	$25,000
Walcott	1	0	0	1	0	0	0	$292,000
Walcott Junction	1	0	1	0	0	0	0	$0

		Mode						
Jurisdiction	# Incidents	Air	Highway	Rail	Other	Injuries	Fatalities	Damages
Total	46	0	36	10	0	0	1	$1,273,016

Probability

Albany County

Based on the NRC data, Albany has experienced 80 hazmat release incidents from 1990 to 2018, resulting in over 100% annual occurrence, or a highly likely probability.

Carbon County

Carbon County has experienced 336 hazmat release incidents during this time frame, which also results in over 100% annual occurrence and a highly likely probability. However, many of these incidents may have little to no impact on people or the environment.

Vulnerability Assessment

Inventory Exposed/Impacts

It cannot be predicted where a hazardous materials incident may occur, so all existing and future buildings, facilities, and populations in the Region are considered to be equally exposed to this hazard and could potentially be impacted.

Interstate 80 is a major transportation route that crosses the southern part of Albany County and across the center of Carbon County. Transportation accidents on Interstate 80 are a significant hazard, potential causing impacts such as injuries, fatalities, and highway closures. Many trucks are now transporting hazardous materials across the Region. Additionally, Interstate 80 crosses the Casper Aquifer, which is a major source of drinking water for residents of Laramie and Albany County (over 90% of the population relies on this source). Transportation accidents in the vicinity of the Casper Aquifer have the potential to contaminate the drinking water supply. In addition to transportation accidents, the aquifer may be impacted by septic tanks east of Laramie that may be releasing nitrates and other chemicals into the aquifer. Accidents involving the railroad, pipelines, and other vehicles also have the potential to contaminate the streams, underground water levels, the land, and the air.

Several underground pipelines transport various products including natural gas, diesel fuel, fuel oil, gasoline, and crude oil across the Region. Companies such as Conoco Pipeline, the Kaneb Pipeline, Kinder Morgan, Sinclair Pipeline, Williams Pipeline, and Colorado Interstate Gas, have pipelines throughout. Potential leaks could cause problems. All pipelines have markers indicating where the pipelines are, and this is to ensure that pipelines are not damaged by digging or other accidents. Those that live near a pipeline should use sight, smell, and sound to make sure the pipelines are not leaking.

Additionally, the Planning Team noted the presence of active and abandoned leaking underground storage tanks in the Region. These tanks can release hazardous materials into the soil and groundwater. It was noted that the Wyoming DEQ has spent resources doing remediation on these tanks, but there may still be some that are leaking.

This hazard has the potential to threaten lives and disrupt business. It can cause serious environmental contamination to air, ground, and water sources that require costly cleanups.

Hazardous material spills will continue in Wyoming and the rest of the nation. There are some facilities, however, that contain extremely hazardous substances. Those are the facilities that are required to generate Risk Management Plans. An accident resulting in the release of chemicals from those facilities could pose a significant problem to local jurisdictions and the State of Wyoming. Additionally, presently Interstate 80 is designated as a corridor for radioactive shipments for many years to come. However, continued federal, state, and local regulations help to lower the risk of hazmat release and impacts.

Potential Losses

Life safety is a concern related to transportation incidents that can occur on the Interstate 80, state highway, and the Union Pacific Railroad corridors in the Region, as well for employees and residents near established fixed facility hazmat locations.

Albany County

Based on PHMSA hazmat incident data, there has been $1,069,248 in damages from transportation hazmat incidents since 1973 in Albany County. This equates to $23,761 in annual damages. This is likely a low estimate due to the fact that it is only related to transportation incidents. Based on previous occurrences, the majority of these damages were located in Red Buttes in Unincorporated Albany County. It is evident that Unincorporated Albany County is vulnerable to high damages from hazmat incidents. Additionally, the City of Laramie experiences heavy hazmat traffic, and with its higher population, is susceptible to damages, injuries, and fatalities. According to previous occurrences, Laramie has experienced the most injuries from hazmat incidents (11) and will continue to be vulnerable to injuries and fatalities.

Carbon County

In Carbon County, there has been $1,273,016 in damages since 1990, based on PHMSA data. This equates to $45,464 in annual damages. Similar to Albany County, this is likely a low estimate since these are related only to transportation incidents. Based on previous occurrences, the majority of this damage occurred in Hanna, followed by Rawlins.

Land Use and Development

Development near major transportation corridors and fixed facility hazmat sites will be at the highest risk to a hazmat release. Additionally, hazmat release impacts can be more severe in more densely populated areas, such as the jurisdictions in the Region.

Albany County

All jurisdictions have experienced an increase in population in Albany County, and the population is projected to continue to grow through 2030. Increased population in Albany County puts more people at risk to a hazmat incident. The UPRR runs through both the City of Laramie and the Town of Rock River, which are both experiencing population growth. Additionally, both Highway 287 and Interstate 80 go through Laramie, and Highway 287 through Rock River. These areas are at higher risk to hazmat incidents and increased development will put more people at risk to a hazmat incident.

Carbon County

Carbon County population is expected to remain relatively constant, although fluctuations due to changes in the energy industry are common. New residents and development related to population changes are vulnerable to a hazmat incident across the County. Interstate 80 passes through several jurisdictions in Carbon County, including Elk Mountain, Sinclair, and Rawlins. Additionally, the UPRR

passes by Sinclair and Rawlins. During population upswings, people and development in these jurisdictions may be at a higher risk to hazmat incidents.

4.5.16. Terrorism

Description

The Federal Bureau of Investigation (FBI) defines domestic terrorism as follows[90]:

- Involve acts dangerous to human life that violate federal or state law;
- Appear intended (i) to intimidate or coerce a civilian population; (ii) to influence the policy of a government by intimidation or coercion; or (iii) to affect the conduct of a government by mass destruction, assassination. or kidnapping; and
- Occur primarily within the territorial jurisdiction of the U.S.

Certain facilities are at greater risk than others to a terrorist attack. The Department of Homeland Security (DHS) identifies a range of potentially high-risk targets including chemical plants, hospitals, colleges and universities, oil and gas production sites, and food processing sites. Other sites, such as large cities, well known landmarks, large gatherings, transportation systems, and water sources may be terror targets.

Acts of terror may include assassinations and armed attacks, kidnappings, hijackings, bomb scares and bombings, cyber-attacks (computer-based), and the use of chemical, biological, nuclear and radiological weapons, and homegrown terrorism. Each act of terror is described below[91]:

- **Assassinations/Armed Attack**: Tactical assault or sniping from a remote location.
- **Kidnapping**: Capturing a person or persons against their will and holding them in false imprisonment, often for ransom.
- **Hijacking**: Robbing or seizing control or a vehicle by use of force.
- **Bomb Scares and Bombing:** A bombing is the result of a detonation of any material that will cause injury, death, or property damage. A bomb scare involves the verbal or written threat to detonate a bomb.
- **Cyber Attack:** This refers to the electronic attack using one computer system against another.
- **Chemical Agent**: Liquid/aerosol contaminants can be dispersed using sprayers or other aerosol generators; liquids vaporizing from puddles or containers; or munitions.
- **Biological Agent**: Liquid or solid toxic contaminants can be dispersed using sprayers/aerosol generators, or by point of line sources such as munitions, covert deposits and moving sprayers.
- **Nuclear Bomb**: A nuclear device may be detonated underground, at the surface, in the air or at high altitude.
- **Radiological Agent**: Radioactive contaminants can be dispersed using sprayers/aerosol generators, or by point of line sources such as munitions, covert deposits and moving sprayers.

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[90] http://www.fbi.gov/about-us/investigate/terrorism/terrorism-definition

[91] Much of this information comes from the FEMA State and Local Mitigation Planning How-to Guide: Integrating Manmade Hazards.

Location

Acts of terrorism may occur anywhere and cannot be predicted. High-risk targets are potentially of greater concern but all areas are at risk.

Albany County

In Albany County, Laramie is the most populated jurisdiction and also houses the University of Wyoming.

Carbon County

In Carbon County, Rawlins is the most populated city and could be a potential high-risk target for terrorism. Additionally, Carbon County is home to many energy-related industries, which also may be potential high-risk targets.

Extent

It is difficult to describe the extent of an imminent threat due to the human-caused nature of the hazard. Factors such as the type of attack, location, time of day, and weather can all influence the impacts of an attack. The United States Department of Homeland Security utilizes the National Terrorism Advisory System (NTAS) to communicate information about terrorist threats by providing timely, detailed infomration to the public.

Previous Occurrences

Albany County

Albany County has experienced eight healthcare related ransomware attacks since 2016.

Aside from these cyber-attacks, there is no known history of an act of terror occurring in Albany County.

Carbon County

There is no known history of an act of terror occurring in Carbon County.

Probability

Based on eight previous occurrences of cyber-attacks in Albany County since 2016, the probability of cyber-attacks is highly likely. However, the probability of other types of future terrorist attack in either county is unlikely, although a single event could have devastating effects on human lives, the economy, and future way of life.

Vulnerability Assessment

Inventory Exposed/Impacts

All existing and future buildings, facilities, and populations in the planning area are considered to be equally exposed to this hazard and could potentially be impacted. A terrorist attack could impact both Albany and Carbon counties significantly. An attack could cause deaths, injuries, structural damage, and economic damage. These impacts could be long-term as communities recover after an attack. Cyber-attacks can significantly impact the economy and safety of the Region. The details of the impacts of previous cyber-attacks in Albany County were not released due to security concerns.

Potential Losses

Given the lack of historical loss data on terror events in the Region, it is assumed that while one major event could potentially result in significant losses, annualizing those losses over a long period of time would most likely yield a very low annualized loss estimate for the Region.

Land Use and Development

As population increases areas could be at a higher risk for a terrorist attack. As mentioned previously, the City of Laramie in Albany County and the City of Rawlins in Carbon County have the highest populations. Densely populated areas can experience greater impacts from an attack than more sparsely populated areas.

5. Mitigation Strategy

5.1. Hazard Mitigation Strategy Overview

The Mitigation Strategy provides a blueprint for Albany and Carbon Counties to follow to become less vulnerable to its identified hazards. It is based on general consensus of each County's planning team, the findings and conclusions of the Risk Assessment, and input from the public and stakeholders. The Mitigation Strategy includes hazard mitigation plan goals and hazard mitigation actions. The plan goals serve as the guiding principles for future mitigation policy and project administration and hazard mitigation actions serve as implemental items that support goals. The mitigation strategy includes a process for evaluating mitigation actions to ensure actions are feasible based on community capabilities, tied to plan goals, and effective in reducing hazard losses for current and future structures and populations.

This section outlines the goals, capabilities, mitigation action evaluation, and prioritization process undertaken in Albany and Carbon Counties. Each County has their own Mitigation Strategy section.

5.2. Albany County Mitigation Strategy

5.2.1. Albany County Mitigation Goals

The goals identified in the 2015 Albany County Mitigation Strategy were reviewed as part of the planning process and when developing mitigation actions. The planning team decided to consolidate the 2015 goals to be more concise while still encompassing all aspects of mitigation in the County. These new Plan goals reflect current needs and priorities of the County and are intended to reduce long-term vulnerability and risk to all hazards identified in this Plan. The new 2019 mitigation goals are as follows:

- **Goal One:** Reduce the potential for injury and loss of life from natural and human-caused disasters.
- **Goal Two:** Minimize the potential for economic losses from natural and human-caused disasters.
- **Goal Three:** Reduce the impact of natural and human-caused disasters on critical infrastructure, communication systems, and facilities.
- **Goal Four:** Reduce the impact of natural and human-caused disasters on private property.
- **Goal Five:** Increase public outreach to raise awareness of hazard mitigation and potential funding sources.

It was decided by the planning team that objectives would not be created for each goal since each mitigation action has measurable elements.

5.2.2. Albany County Capabilities Assessment

Prior to forming new mitigation actions, a capabilities assessment was conducted for the County to understand what planning and regulatory, administrative and technical, financial, and education and outreach capabilities the County has (or is lacking) for implementing hazard mitigation projects. To assess capabilities, an online survey was distributed to each jurisdiction. Additionally, capabilities were discussed during each planning team workshop. Albany County capabilities are described in the tables below. Overall, capabilities in all jurisdictions in the County are generally unchanged from the 2015 Plan. The City of Laramie and Albany County have relatively extensive capabilities for implementing mitigation actions. Expansion or improvement of these capabilities would likely be reliant on City or County

funding. Due to its size, the Town of Rock River will likely continue to work in partnership with the County for many of its capabilities.

Table 5-1 Albany County Planning and Regulatory Capabilities

Capability	Albany County	Laramie	Rock River
Building Codes	x	x	x
BCEGS Rating			
Capital Improvements Program (CIP) or Plan	x	x	
Community Rating System (CRS)		x	
Community Wildfire Protection Plan (CWPP)	x	x	
Comprehensive, Master, or General Plan	x	x	
Economic Development Plan	x	x	
Elevation Certificates			
Erosion/Sediment Control Program	x	x	
Floodplain Management or Ordinance		x	
Flood Insurance Study			
Growth Management Ordinance			
Non-Flood Hazard Specific Ordinance or Plan (steep slope, wildfire, snow load)			
NFIP		x	
Site Plan Review Requirements	x	x	
Stormwater Program, Plan, or Ordinance		x	
Zoning Ordinance	x	x	

Table 5-2 Albany County Administrative and Technical Capabilities

Capability	Albany County	Laramie	Rock River
Emergency Manager	x	x	x
Floodplain Administrator	x	x	
Planner/Engineer (Land Development)	x	x	x
Planner/Engineer/Scientist (Natural Hazards)	x	x	x
Engineer/Professional (Construction)	x	x	x
Resiliency Planner			
Transportation Planner	x	x	
Full-Time Building Official	x	x	
GIS Specialist and Capability	x	x	x
Grant Manager, Writer, or Specialist	x	x	
General Warning Systems/Services	x	x	x
Flood Warning Systems/Services		x	
Wildfire Warning Systems/Services	x	x	
Tornado Warning Systems/Services	x	x	x
Geological Hazards Warming Systems/Services		x	x
Other			

Table 5-3 Albany County Financial Capabilities

Capability	Albany County	Laramie	Rock River
Levy for Specific Purposes with Voter Approval	x	x	
Utilities Fees	x	x	x
System Development/Impact Development Fee	x	x	x
General Obligation Bonds to Incur Debt		x	
Special Tax Bonds to Incur Debt		x	x
Withheld Spending in Hazard-Prone Areas			
Stormwater Service Fees	x		
Capital Improvement Project Funding	x	x	
Community Development Block Grants	x	x	x
Other			

Table 5-4 Albany County Education and Outreach Capabilities

Capability	Albany County	Laramie	Rock River
Local Citizen Groups that Communicate Hazard Risks	x	x	x (Local Volunteer Fire Dept)
Firewise	x	x	
StormReady	x	x	
Other			

5.2.3. Albany County Continued NFIP Compliance

The County and City of Laramie will continue to comply with the NFIP. Each community has a designated floodplain administrator. New floodplain maps are being developed for the planning area. Once these are approved, the existing ordinances will be updated to reflect the floodplain areas in the new maps. Each community maintains a floodplain ordinance that regulates development in the floodplain. In Albany County it is the Flood Damage Prevention Resolution; in Laramie, it is the Unified Development Code. In the County, all residential structures in the Special Flood Hazard Areas must include freeboard at least two feet above base flood elevation. In the City, the ordinance calls for freeboard of 1 foot above base flood elevation for residential structures. No development is allowed in either community's floodway per the regulations. Also, other regulatory plans, including the County's Subdivision and Planning Regulations, recognize and incorporate floodplain awareness for new developments and permitting.

5.2.4. Albany County Past Action Reporting

Table 5-5 describes the progress on actions from the 2015 Albany County Hazard Mitigation Plan.

Table 5-5 Albany County Progress on 2015 Mitigation Actions

ID	Project Description	Hazard	Jurisdiction	2019 Status	Status Summary
2015.01	Install a siren system for Garrett, Wyoming	Tornado, High Winds	Albany County	Delete	A location was not approved by residents for this project.
2015.02	Clearly identify parking areas for trucks during times of I-80 closure also for hazmat trucks	Snow, Wildfire, Wind	Albany County	Ongoing	100 additional parking are being added for semis in Sinclair and in Albany County. It is currently funded going out to contract in 2020
2015.03	Obtain Sheltering Supplies	Wildfire, Flood, Storm, Snow	Albany County	Complete	Provided by Red Cross
2015.04	Identify shelter locations for all types of disasters, educate citizens	Wildfire, Flood, Storm, Snow	Albany County	Complete	Completed by Red Cross
2015.05	Develop a Hazmat Response and evacuation plan for the Casper Aquifer Area	Hazmat	Albany County	Complete	Approved July 1, 2019
2015.06	Firewise programs with public and enforce these restrictions	Wildfire	Albany County	Ongoing	The County works with communities every year through education. A major is issue is cabins owned by people living out of town that are on forest service leases. The County is limited on what mitigation measures can be done due to them being on federal property. The County works State Forestry and USFS on this issue.
2015.07	Work with local phone service and internet providers as appropriate, to address	All	Albany County	Ongoing	The County is still working with new firstnet capabilities. Albany County has a huge communication gap for fire response and evacuation

ID	Project Description	Hazard	Jurisdiction	2019 Status	Status Summary
	communication gaps				notifications in rural areas because there is lack of internet/cell coverage. The County is working with two different providers to improve coverage, but gaps still exist.
2015.08	Revise/develop the County/town EOP	All	Albany County	Complete	Adopted latest revision 8/6/2018
2015.09	Educate citizens on being prepared for disasters of all types	All	Albany County	Ongoing	Ongoing
2015.10	Enact regulations on where homes can be built due to landslide prone areas	Landslide	Albany County	Delete	Landslide areas are limited in the County and the regulations would be difficult for the County to enforce.
2015.11	Better education to the public on hazardous materials in County.	Hazmat	Albany County	Ongoing	Outreach plan still needed but several public comments during this planning process note the high risk of HAZMAT indicating some public awareness of the issue.
2015.12	Studies on current infrastructures in County	All	Albany County	Complete	DHS PSA had assessment on Water/Wastewater
2015.13	Start educating the public about reporting hail and how to keep safe.	Hail	Albany County	Complete	Built Weather Spotter Capability
2015.14	Update the plan for Rob Roy Dam	Dam Failure	Albany County	Complete	EMA has received a copy from Cheyenne
2015.15	Restrict building in mined out areas	Mine Subsidence	Albany County	Delete	This version of HMP worked to further identify where these areas are in the county. Marcia Murdock (WY abandoned mine

ID	Project Description	Hazard	Jurisdiction	2019 Status	Status Summary
					division) is the contact to for county to work with to further address where these areas are as they are not released to the public.
2015.16	Prepare backup power for communication systems.	All	Albany County	Complete	Both LARC and EOC have generators
2015.17	Type 3 Wildland engine with firefighting gel pump and 50 5-gallon buckets of gel	Wildfire	Albany County	Complete	5 Gallon Buckets of Gel was purchased and is kept at Laramie Peak Fire Department.
2015.18	Conduct a pine beetle exercise that includes evacuation measures	Wildfire	Albany County	Complete	Plan is being developed
2015.19	Complete Floodplain study for South Laramie and establish base flood elevations	Flooding	Albany County	In Progress	A flood study is underway to remap the City of Laramie (including South Laramie/Spring Creek). The process will also include public involvement.
2015.20	Install County Road protection measures and signage along with public awareness	Landslide	Albany County	Delete	High Risk Roads for Landslide are in the WYDOT jurisdiction.
2015.21	Continue to work with NWS to offer weather spotter training sessions (annual spring class held as a result of previous HMP action)	All	Albany County	Completed	EM and National Weather service will provide courses.
2015.22	Inspections for private dams	Dam Failure	Albany County	Ongoing	Wyoming Engineering Office has a set schedule

ID	Project Description	Hazard	Jurisdiction	2019 Status	Status Summary
					for Dam inspections. They work with EMA office to update status when inspections have been completed
2015.33	City, County involvement with UW labs and other private businesses	Hazmat	Albany County, City of Laramie	Complete	EMA is working with UW to have better reporting with tier II reports.
2015.34	Cache of sprinklers for protecting buildings	Wildfire	Albany County, City of Laramie	Delete	Project has been altered to look into options for protection buildings
2015.35	Implement West and North Laramie Drainage studies into plans of action	Flooding	Albany County, City of Laramie	Complete	Comprehensive Drainage Plans have been completed for North Laramie (2012) and West Laramie (2010). The study for South Laramie is underway and should be completed in the next few months. Will be used a fiscal study and results from each study combined.
2015.36	Create a critical facilities matrix/plan for county	Flooding	Albany County, City of Laramie	In Progress	EMA is working with critical infrastructure partners to identify priority plan for emergency response and restoration.
2015.37	Public awareness of windblown mitigation activities	Windblown Deposits	Albany County, City of Laramie,	Complete	City of Laramie: City adheres to state policies on dust management (especially with new construction). Buildings division encourage (and will enforce with fine) any windblown litter/improper storage. Encourages keeping dumpsters closed and trashcans secured.

ID	Project Description	Hazard	Jurisdiction	2019 Status	Status Summary
					Several volunteer groups that work to clean up windblown debris.
2015.38	Develop back- up comm. system for Laramie and Rock River during power outages	All	Albany County, City of Laramie, Town of Rock River	Ongoing	Generators are still needed for Rock River Town Hall and siren and notification system.
2015.39	Create water conservation plans for County	Drought	Albany County, City of Laramie, Town of Rock River	Completed for Laramie; delete for the County	Laramie updated their plan this year (2019). Albany County doesn't have a water conservation area/assets.
2015.40	Public awareness of Earthquakes	EQ	Albany County, City of Laramie, Town of Rock River	Ongoing	Public education to weather hazards will continue through the office of EMA
2015.41	Public Awareness and education	Avalanche	Albany County, City of Laramie, Town of Rock River	Ongoing	Working to secure funding; Expected to be completed in next grant cycle.
2015.42	Work with school district utilities sheltering, lightning, and all weather hazards education for kids	Thunderstorm, wind, tornado, earthquake, Lightning, flash flooding	Albany County, City of Laramie, Town of Rock River	Ongoing	[description amended to include school district and sheltering and all weather hazards] County EMA has been conducting education outreach at schools on hazards including lightning Flooding, tornado, earthquake, sheltering
2015.43	Work with local paper and radio stations to add info on lightning and other natural hazards including preparedness kits.	Thunderstorm, wind, Lightning	Albany County, City of Laramie, Town of Rock River	Ongoing	[description amended to include all natural hazards and preparedness kits] Work with local radio stations and newspapers to educate the community members on preparedness planning and kits.

ID	Project Description	Hazard	Jurisdiction	2019 Status	Status Summary
2015.44	Create an agricultural business plan for protecting lands and crops	Drought	Albany County, City of Laramie, Town of Rock River	Complete	County EMA has been working with Department of Ag and College of Ag to understand risks and capabilities
2015.45	Stabilize vegetation on identified areas	Windblown Deposits	City of Laramie	In Progress	City of Laramie has made progress on this using consistent informal policy to require stabilization if on a steep slope (for permit approval), need geotechnical analysis; will formalize this policy in next update.
2015.46	Build snow fences on west side of town to protect homes and roads	Winter Storm	Rock River	Ongoing	It is difficult for the Town to get buy-in from landowners, but would like to continue to work on this. Consider living snow fences.
2015.47	Purchase equipment (dump trucks, graters) to better respond and recovery to snow and wind event to remove debris (including snow) from roadways; currently the town the town is left immobilized in times of snowstorms and faces a long recovery time frame. There are also access issues such as for emergency response. There is a water-main break that cannot	Winter Storm, Snow, Wind	Rock River	Ongoing	Funding towards this ongoing, should be complete this year (2019).

ID	Project Description	Hazard	Jurisdiction	2019 Status	Status Summary
	be accessed due to impassible roads. Town would like to increase this capability on their own rather than relying on an outside party.				
2015.48	Create site-specific plans for mines of concern in the jurisdiction of Rock River	Mine Subsidence	Rock River	Delete	Rock River indicated there are no mines or abandoned mines in Rock River so this is not a concern or a need.
2015.23	Install road side barriers or flatten the slope where rock falls onto roadways is a common occurrence	Landslide	Albany County	Delete	Most areas are owned by WYDOT
2015.24	Ensure all new structures meet current standards for earthquake protection.	Earthquake	Albany County	Delete	
2015.25	Remove stream bed and storm water structure obstructions that impede storm water flow and cause flooding	Flood	Albany County	In Progress	Education for Ranch Community by FSA
2015.26	Prevent new construction in flood plain which could be flooded	Flood	Albany County	Ongoing	Public Education provided to new homeowner about Flood Insurance/Building in Floodplain
2015.27	Provide storm water infrastructure that can safely handle 100 year storms without causing flooding	Flood	Albany County	Complete	Berm built in Laramie

ID	Project Description	Hazard	Jurisdiction	2019 Status	Status Summary
	by being overloaded				
2015.28	Determine locations where stream bank modifications and the installation of berms will prevent future flooding and work to acquire funding for remediation work	Flood	Albany County	Completed	
2015.29	Promote the Fire Wise Mitigation Program to lesson the impact to private property. Identify Funding to assist in the promotion of the program and off set the cost to citizens.	Wildfire	Albany County	Ongoing	Fire Wise Program is strong in Albany County
2015.30	Investigate settled spots in streets and roads to determine if the settlement is caused by underground utilities and make repairs prior to large scale subsidence.	Land Subsidence/ Mine Collapse	Albany County	Delete	Delete
2015.31	Provide active shooter training for all interested persons. Include barriers to be used as a deterrent for vehicle attacks. Coordinate with ESF 13 Public	Terrorism	Albany County	Ongoing	Local Law Enforcement has instructors to assist community partners with active shooter training

ID	Project Description	Hazard	Jurisdiction	2019 Status	Status Summary
	Safety to identify Hazards and Risks for event planning				
2015.32	Public education for See Something Say Something	Terrorism	Albany County	Ongoing	Initiatives by Wyo Office of Homeland Security

5.2.5. Albany County Identification of New Mitigation Actions

Selection of Mitigation Actions

Selected actions are included in the Mitigation Action Plan (MAP), which is presented in Table 5-6. The MAP is a functional plan for action and is considered to be the most essential outcome of the mitigation planning process. The MAP includes a prioritized listing of proposed hazard mitigation actions for the County and participating jurisdictions to implement. Each action includes accompanying information such as the department responsible for completing the action, timeline, and funding source. The MAP provides those departments or individuals responsible for implementing mitigation actions with a clear path to reduce risk and vulnerability over time. Further, the MAP provides a mechanism to monitor progress over time. Each action also considers the benefits and costs of an action, to ensure it is cost effective, which is included in the prioritization of actions.

Mitigation actions were derived from the HIRA, local planning team workshops, the public surveys, other County plans, and from identified ongoing or in progress actions from the 2015 Albany County Hazard Mitigation Plan. Changes in priorities were reflected in the selected mitigation actions by reviewing what has been completed since 2015, reviewing how changes in development have impacted hazard risk (discussed in Section 4: HIRA for each hazard), and through the local planning team discussions and workshops. Overall, priorities have remained generally consistent since the 2015 Albany County Hazard Mitigation Plan. One notable change has been the recent increase in hazardous material truck traffic through the County and impacts of spills on the Casper Aquifer. This was reflected in the hazardous materials spills hazard ranking and has been reflected in the MAP.

Prioritization of Mitigation Actions

During the third planning team workshop methods to prioritize mitigation actions were discussed. It was determined that a “high, medium, low” prioritization scheme would work best for the County. Additionally, all actions considered cost-effectiveness including a high-level cost-benefit review for prioritization. In addition, local knowledge or need may necessitate a change in priority. Actions were ranked based on the following criteria:

- Perceived cost effectiveness and feasibility of obtaining funding
- Level of risk to life and property posed by hazard which project addresses
- Reasonableness of project and extent to which it provides a long-term solution
- Potential consequences of not implementing
- Support from the public and elected officials
- Compatibility with other plans and policies

Implementation of Mitigation Actions

The MAP includes several measures to ensure actions are implemented. Albany County Emergency Management Agency will serve as the coordinating agency. However, each action is tied to a responsible agency or individual who will be responsible for leading the completion of the mitigation action. By assigning responsibility, it increases accountability and the likelihood of action.

In addition to the assignment of a local lead department or agency, an implementation time period or a specific implementation date has been assigned in order to assess whether actions are being implemented in a timely fashion. Further, the County will seek outside funding sources to implement mitigation projects in both the pre-disaster and post-disaster environments. When known, potential funding sources have been identified for proposed actions listed in the Mitigation Action Plan. Further detail on implementation can be found in the Maintenance and Implementation section of this Plan.

5.2.6. 2019 Albany County Mitigation Actions

This section describes the 2019 Albany County mitigation actions and their MAPs. Each action includes a number of items, as shown below. This is followed by the 2019 mitigation actions, beginning in Table 5-6.

- Project ID
- Jurisdiction
- Project description
- Hazard
- Cost estimate (if cost is unavailable, a general “high, medium, or low,” is used based on knowledge, experience, and professional judgement)
- Benefit
- Funding source
- Timeframe
- Responsible party
- Priority ranking
- Status

Table 5-6 Albany County 2019 Mitigation Actions

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
2019.01	Albany County	Develop a system / process to contain hazmat spills from truck accidents along Hwy 230 before they reach the City's water source.	Hazmat Release	Medium	Public safety, environmental safety, losses avoided	FEMA grant, County EMA, WYDOT	5 years	County EMA, WYDOT	High	New
2019.02	Albany County	Water/ wastewater assessment for the South Laramie Water District	Multiple	Medium	Losses avoided, public safety	South Laramie Water District	5 years	South Laramie Water District	Low	New
2019.03	Albany County	Generator for the Albany County Fire District facilities	Multiple	Medium	Public safety	FEMA grant, County EMA	5 years	Albany County Fire District, County EMA	Low	New
2019.04	Laramie	Generator for the Laramie Airport	Multiple	Medium	Public safety	FEMA grant, County EMA	5 years	Laramie Airport, County EMA	Low	New
2019.05	Albany County	Promote xeriscaping projects within the Centennial Water District	Drought	Low	Losses avoided	Centennial Water District budget, County budget	Annual	Centennial Water District	Medium	New
2019.06	Albany County	Centennial – public education for retrofit of at-risk structures with ignition resistant	Wildfire	Low	Public safety, losses avoided, private property protection	County budget, County EMA, Firewise programs	Annual	County EMA	High	New

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
		materials for wildfire.								
2019.07	Laramie	Evaluate building standards for the City of Laramie for natural hazards.	All natural hazards	Medium	Losses avoided, property/ infrastructure protection, public safety	City budget	5 years	City planning department	Medium	New
2019.08	Albany County, Laramie	Public education in Laramie and surrounding areas for tornadoes and hail storms	Hail, Tornado	Low	Public safety, education and awareness	County/City budgets, FEMA grants	Annual	County EMA	Medium	New
2019.09	Albany County	Increase communication capabilities for responders in and around HWY 10, HWY 230/HWY 130 and Northern Albany County for public and private owned areas.	All	High	Public safety	Private funds, FEMA grants, County	5 years	County EMA	High	New
2019.10	Albany County	Education for public regarding mitigation opportunities for development in wildfire hazard areas.	Wildfire	Low	Public education and awareness, losses avoided	Firewise programs, County EMA, FEMA grants	Annual	County EMA	High	New

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
2019.11	Laramie	8" pump for Water Waste Water operations as a related project based on our assessment from 2018.	Flood	Medium	Public safety, losses avoided	City budget, FEMA grant, County EMA	5 years	Laramie public works	High	New
2019.12	Albany County	Centennial Water/ Wastewater assessment for unincorporated areas. Mitigation projects that may be related to that assessment are generators, Pumps, etc.	Drought	Medium	Improvements to water systems	County Budget	3 years	County EMA	Medium	New
2019.13	Rock River	Public education for wildfire and tornadoes	Wildfire, Tornado	Low	Public education and awareness, public safety	County EMA, Town budget, FEMA grants	Annual	County EMA	Medium	New
2015.02	Albany County	Clearly identify parking areas for trucks during times of I-80 closure also for hazmat trucks	Snow, Wildfire, Wind	Medium	Safety of truck drivers, avoiding vehicle accidents and possible Hazmat spills	City and County Budgets	2020	Streets Dept, Police, EMA and WYDOT	High	Ongoing - 100 additional parking are being added for semis in Sinclair and in Albany County. It is currently funded going out to contract in 2020
2015.06	Albany County	Firewise programs with public and	Wildfire	Low	Public knowledge, better	Fire wise education programs.	Ongoing	County Fire Warden, Fire Departments, EMA; state	High	Ongoing - The County works with communities every year

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
		enforce these restrictions			preparedness, losses avoided			legislature; Albany County planning		through education. A major is issue is cabins owned by people living out of town that are on forest service leases. The County is limited on what mitigation measures can be done due to them being on federal property. The County works State Forestry and USFS on this issue.
2015.07	Albany County	Work with local phone service and internet providers as appropriate, to address communication gaps	All	Low	Life safety, protection of property losses avoided	County EMA	Ongoing	Emergency Management and Phone Companies	High	Ongoing - The County is still working with new firstnet capabilities. Albany County has a huge communication gap for fire response and evacuation notifications in rural areas because there is lack of internet/cell coverage. The County is working with two different providers to improve coverage, but gaps still exist.

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
2015.09	Albany County	Educate citizens on being prepared for disasters of all types	All	Low	Life safety, public education, preparedness, losses avoided	County EMA	Ongoing	County EMA	High	Ongoing
2015.11	Albany County	Better education to the public on hazardous materials in County.	Hazmat	Low	Public knowledge	County EMA	Annual education planning for each year progressing throughout the term of 5 years	County EMA, Police and Fire	Low	Ongoing - Outreach plan still needed but several public comments during this planning process note the high risk of HAZMAT indicating some public awareness of the issue.
2015.19	Albany County	Complete Floodplain study for South Laramie and establish base flood elevations	Flooding	High	Life safety, protection of property and of environmental assets, losses avoided	FEMA grant	Jun-15	FEMA, Emergency Management	Medium	In Progress - A flood study is underway to remap the City of Laramie (including South Laramie/Spring Creek). The process will also include public involvement.
2015.22	Albany County	Inspections for private dams	Dam Failure	Medium	Prevention; emergency services	Grants, private funds	Ongoing	Undetermined	Medium	Ongoing - Wyoming Engineering Office has a set schedule for Dam inspections. They work with EMA office to update status when inspections have been completed.

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
2015.36	Albany County, Laramie	Create a critical facilities matrix/plan for county	Flooding	Medium	protection of property, losses avoided	CDBG-DR, FEMA grants, city funds	Ongoing	EMA, City and County	Medium	In progress - EMA is working with critical infrastructure partners to identify priority plan for emergency response and restoration.
2015.38	Albany County, Laramie, Rock River	Develop back-up comm. system for Laramie and Rock River during power outages	All	Medium	Life safety, protection of property	HSGP grant and other grant avenues	Ongoing	Mayor, Local Utility, LARC and EM	High	Ongoing - Generators are still needed for Rock River Town Hall and siren and notification system.
2015.40	Albany County, Laramie, Rock River	Public awareness of Earthquakes	EQ	Low	Life safety, public education, preparedness, losses avoided	County EMA	Ongoing	County EMA	Low	Ongoing - Public Education to weather hazards will continue through the office of EMA.
2015.41	Albany County, Laramie, Rock River	Public Awareness and education	Avalanche	Low	Life safety, property protection, losses avoided	County EMA; HSGP Grant	5 years	County EMA, Forest Service, Search and Rescue	Low	Ongoing - Working to secure funding; Expected to be completed in next grant cycle.
2015.42	Albany County, Laramie, Rock River	Work with school district and utilities sheltering, lightning, and all weather hazards education for kids	Thunderstorm, wind, tornado, earthquake, Lightning, flash flooding	Low	Life safety, public education	County EMA	Ongoing throughout 5 year period	County EMA	Medium	Ongoing - [description amended to include school district and sheltering and all weather hazards] County EMA has been conducting education outreach at

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
										schools on hazards including lightning Flooding, tornado, earthquake, sheltering
2015.43	Albany County, Laramie, Rock River	Work with local paper and radio stations to add info on lightning and other natural hazards including preparedness kits.	Thunderstorm, wind, Lightning	Low	Life safety, public education, losses avoided	County EMA, FEMA	Ongoing out reach 5 year period	County EMA	Medium	Ongoing - [description amended to include all natural hazards and preparedness kits] Work with local radio stations and newspapers to educate the community members on preparedness planning and kits.
2015.45	Laramie	Stabilize vegetation on identified areas	Windblown Deposits	Medium	Life safety, property protection, losses avoided	FEMA grants, private funds	5 year	Landowner, county if grant	Low	In progress - City of Laramie has made progress on this using consistent informal policy to require stabilization if on a steep slope (for permit approval), need geotechnical analysis; will formalize this policy in next update.
2015.46	Rock River	Build snow fences on west side of town to	Winter Storm	High	Prevent people from being isolated in houses;	Grants; Conservation District has cost share	Target within 5 years but largely	Town of Rock River	High	Ongoing - It is difficult for the Town to get buy-in from

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
		protect homes and roads			reduce accidents on roads; Reduce plowing demands	program for living snow fences that has been used in the county and public and private lands.	dependent on funding			landowners, but would like to continue to work on this. Consider living snow fences.
2015.47	Rock River	Purchase equipment (dump trucks, graters) to better respond and recovery to snow and wind event to remove debris (including snow) from roadways; currently the town the town is left immobilized in times of snowstorms and faces a long recovery time frame. There are also access issues such as for emergency response. There is a water-main break that cannot be	Winter Storm, Snow, Wind	High	Prevent people from being isolated in houses; reduce accidents on roads; Increase access throughout town	Grants; possible homeland security grant or DOT grant	2019	Town of Rock River (Cathey Leslie "CJ")	High	Ongoing - Funding towards this ongoing, should be complete this year (2019).

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
		accessed due to impassible roads. Town would like to increase this capability on their own rather than relying on an outside party.								
2015.25	Albany County	Remove stream bed and storm water structure obstructions that impede storm water flow and cause flooding	Flood	Medium	Addresses flooding problems before they occur to reduce damages.	FEMA grants, County	Ongoing	County EMA	Low	In progress - Education for Ranch Community by FSA
2015.26	Albany County	Prevent new construction in flood plain which could be flooded	Flood	Low	Public safety, losses avoided	County EMA	Ongoing	County EMA	Medium	Ongoing - Public Education provided to new homeowner about Flood Insurance/ Building in Flood plain
2015.29	Albany County	Promote the Fire Wise Mitigation Program to lesson the impact to private property. Identify Funding to assist in the promotion of the program	Wildfire	Low	Public safety, losses avoided, education and awareness, property protection	County EMA, Firewise programs	Ongoing	County Fire Warden, Fire Departments, EMA; state legislature; Albany County planning	Medium	Ongoing - Fire Wise Program is strong in Albany County

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
		and off set the cost to citizens.								
2015.31	Albany County	Provide active shooter training for all interested persons. Include barriers to be used as a deterrent for vehicle attacks. Coordinate with ESF 13 Public Safety to identify Hazards and Risks for event planning	Terrorism	Medium	Public safety, preparedness	County EMA, FEMA grants	Ongoing	Albany County Sheriff, County EMA	Medium	Ongoing - Local Law Enforcement has instructors to assist community partners with active shooter training
2015.32	Albany County	Public education for See Something Say Something	Terrorism	Low	Public safety, education and awareness	County EMA, FEMA grants	Ongoing	Albany County Sheriff, County EMA	Medium	Ongoing - Initiatives by Wyo Office of Homeland Security

5.3. Carbon County Mitigation Strategy

5.3.1. Carbon County Mitigation Goals

The goals identified in the 2016 Carbon County Mitigation Strategy were reviewed as part of the planning process and when developing mitigation actions. The planning team decided to consolidate the 2016 goals to be more concise while still encompassing all aspects of mitigation in the County. These new Plan goals reflect current needs and priorities of the County and are intended to reduce long-term vulnerability and risk to all hazards identified in this Plan. The new 2019 mitigation goals are as follows:

- **Goal One:** Reduce the potential for injury and loss of life from natural and human-caused disasters.
- **Goal Two:** Minimize the potential for economic losses from natural and human-caused disasters.
- **Goal Three:** Reduce the impact of natural and human-caused disasters on critical infrastructure, communication systems, and facilities.
- **Goal Four:** Reduce the impact of natural and human-caused disasters on private property.
- **Goal Five:** Increase public outreach to raise awareness of hazard mitigation and potential funding sources.

It was decided by the planning team that objectives would not be created for each goal since each mitigation action has measurable elements.

5.3.2. Carbon County Capabilities Assessment

Prior to forming new mitigation actions, a capabilities assessment was conducted for the County to understand what planning and regulatory, administrative and technical, financial, and education and outreach capabilities the County has (or is lacking) for implementing hazard mitigation projects. To assess capabilities, an online survey was distributed to each jurisdiction. Additionally, capabilities were discussed during each planning team workshop. Carbon County capabilities are described in the tables below. Overall, this capability assessment is more comprehensive than the one completed for the 2016 Plan. This should help jurisdictions moving forward in realizing their capabilities for implementing mitigation projects. Due to the small size of the communities in Carbon County, many will continue to work in partnership with the County for any expansion or improvement on existing capabilities.

Table 5-7 Carbon County Planning and Regulatory Capabilities

Capability	County	Baggs	Dixon	Elk Mountain	Encampment	Hanna	Medicine Bow	Rawlins	Riverside	Saratoga	Sinclair
Building Codes			x	x	x	x	x	x (2018)	X (1996)	x	X (2015)
BCEGS Rating								X (Class3)			
Capital Improvements Program (CIP) or Plan						x		x		x	x

Capability	County	Baggs	Dixon	Elk Mountain	Encampment	Hanna	Medicine Bow	Rawlins	Riverside	Saratoga	Sinclair
Community Rating System (CRS)											
Community Wildfire Protection Plan (CWPP)	x	x									
Comprehensive, Master, or General Plan		x			x		x	x	x	x	
Economic Development Plan								x		x	
Elevation Certificates											
Erosion/Sediment Control Program											
Floodplain Management or Ordinance	x	x	x				x	x	x	x	
Flood Insurance Study				x	x					x	
Growth Management Ordinance		x						x		x	
Non-Flood Hazard Specific Ordinance or Plan (steep slope, wildfire, snow load)	x						x	x		x	
NFIP	x		x					x	x	x	
Site Plan Review Requirements	x	x	x		x	x	x	x	x	x	x
Stormwater Program, Plan, or Ordinance		x			x					x	x
Zoning Ordinance	x	x	x		x	x	x	x	x	x	x

Table 5-8 Carbon County Administrative and Technical Capabilities

Capability	County	Baggs	Dixon	Elk Mountain	Encampment	Hanna	Medicine Bow	Rawlins	Riverside	Saratoga	Sinclair
Emergency Manager	x						x	x	x		
Floodplain Administrator	x	x	x					x	x	x	
Planner/Engineer (Land Development)	x					x		x		x	
Planner/Engineer/Scientist (Natural Hazards)	x							x			
Engineer/Professional (Construction)	x	x	x			x		x	x	x	x

Capability	County	Baggs	Dixon	Elk Mountain	Encampment	Hanna	Medicine Bow	Rawlins	Riverside	Saratoga	Sinclair
Resiliency Planner											
Transportation Planner						x		x			
Full-Time Building Official								x			x
GIS Specialist and Capability	x							x		x	
Grant Manager, Writer, or Specialist	x					x	x			x	
General Warning Systems/Services	x	x		x	x	x		x		x	x
Flood Warning Systems/Services	x					x	x			x	x
Wildfire Warning Systems/Services	x					x	x				x
Tornado Warning Systems/Services	x	x				x	x			x	x
Geological Hazards Warming Systems/Services	x					x					x

Note from Encampment: No paid professional Planners but we do have a planning commission.

Table 5-9 Carbon County Financial Capabilities

Capability	County	Baggs	Dixon	Elk Mountain	Encampment	Hanna	Medicine Bow	Rawlins	Riverside	Saratoga	Sinclair
Levy for Specific Purposes with Voter Approval		x		x						x	
Utilities Fees				x		x		x		x	
System Development/Impact Development Fee				x						x	
General Obligation Bonds to Incur Debt		x						x		x	
Special Tax Bonds to Incur Debt		x									
Withheld Spending in Hazard-Prone Areas											
Stormwater Service Fees								x			
Capital Improvement Project Funding		x	x			x		x			
Community Development Block Grants						x		x			

Table 5-10 Carbon County Education and Outreach Capabilities

Capability	County	Baggs	Dixon	Elk Mountain	Encampment	Hanna	Medicine Bow	Rawlins	Riverside	Saratoga	Sinclair
Local Citizen Groups that Communicate Hazard Risks	x	x		x							
Firewise	x									x	
StormReady		x									

Note from Encampment: We have minimal local capabilities as we have volunteer only responder teams. We have awareness level of basic programs.

5.3.3. Carbon County Continued NFIP Compliance

Carbon County, Baggs, Dixon, Elk Mountain, Medicine Bow, Rawlins, Riverside, and Saratoga will continue to comply with the NFIP through enforcement of existing floodplain management requirements. All communities in the County have been participating in the RiskMAP process, and resulting floodplain maps were demonstrated at the final planning team workshop for jurisdictions to view and incorporate into local floodplain management.

5.3.4. Carbon County Past Action Reporting

Table 5-11 describes the progress on actions from the 2016 Carbon County Hazard Mitigation Plan.

Table 5-11 Carbon County Progress on 2016 Mitigation Actions

ID	Project Description	Hazard	Jurisdiction	2019 Status	Status Summary
2016.01	Continue participation in NFIP. Coordinate with FEMA RiskMAP project.	Flood	Baggs	Ongoing	meeting soon
2016.02	*Participate in county-NF coordination project.	Flood	Baggs	Ongoing	Ongoing
2016.03	Update 1990s Storm Water Management Plan	Flood	Baggs	Ongoing	Ongoing
2016.04	Conduct a tabletop exercise for Baggs first responders on their	HazMat	Baggs	Deferred	This exercise has not yet been completed

ID	Project Description	Hazard	Jurisdiction	2019 Status	Status Summary
	responsibility during pipeline rupture or leak, how to coordinate with pipeline company.				
2016.05	Obtain a permanent 3-phase stand-by generator for the water plant	All	Baggs	Ongoing	Currently seeking funding for this project
2016.06	Obtain cots, blankets, and MREs to set up a shelter	All	Baggs	Completed	
2016.07	Have Red Cross pre-certify 1-2 shelter locations	All	Baggs	Ongoing	one has been identified and established
2016.08	Educate, train and equip fire fighters to respond safely to incidents involving production water.	HazMat	Carbon County	Deferred	Will be coordinating training soon
2016.09	Continue participation in NFIP. Coordinate with FEMA RiskMAP project.	Flood	Carbon County	Ongoing	Carbon County participates in the NFIP program. The last public meeting for the RiskMAP project was held in August of 2018 and the timeline has been further delayed for the release of the DFIRM.
2016.10	Complement Code Red with IPAWS county-wide and complete implementation. Public awareness effort to get	All	Carbon County	Ongoing	Carbon County is currently in the process of renewal

ID	Project Description	Hazard	Jurisdiction	2019 Status	Status Summary
	everyone signed up for Code Red.				
2016.11	Understand procedures and be prepared to call in air and other resources as needed.	Winter Storm	Carbon County	Delete	No Progress
2016.12	Ensure dam Emergency Action Plans are kept current by responsible entity and available to emergency management.	Dam Failure	Carbon County	Ongoing	Ongoing
2016.13	Update County floodplain regulations	Flood	Carbon County	Ongoing	County is interested in updating the floodplain ordinance in conjunction with the updated RiskMAPs.
2016.14	Coordinate with National Forest managers to understand potential hazards from natural or human-caused actions on the NF, and to reduce and mitigate those hazards.	Flood, Wildland Fire	Carbon County	Ongoing	County Planning has attended some community meetings in WUI areas that the Forest Service and State are proposing thinning's and clear-cuts to create a barrier from potential fire risk. Has spoken to community about E911 addressing and importance.
2016.15	Develop detailed wildland fire hazard maps	Wildland Fire	Carbon County	Completed	A Carbon County Community Wildfire Protection Plan was adopted in 2016. Included mapping with fire risk ranking of WUI areas.
2016.16	Formalize the review process for fire protection in proposed	Wildland Fire	Carbon County	No Progress	This has not come up or been discussed to the best of my knowledge in the County Planning and

ID	Project Description	Hazard	Jurisdiction	2019 Status	Status Summary
	interface development				Development Department.
2016.17	Construct structure to house Savery fire apparatus	Wildland Fire	Carbon County	No Progress	
2016.18	Continue to offer periodic weather spotter training	Weather Hazards	Carbon County	Ongoing	Spotter training will be a part of our up-coming training schedule
2016.19	Update county subdivision regulations to consider natural hazards in subdivision review process	All	Carbon County	Already Considered	The County Subdivision Review process already asks to consider the following: "Will the site be adversely affected by its surrounding environment or will the proposed usage adversely affect the environment?" Also specific language related to flooding. Subdivisions need to be reviewed by planning staff, but also approved by the Planning and Zoning Commission (recommended approval) and the Board of County Commissioners.
2016.20	Continue development of a County Type 3 All-Hazard Response Team.	All	Carbon County	Ongoing	Currently reviewing possible candidates and training requirements to add depth to the Type 3 team
2016.21	Coordinate with FEMA RiskMAP project.	Flood	Dixon	Ongoing	The town is continuing to work with FEMA on RiskMAP project.
2016.22	Plan for a mass casualty incident at the airport. Coordinate with Baggs and Craig, CO.	HazMat/Mass Casualty	Dixon	Deferred	To my knowledge this has not been started or completed.

ID	Project Description	Hazard	Jurisdiction	2019 Status	Status Summary
2016.23	Continue participation in NFIP. *Participate in county-NF coordination project.	Flood	Dixon	Ongoing	The town is continuing participation in NFIP.
2016.24	Coordinate with FEMA RiskMAP project and establish new base flood elevations.	Flood	Elk Mountain	Ongoing	
2016.25	Continue participation in NFIP. *Participate in county-NF coordination project.	Flood	Elk Mountain	Ongoing	
2016.26	Develop plan for holding traffic during of I-80 closure.	HazMat/ Winter Storm	Elk Mountain	Complete	based on existing evacuation and containment plan
2016.27	Continue participation in NFIP. * Participate in county-NF coordination project.	Flood	Encampment	No Progress	
2016.28	Coordinate with FEMA RiskMAP project.	Flood	Encampment	No Progress	
2016.29	Implement drainage study to properly route surface water.	Flood	Encampment	ongoing	The town is continuing to work toward a solution
2016.30	Maintain eligibility of residents to purchase flood insurance.	Flood	Encampment	Deferred	flood mapping has not been identified yet

ID	Project Description	Hazard	Jurisdiction	2019 Status	Status Summary
2016.31	Continue Fire Wise program, hazard fuel reduction projects. Prepare to host a large fire organization.	Wildland Fire	Encampment	Ongoing	currently looking at implementing a town ordinance
2016.32	Continue to monitor potential damage from high ground water. Identify projects to address situations.	Flood	Encampment	Ongoing	currently looking at the construction of a retention pond in higher risk areas
2016.33	Become familiar with Hog Park Dam Emergency Action Plan, role of town during dam breach. Work with City of Cheyenne to ensure plan is current.	Dam Failure	Encampment	No progress	
2016.34	Increase capacity of settling pond to handle larger sediment load.	Wildland Fire	Encampment	Ongoing	
2016.35	Clean up and mitigation of overgrown vegetation areas to prevent spread of fire to populated areas.	Wildland Fire	Encampment	Ongoing	Currently looking at implementing a town ordinance
2016.36	Abate flooding from big ditch and Stink Creek	Flood	Hanna	Completed	Big Ditch and Stink Creek have both been improved to handle higher volume
2016.37	Provide map of subsidence areas in town, prioritize sites for remediation	Mine Sub-sidence	Hanna	No Progress	

ID	Project Description	Hazard	Jurisdiction	2019 Status	Status Summary
2016.38	Plan, train for first 72 hour hazmat response. Understand response role.	HazMat	Hanna	No Progress	
2016.39	Certify and supply at least two shelters (back-up power)	Winter Storms	Hanna	Ongoing	certified red cross shelter at community cen
2016.40	Continue participation in NFIP. *Participate in county-NF coordination project.	Flood	Medicine Bow	Ongoing	The town continues to participate
2016.41	Coordinate with FEMA RiskMAP project.	Flood	Medicine Bow	Completed	
2016.42	Mitigate danger to wastewater treatment plant.	Flood	Medicine Bow	No Progress	
2016.43	Plan, train for railroad incident.	HazMat	Medicine Bow	Completed	
2016.44	Work with county to train and develop a high angle rescue team to respond to wind farm incidents.	Summer Storms, Wind, Wildfire, Winter Storms	Medicine Bow	Ongoing	County has funds for equipment and training
2016.45	Design, engineer, and construct storm water mitigation project.	Flood	Rawlins	Ongoing	New equipment has been purchased to track repairs and new installations
2016.46	Continue participation in NFIP. Coordinate with FEMA RIskMAP project.	Flood	Rawlins	Ongoing	The city is working with FEMA on the risk map currently
2016.47	Continue work with WYDOT to secure truck parking area for	Winter Storm, HazMat	Rawlins	Ongoing	WYDOT is building a new facility in the Walcott area

ID	Project Description	Hazard	Jurisdiction	2019 Status	Status Summary
	Interstate closures.				
2016.48	Continue coordination with railroad to establish a mobile or stationary foam cache.	HazMat	Rawlins	Ongoing	Sinclair refinery has agreed to build a mobile foam unit that will be under the direction of CCEM
2016.49	Establish an Enhanced Threat Risk Assessment Team. Use team to assess critical infrastructure and buildings.	All	Rawlins	No Progress	
2016.50	Continue participation in NFIP. *Participate in county-NF coordination project.	Flood	Riverside	No Progress	
2016.51	Coordinate with FEMA RiskMAP project.	Flood	Riverside	Completed	
2016.52	Conduct feasibility study of sewer lift back-up generator to provide power to town during outage	All	Riverside	Ongoing	
2016.53	Purchase, install air quality monitoring equipment.	Wildland Fire	Riverside	Deferred	This will be worked into a capital expenditure through the budget process
2016.54	Inventory sensitive lands to determine areas to protect and areas best suited for development (from Town Master Plan Action D 5.4)	All	Riverside	No Progress	

ID	Project Description	Hazard	Jurisdiction	2019 Status	Status Summary
2016.55	Continue participation in NFIP. *Participate in county-NF coordination project.	Flood	Saratoga	Completed	
2016.56	Coordinate with FEMA RiskMAP project.	Flood	Saratoga	Completed	
2016.57	Implement river stabilization project through town.	Flood	Saratoga	Ongoing	Work has been done and continues to show progress
2016.58	Work with DEQ to obtain air quality monitors.	Wildland Fire	Saratoga	No Progress	
2016.59	Plan and train for aircraft incident at airport.	HazMat/Mass Casualty	Saratoga	Ongoing	Fire Department is working with the Airport on AARF training and support
2016.60	Plan, train and equip for hazmat incident in Saratoga.	HazMat	Saratoga	Ongoing	Basic Hazmat Operations training has taken place
2016.61	Develop a welcome packet and an education program for town residents regarding refinery emergencies.	HazMat	Sinclair	Deferred	adding an educational enclosure to his welcome letter, to assist community newcomers to familiarize themselves with local natural and man-made hazards and preparedness actions they can take to minimize the hazards' impact on them and their families.
2016.62	Work with DEQ and county to establish real-time permanent monitoring sites with information available online.	HazMat	Sinclair	Ongoing	

5.3.5. Carbon County Identification of New Mitigation Actions

Selection of Mitigation Actions

Selected actions are included in the Mitigation Action Plan (MAP), which is presented in Table 5-12. The MAP is a functional plan for action and is considered to be the most essential outcome of the mitigation planning process. The MAP includes a prioritized listing of proposed hazard mitigation actions for the County and participating jurisdictions to implement. Each action includes accompanying information such as the department responsible for completing the action, timeline, and funding source. The MAP provides those departments or individuals responsible for implementing mitigation actions with a clear path to reduce risk and vulnerability over time. Further, the MAP provides a mechanism to monitor progress over time. Each action also considers the benefits and costs of an action, to ensure it is cost effective, which is included in the prioritization of actions.

Mitigation actions were derived from the HIRA, local planning team workshops, the public surveys, other County plans, and from identified ongoing, progress, or deferred actions from the 2016 Carbon County Hazard Mitigation Plan. Changes in priorities were reflected in the selected mitigation actions by reviewing what has been completed since 2016, reviewing how changes in development have impacted hazard risk (discussed in Section 4: HIRA for each hazard), and through the local planning team discussions and workshops. Overall, priorities have remained generally consistent since the 2016 Carbon County Hazard Mitigation Plan. One notable change has been the recent increase in hazardous material truck traffic through parts of the County and impacts of spills on public safety and the environment. This was reflected in the hazardous materials spills hazard ranking and has been reflected in the MAP.

Prioritization of Mitigation Actions

During the third planning team workshop methods to prioritize mitigation actions were discussed. It was determined that a “high, medium, low” prioritization scheme would work best for the County. Additionally, all actions considered cost-effectiveness including a high-level cost-benefit review for prioritization. In addition, local knowledge or need may necessitate a change in priority. Actions were ranked based on the following criteria:

- Perceived cost effectiveness and feasibility of obtaining funding
- Level of risk to life and property posed by hazard which project addresses
- Reasonableness of project and extent to which it provides a long-term solution
- Potential consequences of not implementing
- Support from the public and elected officials
- Compatibility with other plans and policies

Implementation of Mitigation Actions

The MAP includes several measures to ensure actions are implemented. Carbon County Emergency Management Agency will serve as the coordinating agency. However, each action is tied to a responsible agency or individual who will be responsible for leading the completion of the mitigation action. By assigning responsibility, it increases accountability and the likelihood of action.

In addition to the assignment of a local lead department or agency, an implementation time period or a specific implementation date has been assigned in order to assess whether actions are being implemented in a timely fashion. Further, the County will seek outside funding sources to implement mitigation projects in both the pre-disaster and post-disaster environments. When known, potential

funding sources have been identified for proposed actions listed in the Mitigation Action Plan. Further detail on implementation can be found in the Maintenance and Implementation section of this Plan.

5.3.6. 2019 Carbon County Mitigation Actions

This section describes the 2019 Carbon County mitigation actions and their MAPs. Each action includes a number of items, as shown below. This is followed by the 2019 mitigation actions, beginning in Table 5-12.

- Project ID
- Jurisdiction
- Project description
- Hazard
- Cost estimate (if cost is unavailable, a general “high, medium, or low,” is used based on knowledge, experience, and professional judgement)
- Benefit
- Funding source
- Timeframe
- Responsible party
- Priority ranking
- Status

Table 5-12 Carbon County 2019 Mitigation Actions

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
2019.01	Sinclair	There is currently no shelter in the community. The community is looking to use the elementary school, but they need a generator.	All	$300,000	Public safety	HMA, SHSG, SLIB	2020 - 2023	Town of Sinclair	M	New
2019.02	Saratoga	Mitigation of hazardous material transportation through downtown Saratoga through: The Town of Saratoga will work with WYDOT to lower the speed limit through town beginning at the south town limits to the north town limits, a distance of approximately three miles. • By reducing the speed limit to 30 mph through this area it will	Hazmat	$10,000	Reduce the human-caused disasters through Saratoga; increase public safety and decrease threat of hazmat incident	Grant funding	2021	Saratoga Police Dept; Town of Saratoga Admin	M	New

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
		reduce the speed going through the busiest, congested areas of Saratoga. • As a control devise, the town would like to install stationary permanent speed signs at the south and north town limits.								
2019.03	Saratoga	The Town of Saratoga will continue to work on River Restoration and Flood Mitigation with the local Natural Resource Conservation District to address areas of concern within the town limits. In 2014 the Town of Saratoga partnered with the local Soil Conservation District to contract with StanTec Consulting to	Flood	H	Mitigate long term high water concerns that effect both residential and business properties as well as river restoration and flood mitigation to protect the fragile river ecosystem through the Town of Saratoga.	FEMA PDM, FEMA FMA, Town, Soil Conservation District	TBD	Saratoga Public Works; Town of Saratoga Admin	M	New

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
		develop a conceptual design and geomorphology river assessment of the Upper Platte River through Saratoga. The Town of Saratoga would like to again partner with the local Soil Conservation District and: • Design a self-sustaining, natural, stable river • Reduce the flood stage through Saratoga • Reduce the sediment deposition through the reach • Maintain the integrity and function of the bridges • Protect river corridor utilities The design will restore approximately 7,800 ft of the								

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
		North Platte River and 1,200 ft of the Cadwell Slough at an approximate cost of 4.8 million dollars.								
2019.04	Rawlins	Improve the spring collection intakes presently within our sage creek collection area, as this area historically produces more water than we can collect. In addition we will be replacing the last section of wood stave pipeline that is past its service life.	Drought	$5 million	Water conservation/ efficiency improvements	City, FEMA, State	5 years	City Public Works	M	new
2019.05	Rawlins	Water treatment expansion and upgrade plan to improve filtration and processing capacity	Drought	$7.5 million	Increase water supply	City	5 years	City Public Works	M	new
2019.06	Rawlins	Reducing the amount of treated water used on green spaces and converting to	Drought	$1 million	Conservation of treated water	City	5 years	City Public Works/ Wastewater	H	new

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
		using raw water. This would be done by extending the raw water line from the river that currently provides water to the Municipal golf course. Proposal is to extend to cemetery, sports complex and school district athletic fields								
2019.07	Rawlins	Create and install a xeriscape or low water usage alternative to the present city green belts to reduce usage within the city. In addition create and adopt a City wide landscaping standard appropriate for the high desert climate that encourages and requires low water usage landscaping on	Drought	$450,000	Water conservation	City, FEMA	Ongoing	City Public Works/ Community Development	M	new

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
		new developments.								
2019.08	Rawlins	Continue to educate the public, our governmental partners and through the use of engineering measures continue to meter the flow and usage of all water provided. With such software programs as Sensus the City of Rawlins has been able to monitor usage of all our 3500 customers in real time, which has greatly improved the ability to discover water leaks, high usage situations and other conditions effecting the water supply system.	Drought	L	Public education and awareness/ water conservation	City	Ongoing	City Public Works	H	New
2019.09	Medicine Bow	Medicine Bow is subject to power outages from multiple	Severe Thunderstorm, Tornado, Wildland Fire,	$50,000	Public Safety, reduce economic losses, protect private property	local general fund, FEMA Mitigation Grant, State	2025	Town	H	New

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
		natural hazards which impact critical infrastructure. Medicine Bow proposes to add backup generators to ensure ongoing operation of critical infrastructure which includes the local water treatment plant, the sewer lagoon pumping station, the fire department and the community hall which also functions as a gathering place/shelter.	Wind, Winter Storm/ Blizzard, Terrorism			Homeland Security Grant Program, State Land Investment Board Grant				
2019.10	Carbon County, Baggs, Dixon, Elk Mountain, Encampment, Hanna, Medicine Bow, Riverside	Region 3 and the entire state of Wyoming is subject to drought. Informing local residents via a flyer of the risk of drought and actions they can take to minimize drought's impact on the community will empower	Drought	staff time, flyer development, printing and delivery (postage or available at public locations) $5,000	Public education and awareness, water conservation	local general fund, partnerships with local for profit businesses, FEMA Mitigation Grant, State Land Investment Board Grant, Water Development Grant	2021	Carbon County EM; supported by Wyoming Office of Homeland Security, Baggs, Dixon, Elk Mountain, Encampment, Hanna, Medicine Bow, Riverside	M	New

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
		residents to take action. Many of drought's impacts can be minimized through residents' active conservation efforts, saving residents money as well as protecting valuable community water assets. This action will protect the viability of our communities, agricultural economic viability, and potable water infrastructure.								
2016.01	Baggs	Continue participation in NFIP. Coordinate with FEMA RiskMAP project.	Flood	M	More accurate information. Protect lives and property.	Town, FEMA	Ongoing	Town	H	meeting soon
2016.02	Baggs	*Participate in county-NF coordination project.	Flood	L	Prevention/ mitigation of conditions causing floods. Save lives and property.	Town	Ongoing	Town	M	Ongoing
2016.03	Baggs	Update 1990s Storm Water	Flood	M	Prevent flooding in town, reduce	Town, State, FEMA	Ongoing	Town	M	Ongoing

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
		Management Plan			potential property damage					
2016.04	Baggs	Conduct a tabletop exercise for Baggs first responders on their responsibility during pipeline rupture or leak, how to coordinate with pipeline company.	HazMat	L	Protect public, responders, and natural resources.	Town, Industry	Ongoing	Town, County EM	M	This exercise has not yet been completed
2016.05	Baggs	Obtain a permanent 3-phase stand-by generator for the water plant	All	H	Be able to continue to produce potable water during emergencies	Town, FEMA	Ongoing	Town	M	Currently seeking funding for this project
2016.07	Baggs	Have Red Cross pre-certify 1-2 shelter locations	All	L	Be prepared to assist (primarily stranded travelers) during disaster	N/A	Ongoing	Town, County EM, Red Cross	M	one has been identified and established
2016.08	Carbon County	Educate, train and equip fire fighters to respond safely to incidents involving production water.	HazMat	M	Protect public, responders, and natural resources.	County, WYOS, Industry	Ongoing	County EM, County Fire	H	Will be coordinating training soon
2016.09	Carbon County	Continue participation in NFIP. Coordinate with FEMA RiskMAP project.	Flood	M	More accurate information. Protect lives and property.	County, FEMA	Ongoing	County	H	Carbon County participates in the NFIP program. The last public meeting for

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
										the RiskMAP project was held in August of 2018 and the timeline has been further delayed for the release of the DFIRM.
2016.10	Carbon County	Complement Code Red with IPAWS county-wide and complete implementation. Public awareness effort to get everyone signed up for Code Red.	All	M	Provide early warning to save lives and property.	County	Ongoing	County EM, County Sheriff	H	Carbon County is in the currently in the process of renewal
2016.12	Carbon County	Ensure dam Emergency Action Plans are kept current by responsible entity and available to emergency management.	Dam Failure	L	Provide for quick response to dam failure. Save lives.	County, State Engineer	Ongoing	County EM	M	Ongoing
2016.13	Carbon County	Update County floodplain regulations	Flood	L	Protect lives, future buildings and infrastructure.	County	Ongoing	County Planning	M	County is interested in updating the floodplain ordinance in conjunction with the

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
										updated RiskMAPs.
2016.14	Carbon County	Coordinate with National Forest managers to understand potential hazards from natural or human-caused actions on the NF, and to reduce and mitigate those hazards.	Flood, Wildland Fire	L	Prevention/mitigation of conditions causing floods. Save lives and property.	County, WY Division of Forestry	Ongoing	County EM, County Fire	M	County Planning has attended some community meetings in WUI areas that the Forest Service and State are proposing thinnings and clear-cuts to create a barrier from potential fire risk. Has spoke to community about E911 addressing and importance.
2016.18	Carbon County	Continue to offer periodic weather spotter training	Weather Hazards	L	Raise awareness. Early warning, save lives.	County EM	Ongoing	County EM	M	Spotter training will be a part of our up-coming training schedule
2016.20	Carbon County	Continue development of a County Type 3 All-Hazard Response Team.	All	M	Enhance disaster responses.	County EM and Fire	Ongoing	County Fire, County EM	M	Currently reviewing possible candidates and training requirements

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
										to add depth to the Type 3 team
2016.21	Dixon	Coordinate with FEMA RiskMAP project.	Flood	M	More accurate information. Protect lives and property.	Town, FEMA	Ongoing	Town	H	The town is continuing to work with FEMA on RiskMAP project.
2016.22	Dixon	Plan for a mass casualty incident at the airport. Coordinate with Baggs and Craig, CO.	HazMat/ Mass Casualty	L	Save lives.	Town, County	Ongoing	Town, County EM	L	To my knowledge this has not been started or completed.
2016.23	Dixon	Continue participation in NFIP. *Participate in county-NF coordination project.	Flood	L	Prevention/mitigation of conditions causing floods. Save lives and property.	Town	Ongoing	Town	M	The town is continuing participation in NFIP.
2016.24	Elk Mountain	Coordinate with FEMA RiskMAP project and establish new base flood elevations.	Flood	M	More accurate information. Protect lives and property.	Town, FEMA	Ongoing	Town	H	
2016.25	Elk Mountain	Continue participation in NFIP. *Participate in county-NF coordination project.	Flood	L	Prevention/mitigation of conditions causing floods. Save lives and property.	Town	Ongoing	Town	M	
2016.29	Encampment	Implement drainage study to properly	Flood	H	Protect infrastructure and property.	Town, FEMA	Ongoing	Town	H	The town is continuing to

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
		route surface water.								work toward a solution
2016.30	Encampment	Maintain eligibility of residents to purchase flood insurance.	Flood	L	Protect property.	Town, FEMA	Ongoing	Town	H	flood mapping has not been identified yet
2016.31	Encampment	Continue Fire Wise program, hazard fuel reduction projects. Prepare to host a large fire organization.	Wildland Fire	M	Protect property and lives. Be prepared for large fire.	Town, WY Division of Forestry	Ongoing	Town, WY Division of Forestry	H	currently looking at implementing a town ordinance
2016.32	Encampment	Continue to monitor potential damage from high ground water. Identify projects to address situations.	Flood	L	Protect property.	Town	Ongoing	Town	M	currently looking at the construction of a retention pond in higher risk areas
2016.34	Encampment	Increase capacity of settling pond to handle larger sediment load.	Wildland Fire	H	Infrastructure, natural resource protection.	Town, FEMA	Ongoing	Town	M	
2016.35	Encampment	Clean up and mitigation of overgrown vegetation areas to prevent spread of fire to populated areas.	Wildland Fire	M	Protect property and lives. Be prepared for large fire.	Town, WY Division of Forestry	Ongoing	Town, Property owners	M	Currently looking at implementing a town ordinance
2016.39	Hanna	Certify and supply at least	Winter Storms	L	Be prepared to house displaced individuals	Red Cross	Ongoing	Town, County EM, Red Cross	M	certified red cross shelter

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
		two shelters (back-up power)								at community cen
2016.40	Medicine Bow	Continue participation in NFIP. *Participate in county-NF coordination project.	Flood	L	Prevention/mitigation of conditions causing floods. Save lives and property.	Town	Ongoing	Town	H	The town continues to participate
2016.44	Medicine Bow	Work with county to train and develop a high angle rescue team to respond to wind farm incidents.	Summer Storms, Wind, Wild Fire,Winter Storms	M	Save lives.	Town, County, Industry	Ongoing	Town, County EM, County Fire	M	County funds for equipment and training
2016.45	Rawlins	Design, engineer, and construct storm water mitigation project.	Flood	H	Protect property and infrastructure.	City, FEMA	Ongoing	City, State, FEMA	H	New equipment has been purchased to track repairs and new installations
2016.46	Rawlins	Continue participation in NFIP. Coordinate with FEMA RIskMAP project.	Flood	M	More accurate information. Protect lives and property.	Town, FEMA	Ongoing	City	H	The city is working with FEMA on the risk map currently
2016.47	Rawlins	Continue work with WYDOT to secure truck parking area for Interstate closures.	Winter Storm, HazMat	M	Protect lives, human health.	City, WYDOT	Ongoing	City, WYDOT	M	WYDOT is building a new facility in the Walcott area
2016.48	Rawlins	Continue coordination with railroad to establish a	HazMat	M	Protect lives, property, and natural resources.	City, UPRR	Ongoing	City, County EM, County Fire, Sinclair, UPRR	M	Sinclair refinery has agreed to build a

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
		mobile or stationary foam cache.								mobile foam unit that will be under the direction of CCEM
2016.52	Riverside	Conduct feasibility study of sewer lift back-up generator to provide power to town during outage	All	L	Protect human health.	Town, WYOS	Ongoing	Town	H	
2016.53	Riverside	Purchase, install air quality monitoring equipment.	Wildland Fire	M	Protect human health.	Town, DEQ	Ongoing	Town, DEQ	L	This will be worked into a capital expenditure through the budget process
2016.57	Saratoga	Implement river stabilization project through town.	Flood	H	Protect lives and property.	Town, WYOS, FEMA	Ongoing	Town	H	Work has been done and continues to show progress
2016.59	Saratoga	Plan and train for aircraft incident at airport.	HazMat/Mass Casualty	L	Save lives.	Town	Ongoing	Town, County EM	M	Fire Department is working with the Airport on AARF training and support
2016.60	Saratoga	Plan, train and equip for hazmat incident in Saratoga.	HazMat	M	Protect public, responders, and natural resources.	Town, WYOS	Ongoing	Town, County EM	M	Basic Hazmat Operations training has taken place
2016.61	Sinclair	Develop a welcome packet	HazMat	L	Reduce fear. Protect lives by people	Town, Sinclair Oil	Ongoing	Town	H	adding an educational

ID	Jurisdiction	Description	Hazard	Cost	Benefit	Funding Source	Time-frame	Responsible Party	Priority	Status
		and an education program for town residents regarding refinery emergencies.			knowing how to respond.					enclosure to his welcome letter, to assist community newcomers to familiarize themselves with local natural and man-made hazards and preparedness actions they can take to minimize the hazards' impact on them and their families.
2016.62	Sinclair	Work with DEQ and county to establish real-time permanent monitoring sites with information available on line.	HazMat	M	Reduce fear. Protect human health.	Town, DEQ	Ongoing	Town, DEQ	M	

6. Plan Maintenance, Revision, and Integration

6.1. Introduction

This section of the Plan describes the ongoing methods to keep the Plan current. It describes how the Plan will be reviewed annually, how the public will be kept involved, and how the Plan will be integrated into other planning mechanisms. The plan maintenance process details the formal process that will ensure the Region 3 Hazard Mitigation Plan remains an active and relevant document. The procedures include a schedule for monitoring and evaluating the Plan annually, as well as revising it every five years. This section also describes how the Region will integrate public participation throughout the plan maintenance process. It was determined during the mitigation strategy workshops for each County that both Counties will utilize the LEPC for monitoring and updating the Plan, with little changes from the Counties' previous plans.

6.2. Plan Monitoring, Evaluation and Enhancement

Albany County Emergency Management Agency is tasked with the overall responsibility of monitoring this Plan for Albany County, and Carbon County Emergency Management Agency is tasked with this responsibly for Carbon County. The Plan will be periodically reviewed to ensure it reflects current vulnerabilities and priorities of the Counties and participating jurisdictions. Reviewing and monitoring the Plan also gives plan developers an opportunity to report progress made and provides the public with an opportunity to see progress made.

The planning team will continue to meet regularly and communicate via email. As part of the monitoring, evaluation, and enhancement process, a meeting will be held at least once annually during an LEPC meeting.

Additionally, for Carbon County jurisdictions, it was discussed that Town Council meetings as well as Council of Government meetings would be an ideal opportunity to discuss mitigation actions and any relevant progress or updates.

6.2.1. Annual Meeting and Review

The Plan will be reviewed at the annual LEPC meeting in January for each County. This meeting is open to the public and the planning team and responsible agencies will be invited via email. Led by Albany County EMA (specifically, the Albany County EMA EM Coordinator) for Albany County and the Carbon County EMA Coordinator for Carbon County, the meeting will be used to determine the effectiveness of programs and reflect changes in programs that may affect mitigation priorities. As part of the evaluation process, responsible agencies will be invited to share an update on their project or projects at the meeting.

In addition, the following questions will be asked:

- Have any potential hazards developed that were not addressed in the Plan?
- Have any natural disasters occurred that were not addressed in the Plan?
- Has any unanticipated development occurred that is vulnerable to hazards?
- Are there any additional mitigation ideas that need to be incorporated?
- Have projects been initiated and or completed?
- What are the barriers to completing projects identified in the Plan?

- Are the Plan goals still reflective of community priorities to reduce hazard vulnerabilities?

The purpose of these questions is to determine if the goals are still current and what progress has been made on the Plan. Agencies responsible for mitigation actions, as well as all participating jurisdictions, will be asked to submit any progress on implementing actions. An update will be required at the annual meeting and can be submitted at any time to Albany and Carbon County Emergency Management Agencies. The discussion will be documented so that when the Plan is revised, the findings of the monitoring can be incorporated in the next five-year update.

6.2.2. Five Year Update of the Plan

Any of the following three situations could trigger a review and update of the plan:

- Occurrence of a major national disaster in or near the Region
- Passage of five years
- Change in state or federal regulations which must meet compliance.

The Plan will be thoroughly reviewed and updated at the five-year mark unless it has undergone a more recent revision (with associated FEMA approval). At the five-year mark, several questions will be asked:

- Do the goals address current and expected conditions?
- Has the nature or magnitude of risks changed?
- What additional hazard events have occurred?
- Have the capabilities changed including social, technical, administrative, political, legal, economic, and environmental?
- Are there any coordination issues that should be addressed?
- What progress has been made to complete mitigation actions?
- How has the public remained involved over the last five years?
- Did the identified departments, individuals and/or other partners participate in the Plan implementation process as assigned?

6.2.3. Five Year Revision Procedures

Should a major natural disaster occur in Albany or Carbon County, the respective County planning team shall meet following the disaster to determine whether a review of the hazard mitigation plan is warranted. In the absence of a major natural disaster, the five-year review will take place during the six-month period preceding the FEMA approval anniversary date (or sooner). Following proper notice in the papers of record, the Albany County Emergency Management Coordinator will convene the steering committee for Albany County, and the Carbon County Emergency Management Coordinator will convene the steering committee for Carbon County, and with their assistance (and/or the assistance of the Wyoming Office of Homeland Security (WOHS) or a contractor as determined necessary), carry out the following tasks:

- Review the Hazard Mitigation Plan Review Crosswalk form completed by WOHS and FEMA during their most recent review of the Plan.
- Examine and revise the risk assessment data as needed to ensure it is current.
- Update the mitigation strategies to incorporate completion of actions and add any needed strategies or projects.
- Identify problems that may be hindering or affecting implementation of the Plan and recommend actions for resolving those problems.
- Recommend any necessary revisions to the hazard mitigation plan.

- Comply with all applicable regulations and statutes.

Forty-five days prior (or earlier) to the five-year anniversary date, a final draft of the revised plan will be submitted to WOHS, and then to FEMA. Once FEMA approval has been granted, the Plan will be adopted locally.

6.3. Plan Adoption

Plan adoption will occur following an "approved pending adoption" status by FEMA. Once this status has been received, the counties and participating jurisdictions need to adopt the Plan. Adoption will occur via a resolution and will be passed by county commissions. A copy of the current resolution can be found in Appendix D. The Albany County and Carbon County EMA offices will be the primary authority in maintaining and coordinating the Plan adoption by the jurisdiction.

6.4. Continued Public Involvement

The public is encouraged to be involved in the continual updates of the hazard mitigation plan. The previous methods of public involvement were reviewed to ensure they were successful in engaging the public. It was determined that the existing methods were working, largely utilizing the County's existing social media pages such as Facebook. Additionally, through the current Plan update, the Region implemented a robust public engagement effort and the methods utilized can continue to be used for ongoing public involvement. Both Albany and Carbon Counties invite the public to the annual plan review meeting during the LEPC meeting in January, which also serves as a community preparedness meeting. In addition, the Plan was made available in key public facilities. The County EMAs will be the lead agency to ensure the public remains involved over the next five years via following methods:

- The public will be notified of the annual review meeting through Channel 11 news information, the local newspapers, local Red Cross volunteer training (Carbon County), and local social media channels.
- The Plan will be made available to the public at the Counties' EMA offices, libraries, and on the internet.
- The internet posting regarding the Plan will include a contact for ongoing comments and involvement from the public.

6.5. Integration of Hazard Mitigation into other Planning Mechanisms

The participating jurisdictions will integrate this Hazard Mitigation Plan into relevant government decision-making processes or mechanisms, where feasible. This includes integrating the requirements of the Hazard Mitigation Plan into other local planning documents, processes, or mechanisms, such as comprehensive or capital improvement plans, when appropriate. The members of the planning team, led by Albany and Carbon Counties EMA, will remain charged with ensuring that the goals and actions of new and updated local planning documents for their agencies or departments are consistent and do not conflict with the goals and actions of the Hazard Mitigation Plan. Further, they will ensure that any actions will not contribute to increased hazard vulnerability in each County.

The county and city plans highlighted in Section 3: Planning Process indicate that the Counties and the participating jurisdictions have made substantial progress integrating hazard mitigation principles into existing plans. For example, recognizing sensitive areas and prohibiting development in the floodway.

However, there is a recognized opportunity to continue to integrate principals. This is especially pertinent for Carbon County as their updated floodplain mapping is released. As these documents are updated, hazard mitigation policies will be reviewed and considered. Much of the information provided in city and county plans, as well as their respective planning efforts, tie into each County's mitigation action plan.

Albany and Carbon Counties EMA will continue to coordinate and support this effort. The Counties' EMA EM Coordinator works closely with planning commissioners, ensuring hazard mitigation is considered during applicable decisions. Further, most plans originate or filter through the EMA office. Much of the information in this Plan, such as the risk assessment, will be incorporated into other emergency management planning efforts, such as the Carbon County THIRA. Many different agencies will be responsible for following the Region 3 Hazard Mitigation Plan. The County Commissioners and participating jurisdictions will have the authority to promote policies regarding hazards. The Counties' LEPC will also consider the hazard mitigation plan in its efforts. It can refer to the plan for guidance on past occurrences and future impacts. Agencies can also utilize the plan to seek out grants and projects that fulfill the mitigation requirements outlined in the plan. Albany and Carbon Counties' EMA will include the necessary information in future plans and coordinate this operation through other agencies as plans are revised and reviewed. It was noted for Carbon County, due to the small size of many of the jurisdictions, much of the planning occurs at the county level. However, routine integration does occur through activities such as site plan review in which natural hazards such as flood, snow, and wind are considered.

Appendixes

7. Appendix A: Meeting Sign-in Sheets and Agendas

7.1. Region 3

Figure 7-1 Hazard Mitigation Planning Steering Committee Kickoff Webinar

CDR MAGUIRE
EMERGENCY MANAGEMENT

Wyoming Region 3 (Albany & Carbon Counties) – Hazard Mitigation Plan
Kick-Off Webinar (Steering Committee)

When: 10:00-12:00 MST - November 19, 2018

Where: Webinar (https://cdrmaguire.zoom.us/j/880571950) – Conference Call (US: +1 669 900 6833 or +1 408 638 0968 \ Meeting ID: 880 571 950)

Invitees: Aimee Binning (Albany County), John Zieger (Carbon County), Melinda Gibson (WOHS), Mike Garner (CDR Maguire)

Agenda:

1. Welcome & Introductions
2. Project Scope & Schedule
3. Roles & Responsibilities
4. Participation Standards
5. Formal Adoptees
6. Project Communication Preferences
7. Local Planning Team
8. Current HMPs
9. Hazards to Profile
10. Hazard Ranking
11. Recent Hazard Events
12. Hazus scenarios
13. Recent Community Planning
14. Best Available Data
15. Local Planning Team Development & Kick-Off Meetings
16. Public Involvement Strategy
17. Questions / Concerns / Other Topics

Post Meeting Action Items:

A.
B.

Questions, Comments, Concerns? – Contact project manager Mike Garner at any point throughout the planning process: 303.710.9498 | Michael.Garner@CDRMaguire.com

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7.2. Albany County

Figure 7-2 Albany County Local Planning Team Kickoff Workshop Agenda

CDR MAGUIRE
EMERGENCY MANAGEMENT

Wyoming Region 3 (Albany & Carbon Counties) – Hazard Mitigation Plan
Albany Kick-Off Workshop (Local Planning Team)

When: 1:00-4:00 MST – January 14, 2019

Where: Albany County Fairgrounds, Laramie | Webinar (https://cdrmaguire.zoom.us/j/421283661) – Conference Call (US: +1 669 900 6833 or +1 408 638 0968 \ **Meeting ID: 421 283 661**)

Invitees: See meeting sign-in sheet

Agenda:

1. Welcome & Introductions
2. Hazard Mitigation Planning Overview
3. Project Overview
4. Local Planning Team
5. Participation Standards
6. Current Plan Review
7. Hazards
8. Public Involvement Strategy
9. Data Request
10. Mitigation Strategy Overview
11. Next Steps
12. Action Items
13. Future Asks
14. Questions / Concerns / Other Topics

Post Meeting Action Items for the Local Planning Team:

A. Relay suggestions for additional planning team members
B. Identify and relay any relevant data or contacts applicable to this plan
C. Begin local coordination / discussions *(Municipality / Agency / Organizational Leads)*
   a. Summary of project
   b. Mitigation Actions
   c. Plan integration opportunities
D. Public Involvement Strategy
   a. Request any public involvement material needs
   b. Provide your thoughts on your community's specific strategy *(Municipality / Agency / Organizational Leads)*
   c. Request any public involvement support needs *(Municipality / Agency / Organizational Leads)*

Questions, Comments, Concerns? – Contact project manager Mike Garner at any point throughout the planning process: 303.710.9498 | Michael.Garner@CDRMaguire.com

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Figure 7-3 Albany County Local Planning Team Kickoff Workshop Sign-in Sheets

Wyoming Region 3 (Albany Carbon Counties) – Hazard Mitigation Plan
Albany Kick-Off Workshop (Local Planning Team)
January 14, 2019

First Name	Last Name	Representing	Department / Division	Email	Sign In
Susan	Adler	South of Laramie Water & Sewer District			
Carson	Anderson	Albany County Volunteer Fire Department	Garrett Fire Zone		
Harold	Babbitt	Rocky Mountain Power	Community Account Manager	harold.babbitt@pacificcorp.com	
Laura	Betzold	University of Wyoming	UW Risk Management & Safety		
Aimee	Binning	Albany County	Homeland Security Emergency Manag	ema@co.albany.wy.us	
Bre	Bockstahler	US EPA Region 8	Emergency Preparedness Unit	bockstahler.breann@epa.gov	
Bill	Brinegar	Wyoming Game & Fish	Enforcement	bill.brinegar@wyo.gov	
Rebecca	Broussard	US EPA Region 8	Emergency Preparedness Unit	broussard.rebecca@epa.gov	
Malea	Brown	City of Laramie	Administrative Services	mbrown@cityoflaramie.org	
Kim	Buckner	valley View Drive Community Improvement & Servic			
Jessica	Buenger	Veterinarians	Animal Health Center		
Dennis	Carpenter	US Bureau of Land Management	Rawlins Field Office	rawlins_wymail@blm.com	
Eric	Clark	Town of Rock River	Town Public Works	rockrivertownmaintenance@union-tel.com	
Harold	Colby	Albany County	Homeland Security Emergency Manag	albanyema2@gmail.com	
Info	Contact	Black Hills Power Gas	Distribution		
Info	Contact	Black Hills Power Gas	Transmission		
Ronald	Copenhaver	Centennial Water & Sewer District			
Graham	Crews	Walden, Town of	Gas Line		
Jim	Crosby	Laramie County Community College Albany Co. Cam	Campus Security	jcrosby@lccc.wy.edu	
Madeline	Dalrymple	Wyoming State Vet Lab	Risk & Safety Office	dalrymple@uwyo.edu	
John	Davis	University of Wyoming	UW Operations Physical Plant	jdavis71@uwyo.edu	
Scott	Davis	Volunteer	EOC		
Josh	DeBree	Albany County	Sheriff	jdebree@co.albany.wy.us	
Tom	DeHoff	Wyoming Dept. of Transportation	Engineering	tom.dehoff@dot.state.wy.us	
Chad	Dinges	Albany County	Fire Warden	cdinges@co.albany.wy.us	
Mark	Doyle	City of Laramie	Fire Department / EMS	mdoyle@cityoflaramie.org	
Lee	Erickson	Wold Improvement & Service District	MX Team		

Wyoming Region 3 (Albany Carbon Counties) – Hazard Mitigation Plan
Albany Kick-Off Workshop (Local Planning Team)
January 14, 2019

First Name	Last Name	Representing	Department / Division	Email	Sign In
Jon	Essley	Albany County Fire District	Tie Siding VFD	tiesidingvfd@hotmail.com	
Rhen	Etzelmiller	US Bureau of Land Management	Casper Field Office	casper_wymail@blm.gov	
Dr Dave	Evertson	Wyoming State Veterinary & Live Stock Board		dave.evertson@wyo.gov	
Todd	Feezer	City of Laramie	Parks and Recreation	tfeezer@cityoflaramie.org	
Bob	Fenton	Rockies Express Pipeline		bob.fenton@tallgrassenergyylp.com	
Rob	Fisher	Albany County	Road and Bridge	jfisher@co.albany.wy.us	
Tye	Fix	Wyoming Dept. of Transportation	Highway Maintenance	tye.fix@dot.state.wy.us	
Jerome	Flores	Sinclair Pipeline		jflores@sinclairoil.com	
Alan	Frank	Albany County	GIS	afrank@co.albany.wy.us	
Hayden	Fuchs	Pete Lein & Sons			
David	Gertsch	Albany County	Planning Office	dgertsch@co.albany.wy.us	
Crystal	Gill	Veterinarians	Gem City Veterinarian Services		
Tom	Glause	Wyoming Insurance Commission			
Pete	Gossar	Downtown Clinic			
Eric	Gregory	Albany County Fire District	Finance	ericcpc@yahoo.com	
Jake	Hammer	Union Pacific Railroad	Hazmat		
Stephan	Hartley	Sinclair Pipeline	Cheyenne Area	shartley@sinclairoil.com	
Paul	Heimer	United Way		pheimer@unitedwayalbanycounty.org	
Tony	Hoch	Laramie Rivers Conservation District	Staff	tony.hoch@lrcd.net	
Wanda	Hulit	Ivinson Memorial Hospital	Emergency Preparedness	wandah@ivinsonhospital.org	
Sheryl	Hunter	US Department of Agriculture	Farm Services Agency	sheryl.hunter@wy.usdw.gov	
Brent	Huston	US Department of Homeland Security	FEMA	michael.houston@fema.dhs.gov	
Eric	Jaap	City of Laramie	City Engineer	ejaap@cityoflaramie.org	
Daryl	Jensen	Sherman Hill Road Improvement & Special District			
Dan	Johnson	City of Laramie	Fire Department / EMS	djohnson@cityoflaramie.org	
Shane	Johnson	City of Laramie	Public Works	shane.johnson@cityoflaramie.org	
Teri	Jones	Albany County	Commissioners	btjones@wyoming.com	

Wyoming Region 3 (Albany Carbon Counties) – Hazard Mitigation Plan
Albany Kick-Off Workshop (Local Planning Team)
January 14, 2019

First Name	Last Name	Representing	Department / Division	Email	Sign In
Tom	Kern	Albany County Fire District	Centennial VFD	kerntat@carbonpower.net	
Andrea	Kern	Epson Center for Seniors	Management		
Rick	King	Wyoming Game & Fish	Management	richard.kin@wyo.gov	
John	Koger	Veterinarians	Laramie Peak Veterinary Associates	vets@wyoming.com	
Will	Laegreid	Wyoming State Vet Lab		wlaegrei@uwyo.edu	
Cathy	Leslie	Town of Rock River	Town Council		
Jeremy	Lewis	Williams Pipeline	Overland Pass Pipeline	jeremie.lewis@williams.com	
Dan	McGregor	Seven Mile Water & Sewer District			
Brian	McNutt	ARES/RACES	State ARES		
Paul	Naylon	Union Pacific Railroad	Local Contact	pnaylon@up.com	
Roger	Newkirk	Wyoming State Veterinary & Live Stock Board	Brand Inspection		
Richard	Parrish	Albany County Fire District	Big Laramie VFD	richard@sfaw.org	
Belinda	Power	Walden Gas		pwerbel@yahoo.com	
Belinda	Power	Walden Gas	Response		
Cyrus	Rahman	Albany County Volunteer Fire Department	Laramie Peak Zone	crahman@gmail.com	
Lori	Reed	US EPA Region 8	Emergency Preparedness Unit	reed.lori@epa.gov	
Debbie	Reichert	Carbon Light & Power			
Jonathan	Rhoades	City of Laramie	City IT	jrhoades@cityoflaramie.org	
Heber	Richardson	Albany County	Commissioners	hrichardson@co.albany.wy.us	
Robert (Bob)	Rodekohr	Wold Improvement & Service District			
Frank	Romero	US Forest Service			
Michael	Samp	University of Wyoming	University Police	bowhntr@uwyo.edu	
Ruth	Shepherd	Laramie Rivers Conservation District	Board of Supervisors	Tony.Hoch@lvcd.net	Martin Curry
Trey	Sherwood	Laramie Main Street Alliance		downtownlaramie@gmail.com	
Steve	Shivy	Albany County Volunteer Fire Department	Garrett Fire Zone		
Robert	Shoemaker	Albany County Volunteer Fire Department	Laramie Peak Fire Zone		
Steven	Shute	Walden Gas			

Wyoming Region 3 (Albany Carbon Counties) – Hazard Mitigation Plan
Albany Kick-Off Workshop (Local Planning Team)
January 14, 2019

First Name	Last Name	Representing	Department / Division	Email	Sign In
Mike	Simmons	Wyoming Highway Patrol	Highway Patrol	michael.simmons@wyo.gov	
Shanon	Sims	Albany County StockGrowers			
Jack	Skinner	Laramie Regional Airport			
Earl	Smith	City of Laramie	Public Works	esmith@cityoflaramie.com	
Dob	Smith	Wheatland Rural Electric Association			
Nick	Speiser	Albany County	Fair Board		
Dale	Stalder	City of Laramie	Police Department	dsatalder@cityoflaramie.org	
Jessica	Stanbury	Wyoming VOAD	Wyoming VOAD Administration	jessica@servewyoming.org	
James	Stine	Nine Mile Water & Sewer District			
Rick	Stricklin	Town of Rock River	Town Fire Department	rockrivertownmaintenance@union-tel.com.com	
Jared	Strucbe	The Paddocks Improvement District			
Andi	Summervill	City of Laramie	City Council	asummerville@cityoflaramie.org	
Dallas	Talbott	Centennial Water & Sewer District			
Ralph	Tarango	Wyoming Dept. of Transportation	Highway Maintenance	tim.mcgary@dot.state.wy.us	
Cal	Van Zee	City of Laramie	Public Works	cvanzee@cityoflaramie.org	
Mike	Vercauteren	Interfaith Good Samaritan		director@laramieinterfaith.org	
Brett	Wadsworth	Albany County Fire District	Vedauwoo Volunteer Fire Department	vvfd2013@gmail.com	
Judith	Wagner	Rainbow Valley Special Road District		rvsrd@carbonpower.net	
Britney	Wallesch	Black Dog Animal Rescue			
David	Walrath	Sage Drive Community Improvement & Service Distr			
Lindsey	Wheat	Albany County	Weed & Pest		
Joe	Whitely	Army National Guard			
Casey	Whitman	Cheyenne Board of Public Utilities			
Dylan	Whitmer	Albany County Fire District	Central Area	dwhitmer.acfd1.central@outlook.com	
Randy	Wilkinson	Albany County School District	Transportation and Facilities	r.wilkinson@acsd1.org	
James	Wilkinson	ARES/RACES			
John	Wilson	Albany County Volunteer Fire Department	Sybille Fire Zone		

JOHN

Wyoming Region 3 (Albany Carbon Counties) – Hazard Mitigation Plan
Albany Kick-Off Workshop (Local Planning Team)
January 14, 2019

First Name	Last Name	Representing	Department / Division	Email	Sign In
Mary	Wood	Albany County	Extension Office	mwood@uwyo.edu	
Tai	Wright	Albany County	Grants Department	tlwright@co.albany.wy.us	
Bob	Bauer	BLVFD	ACFD #1	bbauer@centurylink.net	
Neal	Bowers	BLVFD	ACFD #1	nhbow@Aol.com	Neal Bowers
Chad	Bade	Internal	UWPD	cbade@uwyo.edu	
Mike	Davis	BLVFD	ACFD #1	cd.entltd@gmail.com	
Richard	Parrish	BLVFD / ACFD1	—	richard.blvfd@gmail.com	
Steven	Morgan	LPD / LARC		smorgan@cityofwyoming.org	
Paul	Beckett	City-Public Works	—	pbeckett@cityofwyoming.org	
Joseph	Witt	ACFD #1		JOSEPHISH.RLIY.CM	
John	Longo	ACPH	ACPH	John.longo@wyo.gov	
Martin	Curry	LRCD		Martin.curry@lrcd.net	Martin Curry
Mike	Sullivan	AC ARES/RACES		MIKE.SULLIVAN@UWYO.EDU	
Jackie	Gonzales	Albany Co Clerk		jgonzales@co.albany.wy.us	

Wyoming Region 3 (Albany Carbon Counties) – Hazard Mitigation Plan
Albany Kick-Off Workshop (Local Planning Team)
January 14, 2019

First Name	Last Name	Representing	Department / Division	Email	Sign In
David	Gertsch	County Planning	Planning	dgertsch@co.albany.wy.us	
Chris	Van Aken	Planning	Planning	cvanaken@co.albany.wy.us	
Chuck	Muller	WYDOT	maintenance	charles_muller@wyo.gov	

Figure 7-4 Albany County Local Planning Team HIRA Workshop Agenda

CDR MAGUIRE
EMERGENCY MANAGEMENT

Wyoming Region 3 (Albany & Carbon Counties) – Hazard Mitigation Plan

Albany Workshop #2 (Local Planning Team)

When: 10:00-12:00 MST – April 1, 2019

Where: Fire Station #3, 2374 Jefferson St., Laramie | Webinar: https://cdrmaguire.zoom.us/j/641305540 – Conference Call (US: +1 669 900 6833 or +1 408 638 0968 \ **Meeting ID: 641 305 540**)

Invitees: See meeting sign-in sheet

Agenda:

1. Welcome & Introductions
2. Hazard Mitigation Planning Review
3. Risk Assessment Summary
4. Remaining Data Requests
5. Public Involvement
6. Mitigation Strategy
7. Action Items

Post Meeting Action Items for the Local Planning Team:

- Continue local discussions relating to this project
- Begin identifying new mitigation actions
- Critical facility assessment review
- Capability assessment survey – per jurisdiction
- Historical input on communicable disease
- Public survey / involvement
- Review of Risk Assessment chapter

Questions, Comments, Concerns? – Contact project manager Mike Garner at any point throughout the planning process: 303.710.9498 | Michael.Garner@CDRMaguire.com

WYOMING REGION 3 - HAZARD MITIGATION PLAN 2019 Page | 1

CDR MAGUIRE EMERGENCY MANAGEMENT

Jurisdiction	Avalanche	Drought	Earthquake	Flood	Geologic (landslide, land	Severe Thunderstorm (hail, lightning)	Tornado	Wildland Fire	Wind / Windblown Deposits	Winter Storm / Blizzard	Communicable and Infectious Disease	Dam Failure	Hazardous Material Release	Terrorism
	Risk Rank										Key (average): < 4 = L 5 - 6 = M 7+ = H			
Albany	L	H	L	H	L	M	M	H	M	H	M	M	H	M
Laramie	L	M	M	H	L	M	M	H	M	H	M	M	H	H
Rock River	L	M	L	H	L	M	M	M	M	H	M	M	H	M
Carbon	L	H	L	H	L	M	M	H	M	H	M	M	H	M
Baggs	L	M	L	H	L	M	M	H	M	H	M	M	L	M
Dixon	L	M	L	M	L	M	M	H	M	H	M	M	L	M
Elk Mountain	L	M	L	H	L	M	M	H	M	H	M	M	H	M
Encampment	L	M	L	H	L	M	M	H	M	H	M	M	L	M
Hanna	L	M	L	H	L	M	M	M	M	H	M	M	H	M
Medicine Bow	L	M	L	H	L	M	M	M	M	H	M	M	L	M
Rawlins	L	M	L	H	L	M	M	M	M	H	M	M	H	H
Riverside	L	M	M	H	L	M	M	H	M	H	M	M	L	M
Saratoga	L	M	M	H	L	M	M	H	M	H	M	M	L	M
Sinclair	L	M	L	L	L	M	M	M	M	H	M	M	H	H

Comments:_____

Mitigation Goals:

1. Reduce the potential for injury and loss of life from natural and human-caused disasters.
2. Minimize the potential for economic losses from natural and human-caused disasters.
3. Reduce the impact of natural and human-caused disasters on critical infrastructure, communication systems, and facilities.

Figure 7-5 Albany County Local Planning Team HIRA Workshop Sign-in Sheets

Wyoming Region 3 (Albany Carbon Counties) – Hazard Mitigation Plan
Albany Workshop #2 (Local Planning Team)
April 1, 2019

First Name	Last Name	Representing	Department / Division	Email	Sign In
Nancy	?				
Susan	Adler	South of Laramie Water & Sewer District			
Carson	Anderson	Albany County Volunteer Fire Department	Garrett Fire Zone		
Harold	Babbitt	Rocky Mountain Power	Community Account Manager	harold.babbitt@pacificcorp.com	
Chad	Bade	UWPD			
Bob	Bauer	BLVFD/ACFD #1			
Paul	Beckett	City of Laramie	Public Works		
Laura	Betzold	University of Wyoming	UW Risk Management & Safety		
Aimee	Binning	Albany County	Homeland Security Emergency Manag	ema@co.albany.wy.us	
Bre	Bockstahler	US EPA Region 8	Emergency Preparedness Unit	bockstahler.breann@epa.gov	
Neal	Bowers	BLVFD/ACFD #1			
Bill	Brinegar	Wyoming Game & Fish	Enforcement	bill.brinegar@wyo.gov	
Rebecca	Broussard	US EPA Region 8	Emergency Preparedness Unit	broussard.rebecca@epa.gov	
Malea	Brown	City of Laramie	Administrative Services	mbrown@cityoflaramie.org	
Kim	Buckner	valley View Drive Community Improvement & Servic			
Jessica	Buenger	Veterinarians	Animal Health Center		
Dennis	Carpenter	US Bureau of Land Management	Rawlins Field Office	rawlins_wymail@blm.com	
Eric	Clark	Town of Rock River	Town Public Works	rockrivertownmaintenance@union-tel.com	
Harold	Colby	Albany County	Homeland Security Emergency Manag	albanyema2@gmail.com	
Info	Contact	Black Hills Power Gas	Distribution		
Info	Contact	Black Hills Power Gas	Transmission		
Ronald	Copenhaver	Centennial Water & Sewer District			
Graham	Crews	Walden, Town of	Gas Line		
Jim	Crosby	Laramie County Community College Albany Co. Cam	Campus Security	jcrosby@lccc.wy.edu	
Martin	Curry	LRCD			
Madeline	Dalrymple	Wyoming State Vet Lab	Risk & Safety Office	dalrymple@uwyo.edu	
John	Davis	University of Wyoming	UW Operations Physical Plant	jdavis71@uwyo.edu	

Wyoming Region 3 (Albany Carbon Counties) – Hazard Mitigation Plan
Albany Workshop #2 (Local Planning Team)
April 1, 2019

First Name	Last Name	Representing	Department / Division	Email	Sign In
Scott	Davis	Volunteer	EOC		
Mike	Davis	BLVFD/ACFD #1			
Josh	DeBree	Albany County	Sheriff	jdebree@co.albany.wy.us	
Tom	DeHoff	Wyoming Dept. of Transportation	Engineering	tom.dehoff@dot.state.wy.us	
Chad	Dinges	Albany County	Fire Warden	cdinges@co.albany.wy.us	
Mark	Doyle	City of Laramie	Fire Department / EMS	mdoyle@cityoflaramie.org	Mark Doyle
Lee	Erickson	Wold Improvement & Service District	MX Team		
Jon	Essley	Albany County Fire District	Tie Siding VFD	tiesidingvfd@hotmail.com	
Rhen	Etzelmiller	US Bureau of Land Management	Casper Field Office	casper_wymail@blm.gov	
Dr Dave	Evertson	Wyoming State Veterinary & Live Stock Board		dave.evertson@wyo.gov	
Todd	Feezer	City of Laramie	Parks and Recreation	tfeezer@cityoflaramie.org	
Bob	Fenton	Rockies Express Pipeline		bob.fenton@tallgrassenergyylp.com	
Rob	Fisher	Albany County	Road and Bridge	jfisher@co.albany.wy.us	
Tye	Fix	Wyoming Dept. of Transportation	Highway Maintenance	tye.fix@dot.state.wy.us	
Jerome	Flores	Sinclair Pipeline		jflores@sinclairoil.com	
Alan	Frank	Albany County	GIS	afrank@co.albany.wy.us	
Hayden	Fuchs	Pete Lein & Sons			
David	Gertsch	Albany County	Planning Office	dgertsch@co.albany.wy.us	
Melinda	Gibson				
Crystal	Gill	Veterinarians	Gem City Veterinarian Services		
Tom	Glause	Wyoming Insurance Commission			
Jackie	Gonzales				
Pete	Gossar	Downtown Clinic			
Eric	Gregory	Albany County Fire District	Finance	ericcpc@yahoo.com	
Jake	Hammer	Union Pacific Railroad	Hazmat		
Stephan	Hartley	Sinclair Pipeline	Cheyenne Area	shartley@sinclairoil.com	
Paul	Heimer	United Way		pheimer@unitedwayalbanycounty.org	

Wyoming Region 3 (Albany Carbon Counties) – Hazard Mitigation Plan
Albany Workshop #2 (Local Planning Team)
April 1, 2019

First Name	Last Name	Representing	Department / Division	Email	Sign In
Tony	Hoch	Laramie Rivers Conservation District	Staff	tony.hoch@lrcd.net	
Wanda	Hulit	Ivinson Memorial Hospital	Emergency Preparedness	wandah@ivinsonhospital.org	
Sheryl	Hunter	US Department of Agriculture	Farm Services Agency	sheryl.hunter@wy.usdw.gov	
Brent	Huston	US Department of Homeland Security	FEMA	michael.houston@fema.dhs.gov	
Eric	Jaap	City of Laramie	City Engineer	ejaap@cityoflaramie.org	
Daryl	Jensen	Sherman Hill Road Improvement & Special District			
Dan	Johnson	City of Laramie	Fire Department / EMS	djohnson@cityoflaramie.org	dcj
Shane	Johnson	City of Laramie	Public Works	shane.johnson@cityoflaramie.org	
Teri	Jones	Albany County	Commissioners	btjones@wyoming.com	
Tom	Kern	Albany County Fire District	Centennial VFD	kerntat@carbonpower.net	
Andrea	Kern	Epson Center for Seniors	Management		
Rick	King	Wyoming Game & Fish	Management	richard.kin@wyo.gov	
John	Koger	Veterinarians	Laramie Peak Veterinary Associates	vets@wyoming.com	
Will	Laegreid	Wyoming State Vet Lab		wlaegrei@uwyo.edu	
Cathy	Leslie	Town of Rock River	Town Council		
Jeremy	Lewis	Williams Pipeline	Overland Pass Pipeline	jeremie.lewis@williams.com	
John	Longo	ACPH			
Dan	McGregor	Seven Mile Water & Sewer District			
Brian	McNutt	ARES/RACES	State ARES		
Steven	Morgan	LPD/LARC			
Chuck	Muller	WY DOT	Maintenance		
Paul	Naylon	Union Pacific Railroad	Local Contact	pnaylon@up.com	
Roger	Newkirk	Wyoming State Veterinary & Live Stock Board	Brand Inspection		
Richard	Parrish	Albany County Fire District	Big Laramie VFD	richard@sfaw.org	
Richard	Parrish	BLVFD/ACFD #1			
Belinda	Power	Walden Gas		pwerbel@yahoo.com	
Belinda	Power	Walden Gas	Response		

Wyoming Region 3 (Albany Carbon Counties) – Hazard Mitigation Plan
Albany Workshop #2 (Local Planning Team)
April 1, 2019

First Name	Last Name	Representing	Department / Division	Email	Sign In
Cyrus	Rahman	Albany County Volunteer Fire Department	Laramie Peak Zone	crahman@gmail.com	
Lori	Reed	US EPA Region 8	Emergency Preparedness Unit	reed.lori@epa.gov	
Debbie	Reichert	Carbon Light & Power			
Jonathan	Rhoades	City of Laramie	City IT	jrhoades@cityoflaramie.org	
Heber	Richardson	Albany County	Commissioners	hrichardson@co.albany.wy.us	
Robert (Bob)	Rodekohr	Wold Improvement & Service District			
Frank	Romero	US Forest Service			
Michael	Samp	University of Wyoming	University Police	bowhntr@uwyo.edu	
Ruth	Shepherd	Laramie Rivers Conservation District	Board of Supervisors		
Trey	Sherwood	Laramie Main Street Alliance		downtownlaramie@gmail.com	
Steve	Shivy	Albany County Volunteer Fire Department	Garrett Fire Zone		
Robert	Shoemaker	Albany County Volunteer Fire Department	Laramie Peak Fire Zone		
Steven	Shute	Walden Gas			
Mike	Simmons	Wyoming Highway Patrol	Highway Patrol	michael.simmons@wyo.gov	
Shanon	Sims	Albany County StockGrowers			
Jack	Skinner	Laramie Regional Airport			
Earl	Smith	City of Laramie	Public Works	esmith@cityoflaramie.com	
Dob	Smith	Wheatland Rural Electric Association			
Nick	Speiser	Albany County	Fair Board		
Dale	Stalder	City of Laramie	Police Department	dsatalder@cityoflaramie.org	
Jessica	Stanbury	Wyoming VOAD	Wyoming VOAD Administration	jessica@servewyoming.org	
James	Stine	Nine Mile Water & Sewer District			
Rick	Stricklin	Town of Rock River	Town Fire Department	rockrivertownmaintenance@union-tel.com.com	
Jared	Strucbe	The Paddocks Improvement District			
Mike	Sullivan	AC ARES/RACES			
Andi	Summervill	City of Laramie	City Council	asummerville@cityoflaramie.org	
Dallas	Talbott	Centennial Water & Sewer District			

Wyoming Region 3 (Albany Carbon Counties) – Hazard Mitigation Plan
Albany Workshop #2 (Local Planning Team)
April 1, 2019

First Name	Last Name	Representing	Department / Division	Email	Sign In
Ralph	Tarango	Wyoming Dept. of Transportation	Highway Maintenance	tim.mcgary@dot.state.wy.us	
Chris	Van Aken	Albany County	Planning		
Cal	Van Zee	City of Laramie	Public Works	cvanzee@cityoflaramie.org	Cal Van Zee
Mike	Vercauteren	Interfaith Good Samaritan		director@laramieinterfaith.org	
Brett	Wadsworth	Albany County Fire District	Vedauwoo Volunteer Fire Department	vvfd2013@gmail.com	
Judith	Wagner	Rainbow Valley Special Road District		rvsrd@carbonpower.net	
Britney	Wallesch	Black Dog Animal Rescue			
David	Walrath	Sage Drive Community Improvement & Service Distr			
Lindsey	Wheat	Albany County	Weed & Pest		
Joe	Whitely	Army National Guard			
Casey	Whitman	Cheyenne Board of Public Utilities			
Dylan	Whitmer	Albany County Fire District	Central Area	dwhitmer.acfd1.central@outlook.com	
Randy	Wilkinson	Albany County School District	Transportation and Facilities	r.wilkinson@acsd1.org	
James	Wilkinson	ARES/RACES			
John	Wilson	Albany County Volunteer Fire Department	Sybille Fire Zone		
Joseph	Witt	BLVFD/ACFD #1			
Mary	Wood	Albany County	Extension Office	mwood@uwyo.edu	
Tai	Wright	Albany County	Grants Department	tlwright@co.albany.wy.us	
JUDY	KNIGHT	LARAMIE PLAINS MUSEUM	Collections	je.judy@gmail.com	JEK
Jolene	Giese	Personal		wyodog1958@yahoo.com	JG

Figure 7-6 Albany County Local Planning Team Mitigation Strategy Workshop Agenda

CDR MAGUIRE
EMERGENCY MANAGEMENT

Wyoming Region 3 (Albany & Carbon Counties) – Hazard Mitigation Plan

Albany Mitigation Strategy Workshop (Local Planning Team)

When: 10:00-12:00 MST – July 1, 2019

Where: Fire Station #3, 2374 Jefferson St., Laramie | Webinar: https://cdrmaguire.zoom.us/j/315920682 – Conference Call (US: +1 669 900 6833 or +1 408 638 0968 \ **Meeting ID: 315 920 682**)

Invitees: See meeting sign-in sheet

Agenda:

1. Welcome & Introductions
2. Project Overview
3. 2015 Mitigation Action / Project Review
4. Plan Maintenance / Implementation
5. Plan Integration
6. Mitigation Strategy – Goals & Objectives
7. Mitigation Strategy Inputs
8. Mitigation Strategy – New Actions / Projects
9. Remaining Public Involvement
10. Plan Adoptees

Post Meeting Action Items for the Local Planning Team:

- Finalize new Mitigation Actions / Projects
- Review draft updated Plan
- Public Review and Comment

Questions, Comments, Concerns? – Contact project manager Mike Garner at any point throughout the planning process: 303.710.9498 | Michael.Garner@CDRMaguire.com

WYOMING REGION 3 - HAZARD MITIGATION PLAN 2019 Page | 1

Figure 7-7 Albany County Local Planning Team Mitigation Strategy Workshop Sign-in Sheets

Wyoming Region 3 (Albany Carbon Counties) – Hazard Mitigation Plan
Albany Workshop #3 (Local Planning Team)
July 1, 2019

First Name	Last Name	Representing	Department / Division	Email	Sign In
Nancy	?				
Susan	Adler	South of Laramie Water & Sewer District			
Carson	Anderson	Albany County Volunteer Fire Department	Garrett Fire Zone		
Harold	Babbitt	Rocky Mountain Power	Community Account Manager	harold.babbitt@pacificcorp.com	
Chad	Bade	UWPD			
Bob	Bauer	BLVFD/ACFD #1			
Paul	Beckett	City of Laramie	Public Works		
Laura	Betzold	University of Wyoming	UW Risk Management & Safety		
Aimee	Binning	Albany County	Homeland Security Emergency Manag	ema@co.albany.wy.us	
Bre	Bockstahler	US EPA Region 8	Emergency Preparedness Unit	bockstahler.breann@epa.gov	
Neal	Bowers	BLVFD/ACFD #1			
Bill	Brinegar	Wyoming Game & Fish	Enforcement	bill.brinegar@wyo.gov	
Rebecca	Broussard	US EPA Region 8	Emergency Preparedness Unit	broussard.rebecca@epa.gov	
Malea	Brown	City of Laramie	Administrative Services	mbrown@cityoflaramie.org	
Kim	Buckner	valley View Drive Community Improvement & Servic			
Jessica	Buenger	Veterinarians	Animal Health Center		
Dennis	Carpenter	US Bureau of Land Management	Rawlins Field Office	rawlins_wymail@blm.com	
Eric	Clark	Town of Rock River	Town Public Works	rockrivertownmaintenance@union-tel.com	
Harold	Colby	Albany County	Homeland Security Emergency Manag	albanyema2@gmail.com	
Info	Contact	Black Hills Power Gas	Distribution		
Info	Contact	Black Hills Power Gas	Transmission		
Ronald	Copenhaver	Centennial Water & Sewer District			
Graham	Crews	Walden, Town of	Gas Line		
Jim	Crosby	Laramie County Community College Albany Co. Cam	Campus Security	jcrosby@lccc.wy.edu	
Martin	Curry	LRCD			
Madeline	Dalrymple	Wyoming State Vet Lab	Risk & Safety Office	dalrymple@uwyo.edu	
John	Davis	University of Wyoming	UW Operations Physical Plant	jdavis71@uwyo.edu	

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Wyoming Region 3 (Albany Carbon Counties) – Hazard Mitigation Plan
Albany Workshop #3 (Local Planning Team)
July 1, 2019

First Name	Last Name	Representing	Department / Division	Email	Sign In
Scott	Davis	Volunteer	EOC		
Mike	Davis	BLVFD/ACFD #1			
Josh	DeBree	Albany County	Sheriff	jdebree@co.albany.wy.us	
Tom	DeHoff	Wyoming Dept. of Transportation	Engineering	tom.dehoff@dot.state.wy.us	
Chad	Dinges	Albany County	Fire Warden	cdinges@co.albany.wy.us	
Mark	Doyle	City of Laramie	Fire Department / EMS	mdoyle@cityoflaramie.org	
Lee	Erickson	Wold Improvement & Service District	MX Team		
Jon	Essley	Albany County Fire District	Tie Siding VFD	tiesidingvfd@hotmail.com	Jon Essley
Rhen	Etzelmiller	US Bureau of Land Management	Casper Field Office	casper_wymail@blm.gov	
Dr Dave	Evertson	Wyoming State Veterinary & Live Stock Board		dave.evertson@wyo.gov	
Todd	Feezer	City of Laramie	Parks and Recreation	tfeezer@cityoflaramie.org	
Bob	Fenton	Rockies Express Pipeline		bob.fenton@tallgrassenergyllp.com	
Rob	Fisher	Albany County	Road and Bridge	jfisher@co.albany.wy.us	
Tye	Fix	Wyoming Dept. of Transportation	Highway Maintenance	tye.fix@dot.state.wy.us	
Jerome	Flores	Sinclair Pipeline		jflores@sinclairoil.com	
Alan	Frank	Albany County	GIS	afrank@co.albany.wy.us	
Hayden	Fuchs	Pete Lein & Sons			
David	Gertsch	Albany County	Planning Office	dgertsch@co.albany.wy.us	
Melinda	Gibson				
Crystal	Gill	Veterinarians	Gem City Veterinarian Services		
Tom	Glause	Wyoming Insurance Commission			
Jackie	Gonzales				
Pete	Gossar	Downtown Clinic			
Eric	Gregory	Albany County Fire District	Finance	ericcpc@yahoo.com	
Jake	Hammer	Union Pacific Railroad	Hazmat		
Stephan	Hartley	Sinclair Pipeline	Cheyenne Area	shartley@sinclairoil.com	
Paul	Heimer	United Way		pheimer@unitedwayalbanycounty.org	

Wyoming Region 3 (Albany Carbon Counties) – Hazard Mitigation Plan
Albany Workshop #3 (Local Planning Team)
July 1, 2019

First Name	Last Name	Representing	Department / Division	Email	Sign In
Tony	Hoch	Laramie Rivers Conservation District	Staff	tony.hoch@lrcd.net	
Wanda	Hulit	Ivinson Memorial Hospital	Emergency Preparedness	wandah@ivinsonhospital.org	
Sheryl	Hunter	US Department of Agriculture	Farm Services Agency	sheryl.hunter@wy.usda.gov	
Brent	Huston	US Department of Homeland Security	FEMA	michael.houston@fema.dhs.gov	
Eric	Jaap	City of Laramie	City Engineer	ejaap@cityoflaramie.org	
Daryl	Jensen	Sherman Hill Road Improvement & Special District			
Dan	Johnson	City of Laramie	Fire Department / EMS	djohnson@cityoflaramie.org	
Shane	Johnson	City of Laramie	Public Works	shane.johnson@cityoflaramie.org	
Teri	Jones	Albany County	Commissioners	btjones@wyoming.com	
Tom	Kern	Albany County Fire District	Centennial VFD	kerntat@carbonpower.net	
Andrea	Kern	Epson Center for Seniors	Management		
Rick	King	Wyoming Game & Fish	Management	richard.kin@wyo.gov	
John	Roger	Veterinarians	Laramie Peak Veterinary Associates	vets@wyoming.com	
Will	Laegreid	Wyoming State Vet Lab		wlaegrei@uwyo.edu	
Cathy	Leslie	Town of Rock River	Town Council		
Jeremy	Lewis	Williams Pipeline	Overland Pass Pipeline	jeremie.lewis@williams.com	
John	Longo	ACPH			
Dan	McGregor	Seven Mile Water & Sewer District			
Brian	McNutt	ARES/RACES	State ARES		
Steven	Morgan	LPD/LARC			
Chuck	Muller	WY DOT	Maintenance		
Paul	Naylon	Union Pacific Railroad	Local Contact	pnaylon@up.com	
Roger	Newkirk	Wyoming State Veterinary & Live Stock Board	Brand Inspection		
Richard	Parrish	Albany County Fire District	Big Laramie VFD	richard@sfaw.org	
Richard	Parrish	BLVFD/ACFD #1			
Belinda	Power	Walden Gas		pwerbel@yahoo.com	
Belinda	Power	Walden Gas	Response		

Wyoming Region 3 (Albany Carbon Counties) – Hazard Mitigation Plan
Albany Workshop #3 (Local Planning Team)
July 1, 2019

First Name	Last Name	Representing	Department / Division	Email	Sign In
Ralph	Tarango	Wyoming Dept. of Transportation	Highway Maintenance	tim.mcgary@dot.state.wy.us	
Chris	Van Aken	Albany County	Planning		
Cal	Van Zee	City of Laramie	Public Works	cvanzee@cityoflaramie.org	
Mike	Vercauteren	Interfaith Good Samaritan		director@laramieinterfaith.org	
Brett	Wadsworth	Albany County Fire District	Vedauwoo Volunteer Fire Department	vvfd2013@gmail.com	
Judith	Wagner	Rainbow Valley Special Road District		rvsrd@carbonpower.net	
Britney	Wallesch	Black Dog Animal Rescue			
David	Walrath	Sage Drive Community Improvement & Service Distr			
Lindsey	Wheat	Albany County	Weed & Pest		
Joe	Whitely	Army National Guard			
Casey	Whitman	Cheyenne Board of Public Utilities			
Dylan	Whitmer	Albany County Fire District	Central Area	dwhitmer.acfd1.central@outlook.com	
Randy	Wilkinson	Albany County School District	Transportation and Facilities	r.wilkinson@acsd1.org	
James	Wilkinson	ARES/RACES			
John	Wilson	Albany County Volunteer Fire Department	Sybille Fire Zone		
Joseph	Witt	BLVFD/ACFD #1			
Mary	Wood	Albany County	Extension Office	mwood@uwyo.edu	
Tal	Wright	Albany County	Grants Department	tlwright@co.albany.wy.us	

7.3. Carbon County

Figure 7-8 Carbon County Local Planning Team Kickoff Workshop Agenda

CDR MAGUIRE
EMERGENCY MANAGEMENT

Wyoming Region 3 (Albany & Carbon Counties) – Hazard Mitigation Plan
Carbon Kick-Off Workshop (Local Planning Team)

When: 9:00-11:00 MST – January 17, 2019

Where: Fire Station 2, 501 E State, Rawlins | Webinar (https://cdrmaguire.zoom.us/j/992121157) – Conference Call (US: +1 669 900 6833 or +1 408 638 0968 \ **Meeting ID: 992 121 157**)

Invitees: See meeting sign-in sheet

Agenda:

1. Welcome & Introductions
2. Hazard Mitigation Planning Overview
3. Project Overview
4. Local Planning Team
5. Participation Standards
6. Current Plan Review
7. Hazards
8. Public Involvement Strategy
9. Data Request
10. Mitigation Strategy Overview
11. Next Steps
12. Action Items
13. Future Asks
14. Questions / Concerns / Other Topics

Post Meeting Action Items for the Local Planning Team:

A. Suggestions for additional planning team members
B. Identify and relay any relevant data or contacts applicable to this plan
C. Begin local coordination / discussions *(Municipality / Agency / Organizational Leads)*
   a. Summary of project
   b. Mitigation Actions
   c. Plan integration opportunities
D. Public Involvement Strategy
   a. Request any public involvement material needs
   b. Provide your thoughts on your community's specific strategy *(Municipality / Agency / Organizational Leads)*
   c. Request any public involvement support needs *(Municipality / Agency / Organizational Leads)*

Questions, Comments, Concerns? – Contact project manager Mike Garner at any point throughout the planning process: 303.710.9498 | Michael.Garner@CDRMaguire.com

WYOMING REGION 3 - HAZARD MITIGATION PLAN 2019 Page | 1

Figure 7-9 Carbon County Local Planning Team Kickoff Workshop Sign-in Sheets

2019 Carbon County LEPC & Hazard Mitigation Planning Roster

Agency Contact Information

	First name	Last name	Agency	Title	Phone	Email
✓	John	Zeiger	CC Emergency Management	Emergency Manager	307-321-1514	johnzeiger@carbonwy.com
✓	Emily	Kaluzny	Carbon County Public Health	Response Coordinator	307-320-5902	emily.kaluzny@wyo.gov
✓	Bill	Jack			307-710-5490	wajack1950@gmail.com
✓	Archie	Roybal	Carbon County Sheriffs Office	Sheriff	307-320-5870	archieroybal@carbonwy.com
✓	Amanda	Brown	Carbon County Public Health	Nurse Manager	307-328-2607	amanda.brown@wyo.gov
	Jim	Piche	Carbon County	Buildings Manager	307-321-0363	jimpiche@carbonwy.com
✓	Jackie	Wells	State of Wyoming	Regional Nurse Supervisor	307-321-3480	jacquelin.wells@wyo.gov – Jackie – City of Rawlins
✓	Sally	Patton	Carbon County Prevention Network	Prevention Specialist	307 321-1093	sally.patton1955@gmail.com
	Rick	Hooper	Rawlins Police Department			rhooper@rawlins-wyoming.com
	Toni	Rietveld	Carbon County Public Health	Nurse		toni.rietveld@wyo.gov
✓	Brittany	Nyman	Carbon County Coroners Office	Deputy Coroner	570 419 5512	brittanynyman@carbonwy.com
	Paul	Zamora	Carbon County Coroners Office	Coroner		paulzamora@carbonwy.com
	Kaleigh	Good	Central Wyoming Healthcare Coalition	Regional Director		kaleigh.good@wyo.gov
✓	John	Rutherford	Carbon County Fire Department	Fire Warden	307-320-7964	Johnrutherford@carbonwy.com
	Ashley	Mayfield	Carbon County Attorneys Office	County Attorney		ashleymayfield@carbonwy.com
	Bill	Nation	Carbon County Road & Bridge			billnation@carbonwy.com
✓	Sarah	Hutchins	CCPDD	Planner/GIS	307-328-2752	sarahhutchins@carbonwy.com
✓	Melisa	Sikes	South Central Wyoming	Director	307-710-7559	msikes526@gmail.com
	Brian	Lally				
	William	Ryan				
	Pam	Paulson				
✓	Travis	Moore	CCSD#1/Commission	Principal/Commissioner		tmoore@ccsd1.net
	Duane	Shillinger				
	Shawn	Kelley				
	Patrick	Vining				
	Bob	Clark	Sinclair Oil			bclark@sinclairoil.com

	RJ	Griffiths	Sinclair Oil			rgriffiths@sinclairoil.com
	David	Irby				
	Lisa	Wood	Memorial Hospital of Carbon County			lwood@imhcc.com
	Heidi	Sifford				heidisifford@yahoo.com
	Gwynn	Bartlett	Carbon County Clerks Office	County Clerk		gwynnbartlett@carbonwy.com
	John	Nelson	Saratoga Town Council			jnelson@northforkeng.com
	Maggie	Really				
	Wess	Trapp	Sinclair Oil			wtrapp@sinclairoil.com
	Aaron	Zent	Rawlins Fire Department			azent@rawlins-wyoming.com
	Sidney	Fox				
	Mary	Martin				
	Valeta	Rodabaugh				rpdd1@rawlins-wyoming.com
	Judy	Christipherson				townofelkmountain@union-tel.com
	Kelly	Finn				
	Karen	Heath				
	Melinda	Gibson				
✓	Ron	Brown	Carbon County Fire Department	Deputy Warden	307-920-0804	ronbrown@carbonwy.com
	Jen	Bryant				
	Doreen	Harvey				
✓	Troy	Palmer	Rawlins Police Department	Chief of Police	307-328-4530	tpalmer@rawlins-wyoming.com
	Christina	Baugh	Memorial Hospital of Carbon County			cbaugh@imhcc.com
	Becky	Hetland				
	Sue	Jones	Carbon County	Commissioner		suejones@carbonwy.com
	Mandy	Cooper	Saratoga Care Center / Clinic	Nurse		mcooper@hmsmt.com
	Jon	Winter	Town of Saratoga	DPW - Director	326-8335	DPW@saratogawyo.org
	Elizabeth	Ridgeway	CCSD#1	School Community Liaison	321-0228	eridgeway@crbl.net
	TYLER	CHAPMAN	WHP	LT - RAWLINS	321-3567	Tyler.Chapman@wyo.gov
	Ryan	Wells	Sinclair	Emergency Mgmt	328-0111	ryanwells@sinclairoil.com
	Bob	Patton	Hanna	Town of Hanna Council	307-710-9846	bobjpatton@gmail.com
	DAN	FERRIN	TOWN OF SARATOGA	ZONING	326-8335	dan@saratogawyo.org

Figure 7-10 Carbon County Local Planning Team HIRA Workshop Agenda

CDR MAGUIRE
EMERGENCY MANAGEMENT

Wyoming Region 3 (Albany & Carbon Counties) – Hazard Mitigation Plan
Carbon Workshop #2 (Local Planning Team)

When: 9:00-11:00 MST – April 2, 2019

Where: Fire Station 2, 501 E State, Rawlins| Webinar: https://cdrmaguire.zoom.us/j/127580851 – Conference Call (US: +1 669 900 6833 or +1 408 638 0968 \ **Meeting ID: 127 580 851**)

Invitees: See meeting sign-in sheet

Agenda:

1. Welcome & Introductions
2. Hazard Mitigation Planning Review
3. Risk Assessment Summary
4. Remaining Data Requests
5. Public Involvement
6. Mitigation Strategy
7. Action Items

Post Meeting Action Items for the Local Planning Team:

- Continue local discussions relating to this project
- Begin identifying new mitigation actions
- Critical facility assessment review
- Capability assessment survey – per jurisdiction
- Historical input on communicable disease
- Public survey / involvement
- Review of Risk Assessment chapter

Questions, Comments, Concerns? – Contact project manager Mike Garner at any point throughout the planning process: 303.710.9498 | Michael.Garner@CDRMaguire.com

WYOMING REGION 3 - HAZARD MITIGATION PLAN 2019 Page | 1

CDR MAGUIRE EMERGENCY MANAGEMENT

Jurisdiction	Avalanche	Drought	Earthquake	Flood	Geologic (landslide, land	Severe Thunderstorm (hail, lightning)	Tornado	Wildland Fire	Wind / Windblown Deposits	Winter Storm / Blizzard	Communicable and Infectious Disease	Dam Failure	Hazardous Material Release	Terrorism
	Risk Rank										Key (average): < 4 = L 5 - 6 = M 7+ = H			
Albany	L	H	L	H	L	M	M	H	M	H	M	M	H	M
Laramie	L	M	M	H	L	M	M	H	M	H	M	M	H	H
Rock River	L	M	L	H	L	M	M	M	M	H	M	M	H	M
Carbon	L	H	L	H	L	M	M	H	M	H	M	M	H	M
Baggs	L	M	L	H	L	M	M	H	M	H	M	M	L	M
Dixon	L	M	L	M	L	M	M	H	M	H	M	M	L	M
Elk Mountain	L	M	L	H	L	M	M	H	M	H	M	M	H	M
Encampment	L	M	L	H	L	M	M	H	M	H	M	M	L	M
Hanna	L	M	L	H	L	M	M	M	M	H	M	M	H	M
Medicine Bow	L	M	L	H	L	M	M	M	M	H	M	M	L	M
Rawlins	L	M	L	H	L	M	M	M	M	H	M	M	H	H
Riverside	L	M	M	H	L	M	M	H	M	H	M	M	L	M
Saratoga	L	M	M	H	L	M	M	H	M	H	M	M	L	M
Sinclair	L	M	L	L	L	M	M	M	M	H	M	M	H	H

Comments:_____

Mitigation Goals:

1. Reduce the potential for injury and loss of life from natural and human-caused disasters.
2. Minimize the potential for economic losses from natural and human-caused disasters.
3. Reduce the impact of natural and human-caused disasters on critical infrastructure, communication systems, and facilities.

Figure 7-11 Carbon County Local Planning Team HIRA Workshop Sign-in Sheets

Wyoming Region 3 (Albany Carbon Counties) – Hazard Mitigation Plan
Carbon Workshop #2 (Local Planning Team)
April 2, 2019

First Name	Last Name	Representing	Title	Email	Sign In
Amy	Bach	City of Rawlins		amyback@rawlins-wyoming.com	
Byron	Barkhurst	Carbon County Board of Commissioners		byronbarkhurst@carbonwy.com	
Gwynn	Bartlett	Carbon County Clerks Office	County Clerk	gwynnbartlett@carbonwy.com	
Christina	Baugh	Memorial Hospital of Carbon County		cbaugh@imhcc.com	
Jim	Beckmann				
Patty	Bentsen	Rawlins			
Amanda	Brown	Carbon County Public Health	Nurse Manager	amanda.brown@wyo.gov	
Ron	Brown	Carbon County Fire Department	Deputy Warden	ronbrown@carbonwy.com	
Jen	Bryant				
Tyler	Chapman	WITP	LT-Rawlins	tylerchapman@wyo.gov	
Kara	Choquette	PCW/Transwest		kara.choquette@tac-denver.com	
Judy	Christipherson			townofelkmountain@union-tel.com	
Bob	Clark	Sinclair Oil		bclark@sinclairoil.com	
Mandy	Cooper	Saratoga Care Center/Clinic	Nurse	mcooper@hmsmt.com	
Dan	Ferrin	Town of Saratoga	Zoning	dan@saratogawyo.org	
Kelly	Finn				
Sidney	Fox				
Sid	Fox	Carbon County Planning		sidneyfox@carbonwy.com	
Melinda	Gibson	Wyoming Office of Homeland Security			
Kaleigh	Good	Central Wyoming Healthcare Coalition	Regional Director	kaleigh.good@wyo.gov	
RJ	Griffiths	Sinclair Oil		rgriffiths@sinclairoil.com	
Doreen	Harvey				
Karen	Heath				
Becky	Hetland				
Rick	Hooper	Rawlins Police Department		rhooper@rawlins-wyoming.com	
George	Hruska	OFTEDAL Construction		ghruska@oftedalconstruction.com	
Sarah	Hutchins	CCPDD	Planner/GIS	sarahhutchins@carbonwy.com	

Wyoming Region 3 (Albany Carbon Counties) – Hazard Mitigation Plan
Carbon Workshop #2 (Local Planning Team)
April 2, 2019

First Name	Last Name	Representing	Title	Email	Sign In
David	Irby				
Morgan	Irene	Elk Mountain		elkmountainmayor@gmail.com	
Bill	Jack			wajack1950@gmail.com	
Ranae	Johnston	Carbon County Public Health			
Sue	Jones	Carbon County	Commissioner	suejones@carbonwy.com	
Emily	Kaluzny	Carbon County Public Health	Response Coordinator	emily.kaluzny@wyo.gov	
Shawn	Kelley				
Brian	Lally				
Mary	Martin				
J	Mathews				
Debbi	Matthews	Rawlins			
Ashley	Mayfield	Carbon County Attorneys Office	County Attorney	ashleymayfield@carbonwy.com	
Asa	Meeks	Sinclair		papameeks66@gmail.com	
Travis	Moore	CCSD #1/Commission	Principal/Commissioner	tmoore@crb1.net	
Travis	Moore	Carbon County		travismoore@carbonwy.com	
Bill	Nation	Carbon County Road and Bridge		billnation@carbonwy.com	
John	Nelson	Saratoga Town Council		jnelson@northforkeng.com	
Steve	Nicholson	Rawlins		snicholson@rawlins-wyoming.com	
Brittany	Nyman	Carbon County Coroners Office	Deputy Coroner	brittanynyman@carbonwy.com	
Troy	Palmer	Rawlins Police Department	Chief of Police	tpalmer@rawlins-wyoming.com	
Joe	Parsons	SER CD		joe.serd@gmail.com	
Sally	Patton	Carbon County Prevention Network	Prevention Specialist	sally.patton1955@gmail.com	
Bob	Patton	Hanna	Town of Hanna	bob1patton@gmail.com	
Robert	Patton	Town of Hanna		bob1patton@gmail.com	
Pam	Paulson				
Jim	Piche	Carbon County	Buildings Manager	jimpiche@carbonwy.com	
Maggie	Really				

Wyoming Region 3 (Albany Carbon Counties) – Hazard Mitigation Plan
Carbon Workshop #2 (Local Planning Team)
April 2, 2019

First Name	Last Name	Representing	Title	Email	Sign In
Elizabeth	Ridgeway	CCSD #1	School Community Liason	eridgeway@crbl.net	
Toni	Rietveld	Carbon County Public Health	Nurse	toni.rietveld@wyo.gov	Toni Rietveld
Valeta	Rodabaugh			rpdd1@rawlins-wyoming.com	
Archie	Roybal	Carbon County Sherrifs Office	Sheriff	archieroybal@carbonwy.com	
John	Rutherford	Carbon County Fire Department	Fire Warden	johnrutherford@carbonwy.com	
William	Ryan				
Duane	Shillinger				
Heidi	Sifford			heidisifford@yahoo.com	
Melisa	Sikes	South Central Wyoming	Director	msikes26@gmail.com	
Wess	Trapp	Sinclair Oil		wtrapp@sinclairoil.com	
Patrick	Vining				
Jackie	Wells	State of Wyoming	Regional Nurse Supervisor	jacquelin.wells@wyo.gov	
Ryan	Wells	Sinclair Oil	Emergency Manager	ryanwells@sinclairoil.com	
Jacquelin	Wells	City of Rawlins		jrwells@rawlins-wyoming.com	
Jon	Winter	Town of Saratoga	DPW - Director	DPW@saratogawyo.org	
Lisa	Wood	Memorial Hospital of Carbon County		lwood@imhcc.com	
Paul	Zamora	Carbon County Coroners Office	Coroner	paulzamora@carbonwy.com	
John	Zeiger	CC Emergency Management	Emergency Manager	johnzeiger@carbonwy.com	John Zeiger
Aaron	Zent	Rawlins Fire Department		azent@rawlins-wyoming.com	
Daniel	Starr	MHCC EMS	Supervisor	dstarr@imhcc.com	
Sally	Patton	CC Prevention	~~RRT-3~~	~~arobinson@rawlins~~	Sally Patton
Allen	Robinson	RRT-3 - Rawlins Fire Dept	Captain	~~-wyoming.com~~ arobinson@rawlins-wyoming.com	

Wyoming Region 3 (Albany Carbon Counties) – Hazard Mitigation Plan
Albany Workshop #3 (Local Planning Team)
July 1, 2019

First Name	Last Name	Representing	Department / Division	Email	Sign In
Marian	Erdelyi	ACCWA		erdelyi@wyomail.com	
Martin	Greller	ACCWA.			
David	Bennett	ACSD #1			
Harold	Colby	EMA			
Rick	Strickling	RRVFD Town of Rock River		[illegible]	
Sylvia	Baghouras	ACCWA		silverforestfox@gmail.com	
Nancy	Sindelar	ACCWA		Sindynan@Juno.com	
Jamie	Esgar	ACCWA			
Jordan	Achs	Laramie Boomerang		jachse laramieboomerang.com	
Mike	Simmons	WHP		michael.simmons@wyo.gov	
Aimee	Banning	EMA		abanning@co.albany.wy.us	
Allison	Brannemann	EMA		abrannemann@co.albany.wy.us	
Ralph	Tarango	WYDOT		ralph.tarango@wyo.gov	

Figure 7-12 Carbon County Local Planning Team Mitigation Strategy Workshop Agenda

CDR MAGUIRE
EMERGENCY MANAGEMENT

Wyoming Region 3 (Albany & Carbon Counties) – Hazard Mitigation Plan

Carbon Mitigation Strategy Workshop (Local Planning Team)

When: 11:30-1:30 MST – July 2, 2019

Where: Fire Station 2, 501 E State, Rawlins | Webinar: https://cdrmaguire.zoom.us/j/402713853 – Conference Call (US: +1 669 900 6833 or +1 408 638 0968 \ **Meeting ID: 402 713 853**)

Invitees: See meeting sign-in sheet

Agenda:

1. Welcome & Introductions
2. Project Overview
3. 2015 Mitigation Action / Project Review
4. Plan Maintenance / Implementation
5. Plan Integration
6. Mitigation Strategy – Goals & Objectives
7. Mitigation Strategy Inputs
8. Mitigation Strategy – New Actions / Projects
9. Remaining Public Involvement
10. Plan Adoptees

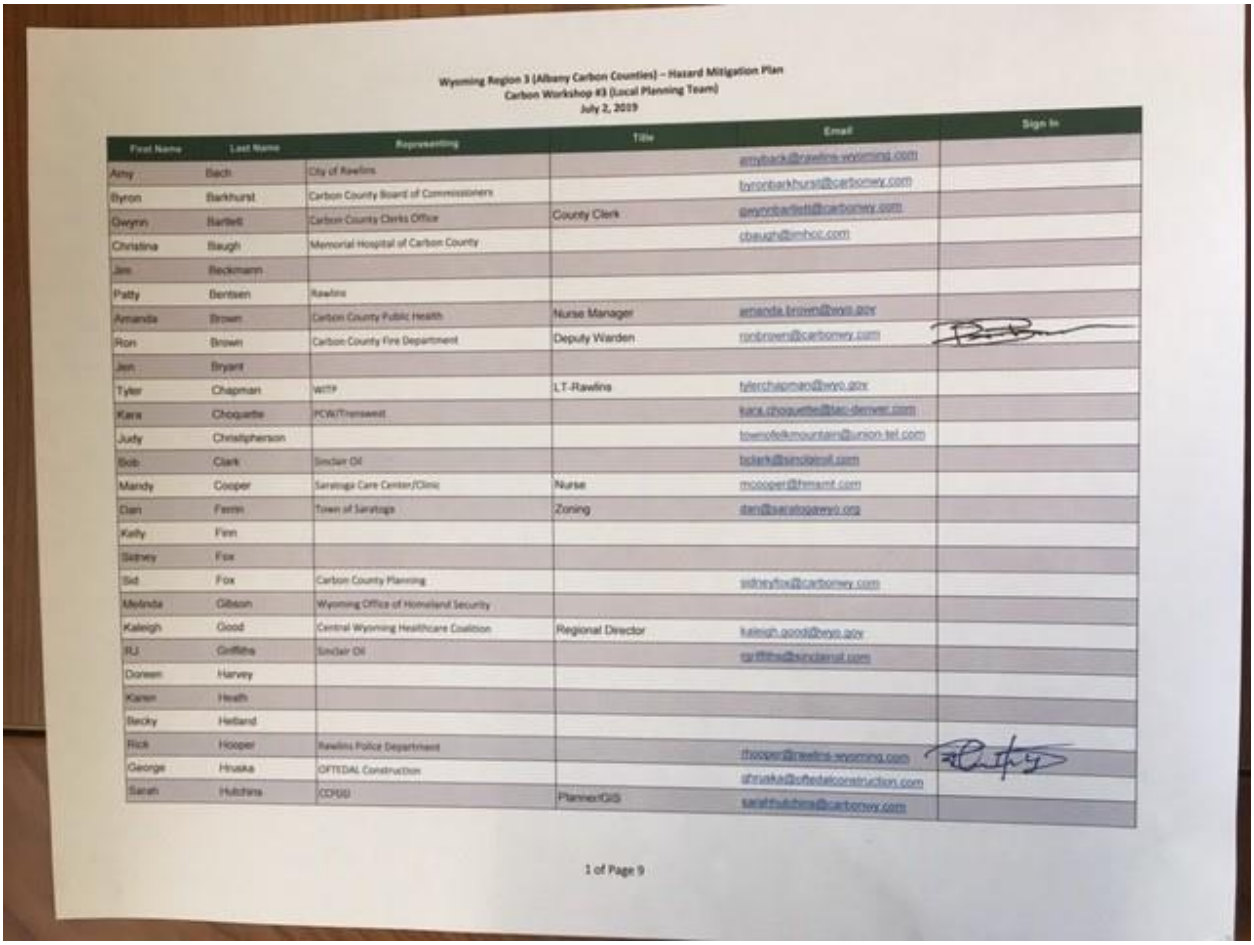
Post Meeting Action Items for the Local Planning Team:

- Finalize new Mitigation Actions / Projects
- Review draft updated Plan
- Public Review and Comment

Questions, Comments, Concerns? – Contact project manager Mike Garner at any point throughout the planning process: 303.710.9498 | Michael.Garner@CDRMaguire.com

WYOMING REGION 3 - HAZARD MITIGATION PLAN 2019 Page | 1

Figure 7-13 Carbon County Local Planning Team Mitigation Strategy Workshop Sign-in Sheets



Wyoming Region 3 (Albany Carbon Counties) – Hazard Mitigation Plan
Carbon Workshop #3 (Local Planning Team)
July 2, 2019

First Name	Last Name	Representing	Title	Email	Sign In
Amy	Bach	City of Rawlins		amyback@rawlins-wyoming.com	
Byron	Barkhurst	Carbon County Board of Commissioners		byronbarkhurst@carbonwy.com	
Gwynn	Bartlett	Carbon County Clerks Office	County Clerk	gwynnbartlett@carbonwy.com	
Christina	Baugh	Memorial Hospital of Carbon County		cbaugh@mhcc.com	
Jim	Beckmann				
Patty	Bentsen	Rawlins			
Amanda	Brown	Carbon County Public Health	Nurse Manager	amanda.brown@wyo.gov	
Ron	Brown	Carbon County Fire Department	Deputy Warden	ronbrown@carbonwy.com	
Jon	Bryant				
Tyler	Chapman	WTP	LT-Rawlins	tylerchapman@wyo.gov	
Kara	Choquette	PCW/Transwest		kara.choquette@tac-denver.com	
Judy	Christiphenson			townofelkmountain@union-tel.com	
Bob	Clark	Sinclair Oil		bclark@sinclairoil.com	
Mandy	Cooper	Saratoga Care Center/Clinic	Nurse	mcooper@hmsmt.com	
Dan	Ferrin	Town of Saratoga	Zoning	dan@saratogawyo.org	
Kelly	Finn				
Sidney	Fox				
Sid	Fox	Carbon County Planning		sidneyfox@carbonwy.com	
Melinda	Gibson	Wyoming Office of Homeland Security			
Kaleigh	Good	Central Wyoming Healthcare Coalition	Regional Director	kaleigh.good@wyo.gov	
RJ	Griffiths	Sinclair Oil		rgriffiths@sinclairoil.com	
Doreen	Harvey				
Karen	Heath				
Becky	Hetland				
Rick	Hooper	Rawlins Police Department		rhooper@rawlins-wyoming.com	
George	Hruska	OFTEDAL Construction		ghruska@oftedalconstruction.com	
Sarah	Hutchins	CCGIS	Planner/GIS	sarahhutchins@carbonwy.com	

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Wyoming Region 3 (Albany Carbon Counties) – Hazard Mitigation Plan
Carbon Workshop #3 (Local Planning Team)
July 2, 2019

First Name	Last Name	Representing	Title	Email	Sign In
David	Irby				
Morgan	Irene	Elk Mountain		elkmountainmayor@gmail.com	
Bill	Jack			wsjack1950@gmail.com	
Renee	Johnston	Carbon County Public Health			
Sue	Jones	Carbon County	Commissioner	suejones@carbonwy.com	
Emily	Kaluzny	Carbon County Public Health	Response Coordinator	emily.kaluzny@wdh.gov	
Shawn	Kelley				
Brian	Lally				
Mary	Martin				
J	Mathews				
Debbi	Matthews	Rawlins			
Ashley	Mayfield	Carbon County Attorneys Office	County Attorney	ashleymayfield@carbonwy.com	
Asa	Meeks	Sinclair		pacameeks06@gmail.com	
Travis	Moore	CCID #1/Commission	Principal/Commissioner	tmoore@ccid1.net	
Travis	Moore	Carbon County		travismoore@carbonwy.com	
Bill	Nation	Carbon County Road and Bridge		billnation@carbonwy.com	
John	Nelson	Saratoga Town Council		jnelson@northforkeng.com	
Steve	Nicholson	Rawlins		snicholson@rawlins-wyoming.com	
Brittany	Nyman	Carbon County Coroners Office	Deputy Coroner	brittanynyman@carbonwy.com	
Troy	Palmer	Rawlins Police Department	Chief of Police	tpalmer@rawlins-wyoming.com	
Joe	Parsons	SER CD			
Sally	Patton	Carbon County Prevention Network	Prevention Specialist	sally.patton1955@gmail.com	
Bob	Patton	Hanna	Town of Hanna	bob1patton@gmail.com	
Robert	Patton	Town of Hanna		bob1patton@gmail.com	
Pam	Paulson				
Jim	Piche	Carbon County	Buildings Manager	jmpiche@carbonwy.com	
Maggie	Realy				

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Wyoming Region 3 (Albany Carbon Counties) – Hazard Mitigation Plan
Carbon Workshop #3 (Local Planning Team)
July 2, 2019

First Name	Last Name	Representing	Title	Email	Sign In
Elizabeth	Ridgeway	CCSD #1	School Community Liason	endgeway@orbl.net	
Toni	Rietveld	Carbon County Public Health	Nurse	toni.rietveld@wyo.gov	
Valeta	Rodabaugh			rpdd1@rawlins-wyoming.com	
Archie	Roybal	Carbon County Sherrifs Office	Sheriff	archerroybal@carbonwy.com	
John	Rutherford	Carbon County Fire Department	Fire Warden	johnrutherford@carbonwy.com	John R. Rutherford
William	Ryan				
Duane	Snillinger			hedisifford@yahoo.com	
Heidi	Sifford		Director	msikes26@gmail.com	
Melisa	Sikes	South Central Wyoming		wrapp@sinclairoil.com	
Wess	Trapp	Sinclair Oil			
Patrick	Vining		Regional Nurse Supervisor	jacquelin.wells@wyo.gov	
Jackie	Wells	State of Wyoming	Emergency Manager	ryanwells@sinclairoil.com	
Ryan	Wells	Sinclair Oil		jowells@rawlins-wyoming.com	
Jacquelin	Wells	City of Rawlins	DPW - Director	DPW@saratogawyo.org	
Jon	Winter	Town of Saratoga		lwood@mhcc.com	
Lisa	Wood	Memorial Hospital of Carbon County	Coroner	paulzamora@carbonwy.com	
Paul	Zamora	Carbon County Coroners Office	Emergency Manager	johnzeiger@carbonwy.com	
John	Zeiger	CC Emergency Management		aprril@rawlins-wyoming.com	
Aaron	Zent	Rawlins Fire Department			
Daniel	Stern	MHCC	EMS Supervisor	dstern@mhcc.com	
Allen	Robinson	Rawlins Fire / RRT-3	Battalion chief	arobinson@rawlins-wyoming.com	

Wyoming Region 3 (Albany Carbon Counties) – Hazard Mitigation Plan
Carbon Workshop #3 (Local Planning Team)
July 2, 2019

First Name	Last Name	Representing	Title	Email	Sign In
Emily	Kalnzny	Public Health	PHRC	emily.kalnzny@wyo.gov	
Stephanie	Parrish	Saratoga Care Center	DON	sparrish@hmsmt.com	Sparrish
Mandy	Cooper	SCC/PVC	RN	mcooper@hmsmt.com	MCooper

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Wyoming Region 3 (Albany Carbon Counties) – Hazard Mitigation Plan
Carbon Workshop #3 (Local Planning Team)
July 2, 2019

First Name	Last Name	Representing	Title	Email	Sign In
DOREEN	HARVEY	ENCAMPMENT			X
KAREN	HEATH	MEDICINE BOW			X
MORGAN	IRENE	ELK MOUNTAIN			X

Scanned by CamScanner

8. Appendix B: Public Involvement

8.1. Albany County Public Involvement Plan (PIP)

Figure 8-1 Albany County PIP

CDR MAGUIRE
EMERGENCY MANAGEMENT

Wyoming Region 3 (Albany & Carbon Counties) – Hazard Mitigation Plan
Albany Public Involvement Plan

Introduction: This Public Involvement Plan (PIP) for the Region III (Albany County) Hazard Mitigation Plan (HMP) outlines the approach to engage communities and stakeholders. As the planning process and plan are guided by public and stakeholder input and the Local Planning Team (LPT), this document provides direction for engagement activities, tools, and schedule.

This engagement plan outlines the public outreach goals, activities, venues, and County / LPT / CDR Maguire team responsibilities that seek to keep citizens informed throughout the planning process, gather feedback at critical points, and create local champions. Every effort will be made to encourage meaningful public involvement throughout the process by involving interested parties early, frequently, and effectively.

Objectives: Outreach efforts are critical to the development of a successful Mitigation Strategy, formulated as part of this HMP project. Our team will focus on creating a community-supported strategy, clearly defining the problems the HMP is trying to solve, and methodically identifying the range of potential solutions and tradeoffs so that informed decisions can be made. The process will:

- Ensure the public has an opportunity to shape the planning for the community and the goals for the future.
- Foster collaboration among local and regional agencies, organizations, and stakeholders.
- Utilize multiple mediums for outreach to engage the greatest possible range of participants and perspectives, including those who have been previously under-represented.
- Create an opportunity for smaller communities and districts to have a vision for their individual communities.
- Strengthen a foundation for ongoing dialogue, collaborative learning and planning for communities.

Tools: A broad range of techniques, events, and tools can be used to engage, inform, and educate members of the public, stakeholders, and community leaders. Options to consider will be based on each community's input and can include:

- LPT meetings
- Social media
- Website
- Surveys
- Newspaper / Radio / TV
- Utility bill insert
- Public postings
- Schools
- Community groups
- Other public events
- Project specific events
- Other?

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Stakeholder Involvement: Ultimately, each community understands how best to involve their residents, businesses, and organizations. Table 1 outlines those specific tools to be utilized as part of this HMP project. CDR | Maguire will develop any necessary content for these activities and will share with the LPT.

Table 1 – Community Project Involvement Tools

Tool	Contact	Phone	Email / Web	Type
Example	*Public event, community, social media, online, radio, utility bill insert, flyers, mailers, newsletter, email list, etc*			
Laramie Boomerang	Joel Funk	307-755-3328	news@laramieboomerang.com https://www.laramieboomerang.com/news/	Online / Print Media
Laramie Live	Ben Kuhns	605-941-3073	ben.kuhns@townsquaremedia.com http://laramielive.com/	Online / Radio Media
Wold Tract Community &friends	Deb Raben	307-532-6526	debraben@wyomail.com	Social Media
Wold Tract Community &friends	Julie Kokes	970-580-8108	kjkokes@gmail.com	Social Media
Foxpark WY	Ana Brandt	307-745-3258	foxparkana@gmail.com	Social Media
Woods Landing Resort	Bill Sheehan	307-742-2643	N/A	Social Media
WyColo Lodge	Gill or Sierra	307-745-3098	N/A	Social Media
Albany Lodge	David	307-745-5782	david@albanylodge.com	Social Media
Snowy Range Snowmoblie Club	Heather Tupper	307-760-6462	heathnic16@hotmail.com	Social Media
University of Wyoming	Chad Baldwin	307-766-2929	cbaldwin@uwyo.edu http://www.uwyo.edu/uw/people/	Community (educational)
This Is Laramie	Nid Collins	307-460-1598	thisislaramie@gmail.com	Social Media
Laramie County Community College	Talisha Mottinger	307-772-4521	tmottinger@lccc.wy.edu www.lccc.wy.edu/contact/index.aspx	Community (educational)
Downtown Laramie	N/A	N/A	downtownlaramie@gmail.com	Social Media
Albany County School District #1	Randy Wilkinson	307-721-4470	Rwilkinson@acsd1.org https://www.acsd1.org/acsd/	Community (educational)
PSAP	Steve Morgan	307-721-5376	smorgan@cityoflaramie.org	Community (government - EM)
City of Laramie	Shawn Garcia	307-760-7979	sgarcia@cityoflaramie.org	Community (municipality)
Hits 106	Shawn Faxon	307-742-2379	shawn@myhits106.com	Online / Radio

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			www.myhits106.com	Media
League of Women Voters of Laramie	Judy Knight	307-760-7427	Je.judy@gmail.com	Community (social)
Town of Rock River	Andrea Lamb	307-460-8752	rrclerk@mwtn.net	Social Media / Print Media / Community (municipality)
Town of Rock River	Rick Water	307-460-8752	rrwater@mwtn.net	Social Media / Print Media / Community (municipality)
State OHS Website	PIO			Social Media
State OHS Facebook	PIO			Social Media

Schedule: Aligning stakeholder involvement activities to the overall project schedule and major milestones will allow relevant content to be disseminated in a timely manner. Table 2 on the following page will serve as the outline for future project involvement activities. CDR | Maguire will develop any necessary content for these activities and will share with the LPT.

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Table 2 - Project Involvement Activities and Schedule

Activity	January	February	March	April	May	June	July	Fall
LPT Kick-off Workshop	x							
Initial Public Information Messaging		x						
LPT Risk Assessment (RA) Workshop				x				
RA Public Engagement Survey			x					
RA Public Education Messaging				x				
Mitigation Strategy Public Engagement Survey					x			
LPT Mitigation Strategy Workshop						x		
Draft Plan Public Information Messaging							x	
Final Plan Public Information Messaging								x
Community Tools	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**Fall**
Online / Print Media		x	x		x		x	x
Online / Radio Media		x	x		x		x	x
Social Media		x	x		x		x	x
Community		x	x		x		x	x

8.2. Carbon County Public Involvement Plan (PIP)

Figure 8-2 Carbon County PIP

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Wyoming Region 3 (Albany & Carbon Counties) – Hazard Mitigation Plan
Carbon Public Involvement Plan

Introduction: This Public Involvement Plan (PIP) for the Region III (Carbon County) Hazard Mitigation Plan (HMP) outlines the approach to engage communities and stakeholders. As the planning process and plan are guided by public and stakeholder input and the Local Planning Team (LPT), this document provides direction for engagement activities, tools, and schedule.

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- LPT meetings
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Stakeholder Involvement: Ultimately, each community understands how best to involve their residents, businesses, and organizations. Table 1 outlines those specific tools to be utilized as part of this HMP project. Please indicate which tools are appropriate for your community in the table below (see Carbon County example row). CDR | Maguire will develop any necessary content for these activities and will share with the LPT.

Table 1 – Community Project Involvement Tools

Municipality / District:	Tool (and Point of Contact)
Example	*Public event, community, social media, online, radio, utility bill insert, flyers, mailers, newsletter, email list, etc*
Rawlins Daily Times Newspaper/Website	Office Manager - Julia Sabo - jsabo@rawlinstimes.com (307) 324-3411
Saratoga Sun Newspaper/Website	Keith McLendon - Publisher/Editor/Graphics&Layout - editor@union-tel.com (307) 326-8311
Bigfoot99 – KTGA 99.3 FM	Jim O'Reilly (307) 326-8642
Rawlins News & Chatter Facebook Social Media Page	Closed Group Social Media Page for local information sharing
Saratoga People Helping People Facebook Social Media Page	Closed Group Social Media Page for local information sharing
Platte Valley Chamber of Commerce	Stacy Crimmins - (307) 326-8855 director@saratogachamber.info
Carbon County LEPC Facebook Page	Social Media News sharing platform
State OHS Website	PIO
State OHS Facebook	PIO

Schedule: Aligning stakeholder involvement activities to the overall project schedule and major milestones will allow relevant content to be disseminated in a timely manner. Table 2 on the following page will serve as the outline for future project involvement activities. CDR | Maguire will develop any necessary content for these activities and will share with the LPT.

CDR MAGUIRE EMERGENCY MANAGEMENT

Table 2 - Project Involvement Activities and Schedule

Activity	January	February	March	April	May	June	July	Fall
LPT Kick-off Workshop	x							
Initial Public Information Messaging		x						
LPT Risk Assessment (RA) Workshop				x				
RA Public Engagement Survey			x	x				
RA Public Education Messaging				x	x			
Mitigation Strategy Public Engagement Survey					x	x		
LPT Mitigation Strategy Workshop						x		
Draft Plan Public Information Messaging							x	
Final Plan Public Information Messaging								x
Community Tools	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**Fall**
Social media		x	x		x		x	x
Email lists		x	x		x		x	x
Online / print media		x	x		x		x	x

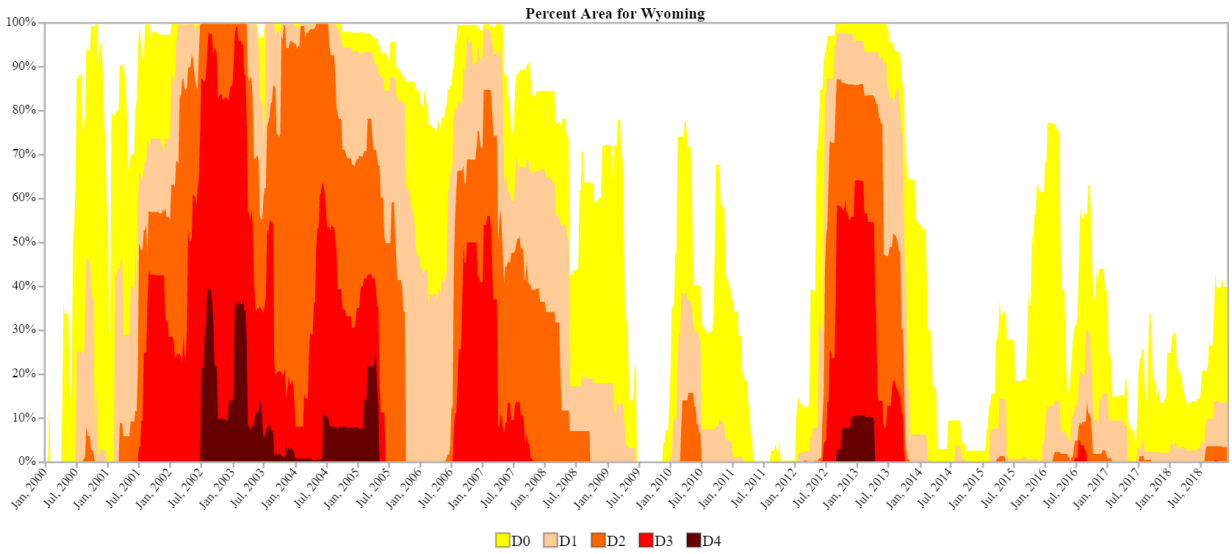
9. Appendix C: HIRA Appendix

9.1. Drought

9.1.1. Previous Occurrences

According to the U.S. Drought Monitor, since 2000, the longest duration of drought (D1-D4) in Wyoming lasted 435 weeks beginning on February 13, 2001 and ending on June 9, 2009. The most intense period of drought occurred the week of August 6, 2002 where D4 affected 39.72% of Wyoming land (Figure 9-1).

Figure 9-1 Drought in Wyoming since 2000[92]



The 2014 Wyoming Hazard Mitigation Plan notes several statewide droughts prior to 2000 that would include Region 3. These include the 1930s which mark the Dust Bowl Era and the 1950s which mark the Great 50s Drought. Droughts lasting multiple years that impact the entire state are listed in Table 9-1 below.

Table 9-1 Wyoming Multi-Year Statewide Droughts[93]

Period	Average Annual Precipitation (inches)	Percent of 1895 – 2006 Average Annual Precipitation (13.04”)
1952-1956	10.65	82%
1900-1903	10.76	83%
1987-1990	11.12	85%
1999-2004	11.07	85%

[92] https://www.drought.gov/drought/states/wyoming
[93] As reported in the 2014 Wyoming Hazard Mitigation Plan, Table 3.3.8: Recent Worst Multi-Year Statewide Drought.

Period	Average Annual Precipitation (inches)	Percent of 1895 – 2006 Average Annual Precipitation (13.04”)
1958-1964	11.67	89%
1931-1936	11.79	90%
1974-1977	11.77	90%

Albany County

Figure 9-2 below shows yearly precipitation averages from 1895 to 2018 for Albany County against the 1901 to 2000 mean of 15.11 inches.[94] Periods with precipitation below the averages are evident in this figure, notably 2012, which was 5.29 inches less than average; 2002, which was 5.10 inches below average; and 1939, which was 4.98 inches below average.

Figure 9-2 Albany County Yearly Precipitation Averages, 1895-2018

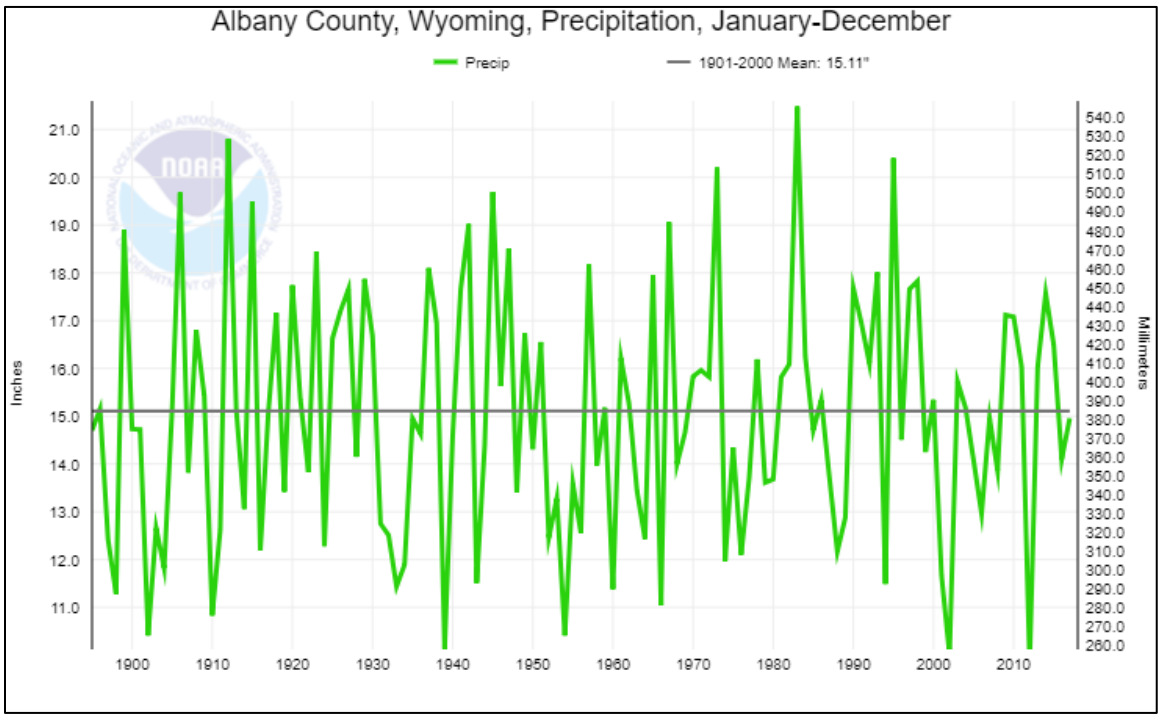
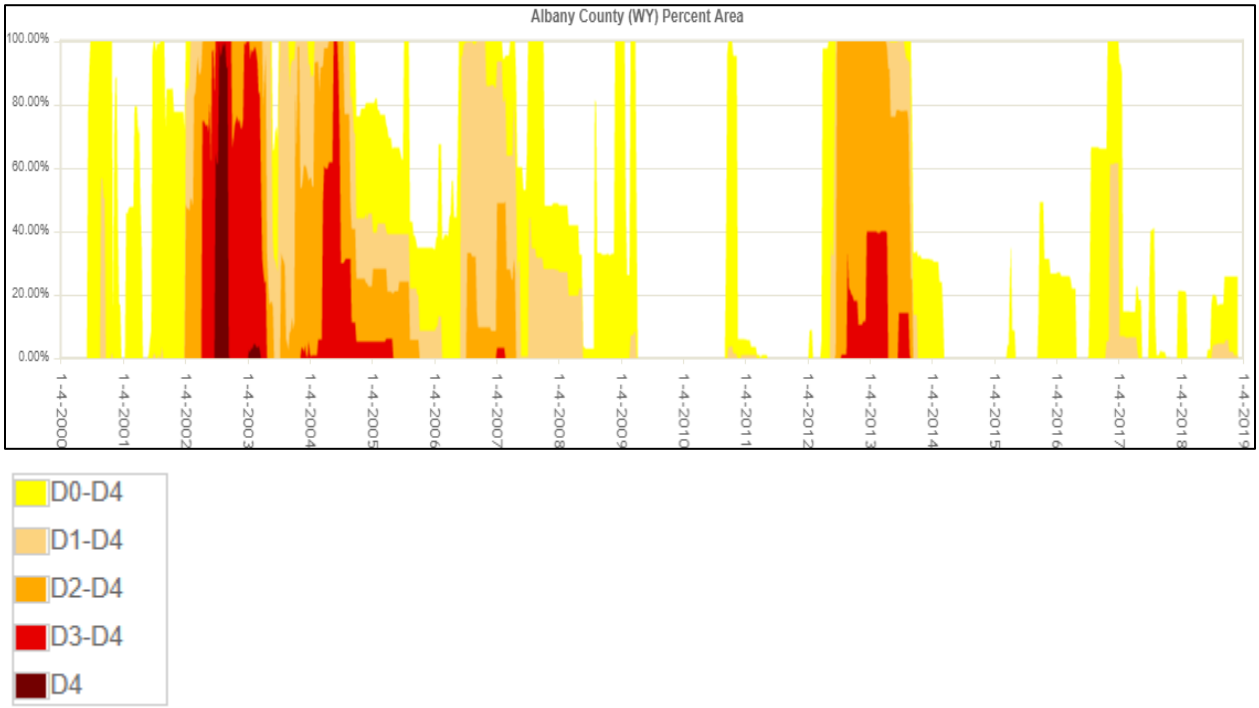


Figure 9-3 shows drought conditions from the U.S. Drought Monitor since 2000 for Albany County. Much of Albany County experienced drought conditions from approximately 2001 to 2009. Nearly 100% of the county experienced Exceptional (D4) or Extreme (D3) drought from 2002-2003. Another notable period of drought includes 2012-2014, where 100% of the county experienced some level of drought, and approximately 40% of the county experiencing Extreme drought in 2013.

[94] https://www.ncdc.noaa.gov/cag/county/time-series

Figure 9-3 U.S. Drought Monitor Conditions since 2000 in Albany County[95]



Carbon County

Figure 9-4 below shows yearly precipitation averages from 1895 to 2018 for Carbon County against the 1901 to 2000 mean of 15.98 inches.[96] Periods with precipitation below the averages are evident in this figure, notably 1902, which was 6.76 inches less than average; 2012, which was 5.71 inches below average; and 2002, which was 5.44 inches below average.

[95] https://droughtmonitor.unl.edu/Data/Timeseries.aspx
[96] https://www.ncdc.noaa.gov/cag/county/time-series

Figure 9-4 Annual Precipitation Averages from 1895 to 2018 in Carbon County

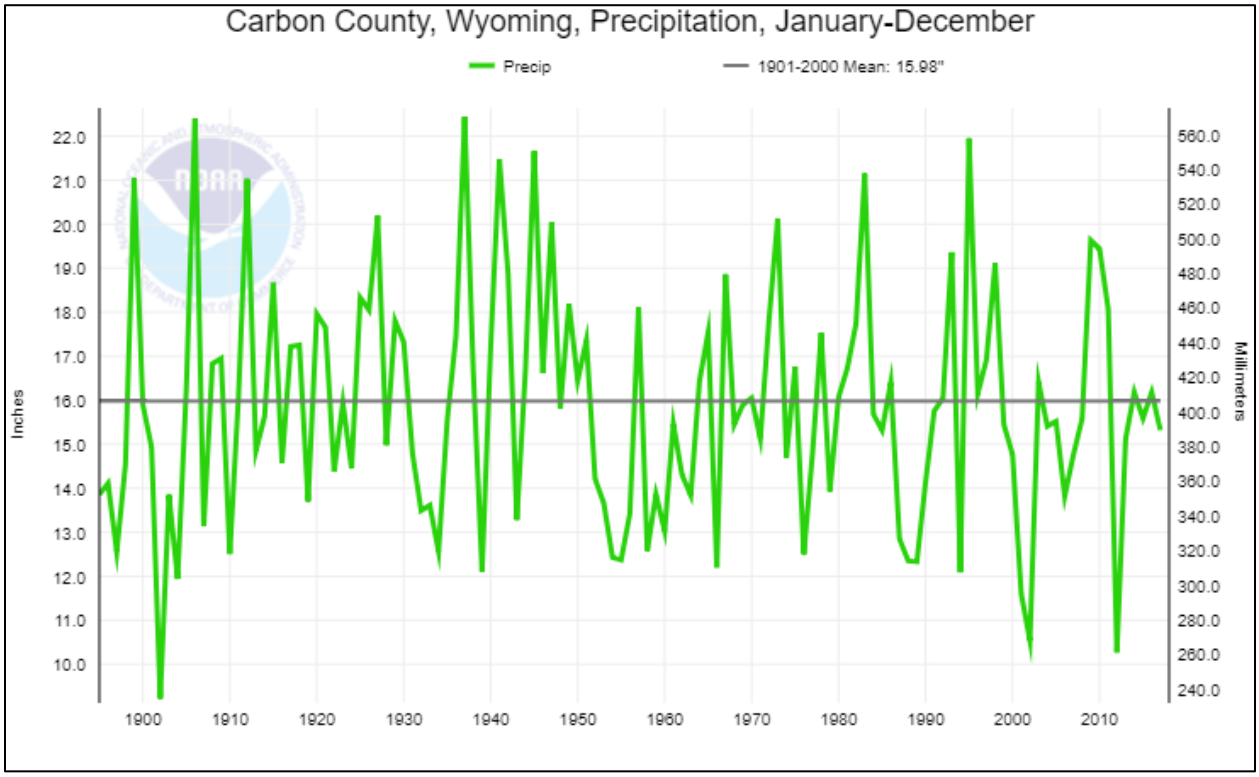
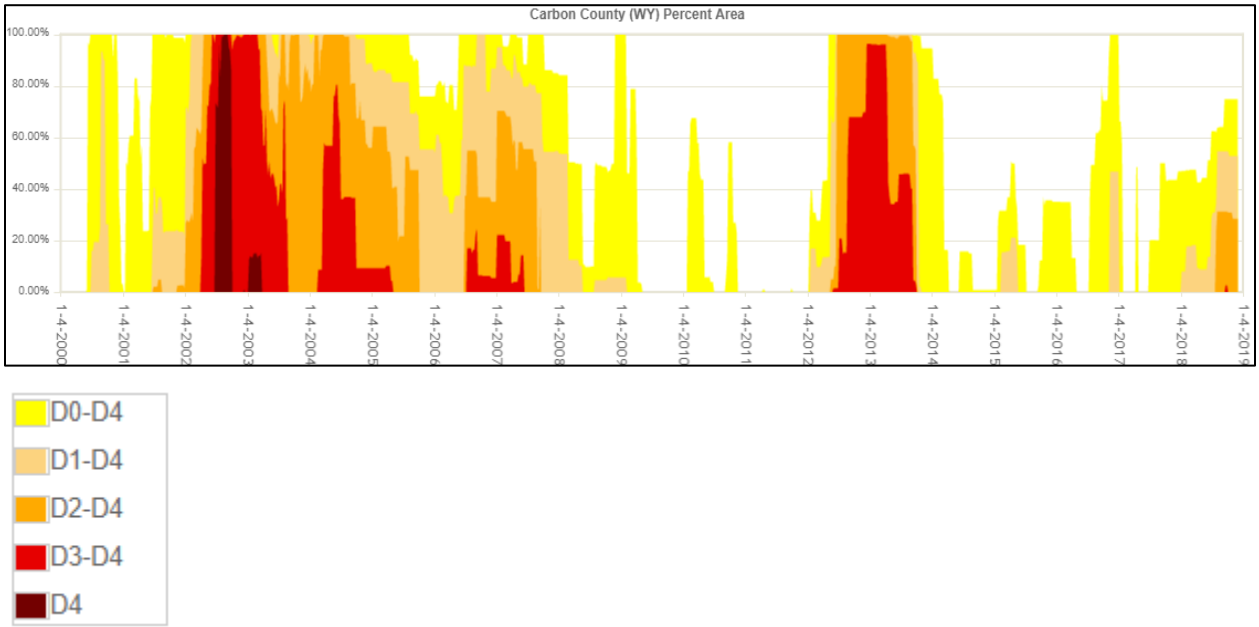


Figure 9-5 shows drought conditions from the U.S. Drought Monitor since 2000 for Carbon County. Much of Carbon County experienced drought conditions from approximately 2000 to 2009. Nearly 100% of the county experienced Exceptional (D4) or Extreme (D3) drought from 2002-2003, with some areas persisting through 2007. Another notable period of drought includes 2012-2014, where 100% of the county experienced some level of drought, and much of the county experiencing Extreme drought. Additionally, portions of Carbon County have been experiencing Moderate to Extreme drought conditions since 2017.

Figure 9-5 U.S. Drought Monitor Conditions since 2000 in Carbon County[97]



9.2. Earthquake

9.2.1. Previous Occurrences

Albany County

Wyoming has substantial seismicity due to Yellowstone National Park; however, many of these events are not felt as far south as Albany County. According to the Wyoming State plan, the area magma chamber beneath Yellowstone National Park, combined with regional tectonic forces, results in significant seismic activity in the state. Earthquakes which may be related to active faults also occur in the park. The most active area in Wyoming for earthquakes is outsides of Yellowstone. The August 17, 1959 Hebgen Lake-Red Canyon earthquake sequence, (magnitude 7.3, intensity X) occurred just west of Yellowstone National Park, near Hebgen Lake, Montana. It was the largest earthquake in the U.S. intermountain region in historic time. The earthquake could be felt as far south as Utah and as for east as North Dakota, making Albany County in the affected area.[98] Earthquakes of this size are rare but are possible and may impact the planning area.

Albany County is also seismically active though rarely is impacted by very strong events. According to the Wyoming State Geological Survey (WSGS) and the USGS, 27 magnitude >= 2.5 or Intensity >= III earthquakes have been recorded throughout Albany County from 1871 to 2018. Hundreds of smaller ones have been reported, and northern Albany County is the most seismically active area in the county. However, not all of these earthquakes have been felt or resulted in damage. The WSGS reports that one of the first two earthquakes recorded in southeast Wyoming occurred between Estes Park, Colorado and Laramie, Wyoming on November 7-8, 1882. The first was a magnitude 6.2 (intensity VI in Laramie) and

[97] https://droughtmonitor.unl.edu/Data/Timeseries.aspx
[98] http://earthquake.usgs.gov/earthquakes/states/montana/history.php

caused people to run into the streets. Plaster was cracked and windows were broken. The second was less severe though an exact magnitude was not identified.

The first earthquake recorded with an epicenter in Albany County was an intensity IV earthquake on January 13, 1898. It shook buildings and rattled dishes, windows, and loose objects in Laramie. According to WSGS reports, residents reported that they "heard a noise similar to that which a heavy wagon would make moving at a good speed a block or two away" (The Daily Boomerang, January 14, 1898). The following table, Table 9-2, highlights all reported earthquakes for Albany County up until 2000. Information past this date was supplemented by a USGS earthquake search which resulted in one additional earthquake in 2013.[99] In addition, several small earthquakes have been reported in Converse County that were felt in Albany County, but did not result in any damage. Figure 9-6 shows previous earthquake epicenters in Wyoming.

Table 9-2 Earthquakes over Intensity III, M2.8 Felt in Albany County[100]

Date	Intensity, Magnitude	General impact area	Description and Impacts
11/7/1882	VI, mag 6.2-6.5	Laramie	Broken windows, cracked plaster
11/8/ 1882	unknown	Laramie	Windows and dishes rattled
1/13/1898	IV	Laramie	Windows and dishes rattled
9/20/1931	IV	Laramie to east southeast of Laramie (Laramie Mountains)	Windows and dishes rattled
11/10/1935	IV	reported in Laramie, Rawlins, Rock River	Buildings shuddered, Windows and dishes rattled
8/27/1938	III	northern Albany county	No damage reported
1/20/1954	V	12 miles south of Laramie felt for 2,000 square miles; Laramie, Fox Park, Albany, Centennial, Jelm, Tie Siding, and Ryan Park	In Laramie, a roaring noise was heard, and buildings shook and dishes fell from tables. One Laramie resident thought that the earthquake was an explosion, and alerted the local fire department; posts supporting the roof of one house was shifted; 2 minutes long.
1/22/1954	IV	Fox Park, Jelm, and Woods Landing area	
5/25/1955	V	Jelm, Woods Landing (not felt in Laramie)	People reported hearing a loud rumbling noise, which was then followed by shaking. Dishes,

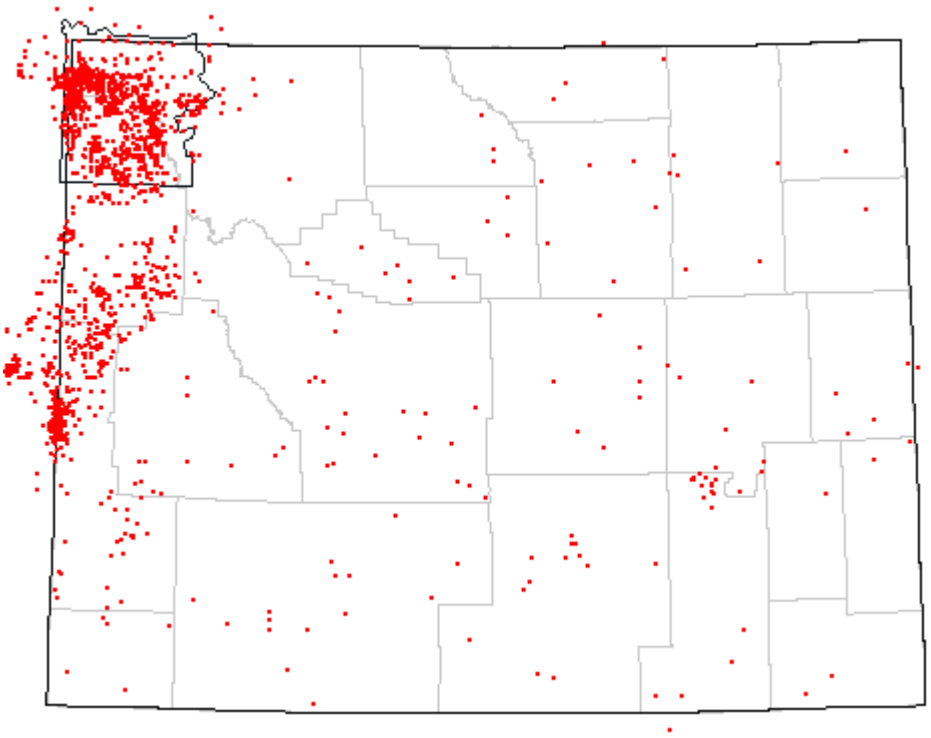
[99] http://earthquake.usgs.gov/earthquakes/search/

[100] James C. Case, Rachel N. Toner, and Robert Kirkwood. "Basic Seismological Characterization for Albany County, Wyoming." Wyoming State Geological Survey, 2002. http://www.wrds.uwyo.edu/wrds/wsgs/hazards/quakes/seischar/seischar.html

Date	Intensity, Magnitude	General impact area	Description and Impacts
			windows, and cupboards were rattled
8/6/1958	IV	Fox Park, Laramie, and Centennial	Windows rattled and dishes shook
8/15/1958	III	Fox Park, Laramie, and Centennial	Windows rattled and dishes shook
12/25/1959	V	Fox Park, Jelm, Laramie	Cracks in concrete building, creaking walls, Windows rattled and dishes shook
2/13/1983	IV, mag 4.0	Northern Albany county, Toltec, Laramie, Casper, Wheatland, and Medicine Bow	No damage reported
10/18/1984	VI, mag 5.5	Northern Albany county/Toltec epicenter; felt in surrounding states as far south as Kansas	Most significant earthquake in the area; cracks were found in the exterior brick walls of the Douglas City Hall and a public school in Medicine Bow. Chimneys were cracked at Casper, Douglas, Guernsey, Lusk, and Rock River. A wall in a Laramie-area school was slightly cracked by the earthquake. The earthquake was one of the largest felt in eastern Wyoming. There were a number of aftershocks to the main event
10/19/1984	Mag 3.3	Northern Albany county	Aftershock to 10/18 event; no damage reported
10/20/1984	Mag 3.5	Northern Albany county	Aftershock to 10/18 event; no damage reported
10/22/1984	Mag 3.1	Northern Albany county	Aftershock to 10/18 event; no damage reported
10/22/1984	Mag 3.2	Northern Albany county	Aftershock to 10/18 event; no damage reported
11/6/1984	Mag 3.5	Northern Albany county	Aftershock to 10/18 event; no damage reported
12/5/1984	Mag 2.9	Northern Albany county	Aftershock to 10/18 event; no damage reported
12/17/1984	Mag 3.5	Northern Albany county	Aftershock to 10/18 event; no damage reported
6/12/1986	Mag 3.0	Northern Albany county	No damage reported
7/23/1993	IV, mag 3.7	Northern Albany county, felt in Laramie	no damage reported

Date	Intensity, Magnitude	General impact area	Description and Impacts
10/9/1993	IV, mag 3.7	Northern Albany county, felt in Laramie, Garrett, Marshall	no damage reported
12/13/1993	mag 3.5	Northern Albany county, felt in Laramie, Garrett, Marshall	no damage reported
4/13/2000	Mag 3.3	Northern Albany county	no damage reported
12/18/2013	Mag 2.8	Northern Albany county/Wheatland	no damage reported

Figure 9-6 Historic Wyoming Earthquakes (Magnitude >= 2.5 or Intensity >= III) from 1871 to 1970. Epicenters shown in red. [101]



Carbon County

Twenty-five magnitude 2.0 or intensity II and greater earthquakes have been recorded in Carbon County. These earthquakes are discussed below.

The first earthquake that was felt and reported in Carbon County occurred just southwest of Rawlins on March 28, 1896. The intensity IV earthquake shook for about two seconds. Residents of Rawlins

[101] http://www.wrds.uwyo.edu/wrds/wsgs/hazards/quakes/quake.html

reported that windows and dishes rattled and lamps swayed. The local newspaper also reported that "Several years ago a similar disturbance was felt here, but at that time it was considerably more severe" (The Rawlins Republican, April 3, 1896). The earlier earthquake may have been a November 7, 1882 event that occurred between Laramie, Wyoming, and Estes Park, Colorado. Kirkham and Rogers (1985) reported that the earthquake was felt as an intensity V event in Rawlins.

On March 10, 1917, another intensity IV earthquake was recorded approximately one mile northeast of Rawlins. The earthquake was felt as a distinct shock that caused wooden buildings to noticeably vibrate. Stone buildings were not affected by the event (Rawlins Republican, March 15, 1917).

The next two earthquakes in Carbon County occurred in the Medicine Bow area. The first was recorded on February 5, 1938, less than a mile southeast of Medicine Bow. The intensity III earthquake was felt as a slight shock in Medicine Bow (Neumann, 1940). On August 28, 1952, an intensity IV earthquake occurred in the same area. Area residents felt this event and reported buildings creaking and loose objects rattling (Murphy and Cloud, 1954).

Most of the earthquakes recorded in Carbon County occurred in the 1970's. A small earthquake of no assigned intensity or magnitude was detected on April 13, 1973, approximately six miles west of Hanna. No one reported feeling this event (Reagor, Stover, and Algermissen, 1985). On May 29, 1973, another earthquake of no specific magnitude or intensity occurred near the Ferris Mountains, approximately 21 miles northeast of Lamont. This earthquake was also not felt (Reagor, Stover, and Algermissen, 1985). Two more small earthquakes of no specific magnitude or intensity were recorded in Carbon County on May 30, 1973, and June 1, 1973. Again, no one felt these earthquakes, which were centered approximately 6 miles west of Hanna (Reagor, Stover, and Algermissen, 1985). On August 3, 1973, a magnitude 4.1 earthquake was recorded on the southeastern margin of Seminoe Reservoir, approximately 13 miles northwest of Hanna. A few days later, a magnitude 3.6 earthquake was recorded approximately nine miles northwest of Hanna on August 10, 1973. Explosions were later identified as being the probable causes of the August 3 and August 10 earthquakes (Coffman and von Hake, 1975). A small earthquake of no assigned magnitude occurred approximately 11 miles northwest of Hanna on August 17, 1973. The U.S. Geological Survey did not report this event as explosion; however, the record was so weak that a definite origin is uncertain (Reagor, Stover, and Algermissen, 1985). A second earthquake of no specific magnitude or intensity occurred on August 17, 1973, approximately nine miles west-northwest of Medicine Bow. No one reported feeling this event (Reagor, Stover, and Algermissen, 1985). On November 21, 1973, another earthquake resulting from a probable explosion was recorded on the western side of Seminoe Reservoir, approximately 20 miles north-northeast of Sinclair. No magnitude was assigned to the event (Coffman and von Hake, 1975).

On December 26, 1973, a small earthquake of no specific magnitude or intensity was recorded approximately 29 miles north-northwest of Hanna. An explosion is thought to be the cause of this earthquake (Reagor, Stover, and Algermissen, 1985). On July 11, 1975, an earthquake occurred on the southeastern margin of Seminoe Reservoir, approximately 12 miles northwest of Hanna. Residents in Rawlins felt the earthquake as an intensity II event (Coffman and Stover, 1977). A magnitude 2.3, intensity V earthquake occurred on January 27, 1976, approximately 12 miles north of Rawlins. Many reports from the Park Drive area indicated that dishes were rattled, pictures fell from walls, lamps were knocked off tables, and one wall in a residence was reportedly cracked. Several people reported that they were thrown out of bed. (The Daily Times, January 28, 1976.) The last earthquake recorded in Carbon County in the 1970s occurred on March 3, 1977. This magnitude 4.2, intensity V earthquake occurred in the Sierra Madre Mountains, approximately 18.5 miles west-northwest of Encampment.

Doors and dishes were rattled in southern Carbon County homes, but no significant damage was reported (The Laramie Daily Boomerang, March 6, 1977).

Only one earthquake was recorded in Carbon County in the 1980s. On November 1, 1989, a magnitude 3.0 earthquake occurred in the Sierra Madre Mountains, approximately 12 miles west of Encampment. Residents of Saratoga reported feeling this earthquake (U.S. Geological Survey, 1989).

Several earthquakes occurred in Carbon County in the 1990s. On April 13, 1991, and April 19, 1991, magnitude 3.2 and magnitude 2.9 earthquakes, respectively, occurred near the center of Seminoe Reservoir. The April 13 event was centered approximately 22 miles northeast of Sinclair, and the April 19 event was centered approximately 24 miles northeast of Sinclair. On December 18, 1991, a magnitude 3.1 earthquake occurred southwest of Seminoe Reservoir, approximately 15 miles northeast of Sinclair. The last earthquake reported in the area occurred on August 23, 1993. This magnitude 3.0 earthquake occurred near the center of Seminoe Reservoir, approximately 18 miles northwest of Hanna. No one reported feeling these Seminoe Reservoir area earthquakes (Case, 1994; U.S.G.S. National Earthquake Information Center). Two additional earthquakes were felt in Carbon County in the 1990s. On August 6, 1998, a magnitude 3.6 earthquake occurred approximately 13 miles north of Rawlins. Residents in Rawlins reported hearing a sound and then feeling a jolt. This non-damaging earthquake was also felt in Sinclair. A magnitude 4.3 earthquake occurred on April 5, 1999, approximately 29 miles north-northwest of Baggs. It was felt in Rawlins, Sinclair, Baggs, Wamsutter, and Rock Springs. Residents of Rawlins reported that pictures fell off walls. The most significant damage occurred between Baggs and Creston Junction, and at Wamsutter. The owner of a ranch house, located approximately 30 miles north of Baggs, reported that cinder block walls in the basement of the home cracked, separated, and may have to be replaced. A motel and associated residence in Wamsutter also suffered cracks in the cinder-block walls of the basement.

Since 2000, 10 earthquakes of magnitude 2.5 or greater have been recorded in Carbon County (USGS National Earthquake Information Center). No one reported feeling any of these nine events. The largest of these, a magnitude 3.5 earthquake, was recorded on August 13, 2004 on the west side of Pathfinder Reservoir, in the Seminoe Dam area.

In the fall of 2014, a 3.2 magnitude earthquake occurred at Hog Park Reservoir. The event was felt at Riverside, but no damages were reported.

Regional Historical Seismicity

Several earthquakes have also occurred near Carbon County. As previously mentioned, an earthquake occurred on November 7, 1882, between Laramie and Estes Park, Colorado. Residents in Rawlins reported feeling the earthquake as an intensity V event (Kirkham and Rogers, 1985).

On August 11, 1916, an earthquake was recorded in southeastern Fremont County, approximately 21 miles northwest of Lamont. No damage was reported from this intensity III event (Reagor, Stover, and Algermissen, 1985).

An intensity IV earthquake occurred in Albany County on November 10, 1935. This earthquake, thought to have an epicenter in Laramie, was felt in Laramie, Rawlins, and Rock River. In Laramie, buildings shuddered slightly, dishes rattled, and a low rumbling sound was heard. The earthquake lasted less than ten seconds (The Laramie Republican-Boomerang, November 11, 1935). On August 27, 1938, an intensity III earthquake was recorded in northern Albany County, approximately 34 miles northeast of Medicine Bow. No damage was associated with the event (Neumann, 1940).

On January 22, 1954, an earthquake was recorded in southwestern Albany County, approximately 42 miles east-southeast of Riverside. This intensity IV earthquake resulted in a very strong but brief shock felt in Jelm (Murphy and Cloud, 1956). On January 23, 1954, an intensity IV earthquake was detected in southern Natrona County, approximately 50 miles north of Hanna. Although this event did not result in any reported damage, one area resident reported that he thought that an intruder in the attic of his house had fallen down (Casper Tribune-Herald, January 24, 1954). On May 22, 1955, an intensity V earthquake in southwestern Albany County, approximately 42 miles east-southeast of Riverside, caused considerable concern. Many Jelm and Woods Landing residents reported hearing a loud rumbling noise, which was then followed by shaking. Dishes, windows, and cupboards were rattled in many cabins in the Woods Landing area. Reflecting the fears of the time, one Jelm resident thought that an atomic bomb had dropped on Denver. A group of fishermen camping near Woods Landing reported that they were rolled around in their tent. The earthquake was not felt in Laramie (The Laramie Republican and Boomerang, May 23, 1955; Murphy and Cloud, 1957). On August 6, 1958, an intensity IV earthquake in the same area was felt in Fox Park, Laramie, and Centennial. Windows rattled and dishes shook in Fox Park, and one Laramie resident thought there was an explosion in his basement (The Laramie Daily Boomerang, August 7, 1958). This earthquake was followed on August 15, 1958, by an intensity III event in the same general area. Residents in the Centennial area reported that buildings shook (The Laramie Daily Boomerang, August 15, 1958). In Fox Park, a light tremor was felt (Brazee and Cloud, 1960). On December 25, 1959, a magnitude 4.3, intensity V event was recorded approximately 38 miles southeast of Riverside. The earthquake was felt in Fox Park, Jelm, and Laramie. In Fox Park, slight cracks formed in a concrete block building under construction. Many residents of Fox Park felt the earthquake and described it as a pretty strong jolt. All Jelm residents felt the earthquake, with many reporting creaking walls (Eppley and Cloud, 1961).

On September 10, 1964, a magnitude 4.1 earthquake occurred in eastern Sweetwater County, approximately 30 miles west of Rawlins. One Rawlins resident reported that the earthquake caused a crack in the basement of his Happy Hollow home. No other damage was reported (The Daily Times, September 11, 1964). On November 24, 1966, a small earthquake with no specific intensity or magnitude occurred approximately 40 miles west-southwest of Rawlins. No one reported feeling this earthquake (Reagor, Stover, and Algermissen, 1985).

The only earthquake to occur near Carbon County in the 1970s occurred on April 22, 1973, in southeastern Fremont County, approximately 34 miles north-northwest of Lamont. This magnitude 4.8, intensity V earthquake rattled dishes and disturbed pictures on walls in Jeffrey City (Casper Star-Tribune, April 24, 1973). No other earthquakes occurred in the region until October 18, 1984, when an earthquake in northern Albany County caused damage in Carbon County. The magnitude 5.5, intensity VI earthquake, which was centered approximately 38 miles northeast of Medicine Bow, was felt in Wyoming, South Dakota, Nebraska, Colorado, Utah, Montana, and Kansas. Stover (1985) reported that cracks were found in the exterior brick walls of the Douglas City Hall and a public school in Medicine Bow. Chimneys were cracked at Casper, Douglas, Guernsey, Lusk, and Rock River. A wall in a Laramie-area school was also slightly cracked by the earthquake. This earthquake was one of the largest felt in eastern Wyoming. There were a number of aftershocks to the main event, with the most significant being a magnitude 4.5, intensity IV event, and a magnitude 3.8 event occurring on October 18, 1984; a magnitude 3.5 event on October 20, 1984; magnitude 3.3 events on October 19, November 6, and December 17, 1984; a magnitude 3.1 event on October 22, 1984; a magnitude 3.2 event on October 24, 1984; and a magnitude 2.9 event on December 5, 1984. On June 12, 1986, a magnitude 3.0 earthquake occurred in the same general area.

A magnitude 3.8, intensity III earthquake occurred in southeastern Fremont County on June 1, 1993. No damage was reported from this event, which was centered approximately 7 miles northwest of Lamont (Case, 1994). On October 9, 1993, a magnitude 3.7, intensity IV earthquake occurred in eastern Albany County, approximately 39 miles north-northeast of Medicine Bow. The earthquake was felt in Garrett. A magnitude 3.4 earthquake occurred in southeastern Fremont County, approximately 14 miles northwest of Lamont on December 11, 1996. No damage was associated with this earthquake.

On April 13, 2000, a magnitude 3.3 earthquake occurred in northern Albany County, approximately 40 miles northeast of Medicine Bow. No damage was reported. Two earthquakes occurred in northeastern Sweetwater County in May 2000. A magnitude 4.0 event was recorded on May 26, 2000, approximately 5 miles southwest of Lamont. Four days later, on May 30, 2000, a magnitude 3.2 event was recorded in the same area. Area residents reported feeling both earthquakes (USGS National Earthquake Information Center).

9.2.2. Probability

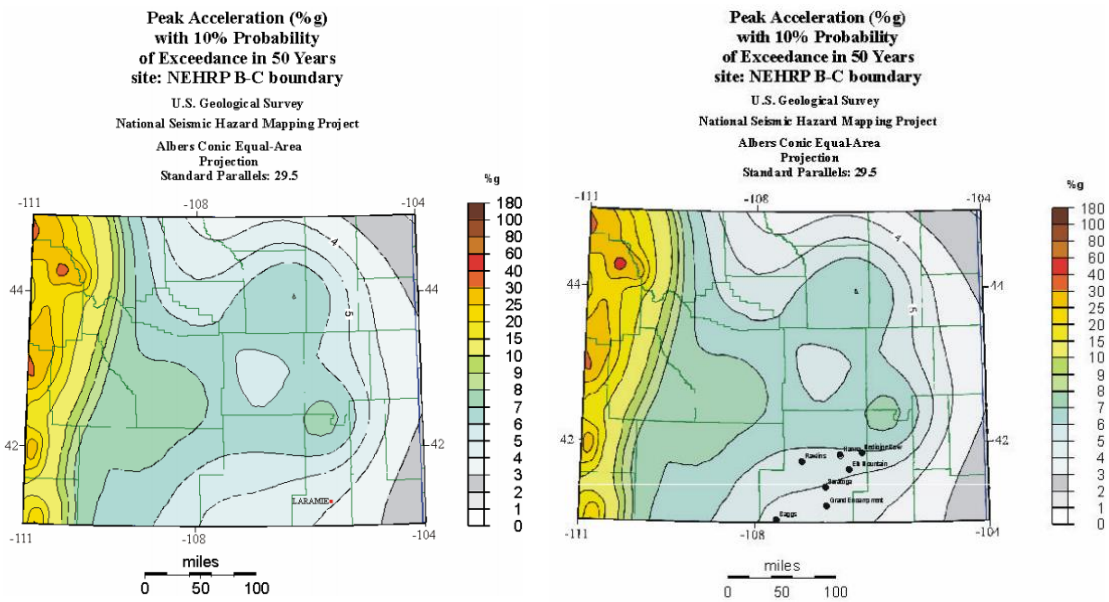
Below is a description of the USGS probabilistic acceleration maps for 500-, 1000-, and 2,500-year time frames for Albany and Carbon counties.[102] It should be noted that in many areas of Wyoming, ground accelerations shown on the USGS maps can be increased due to local soil conditions. For example, 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.

Based upon the 500-year map (10% probability of exceedance in 50 years, Figure 9-7), the estimated peak horizontal acceleration in Albany County ranges from approximately 3%g in the southeastern corner of the county to approximately 7%g in the northwestern corner of the county. Those accelerations are roughly comparable to intensity IV earthquakes (1.4%g - 3.9%g) to intensity V earthquakes (3.9%g - 9.2%g). Intensity IV earthquakes cause little damage. Intensity V earthquakes may result in cracked plaster and broken dishes.

The estimated peak horizontal acceleration in Carbon County ranges from approximately 4%g in the southern and southeastern portions of the county to over 6%g in the northern part of the county. These accelerations are roughly comparable to intensity V earthquakes (3.9%g – 9.2%g). Intensity V earthquakes can result in cracked plaster and broken dishes.

[102] http://www.wrds.uwyo.edu/wrds/wsgs/hazards/quakes/seischar/seischar.html

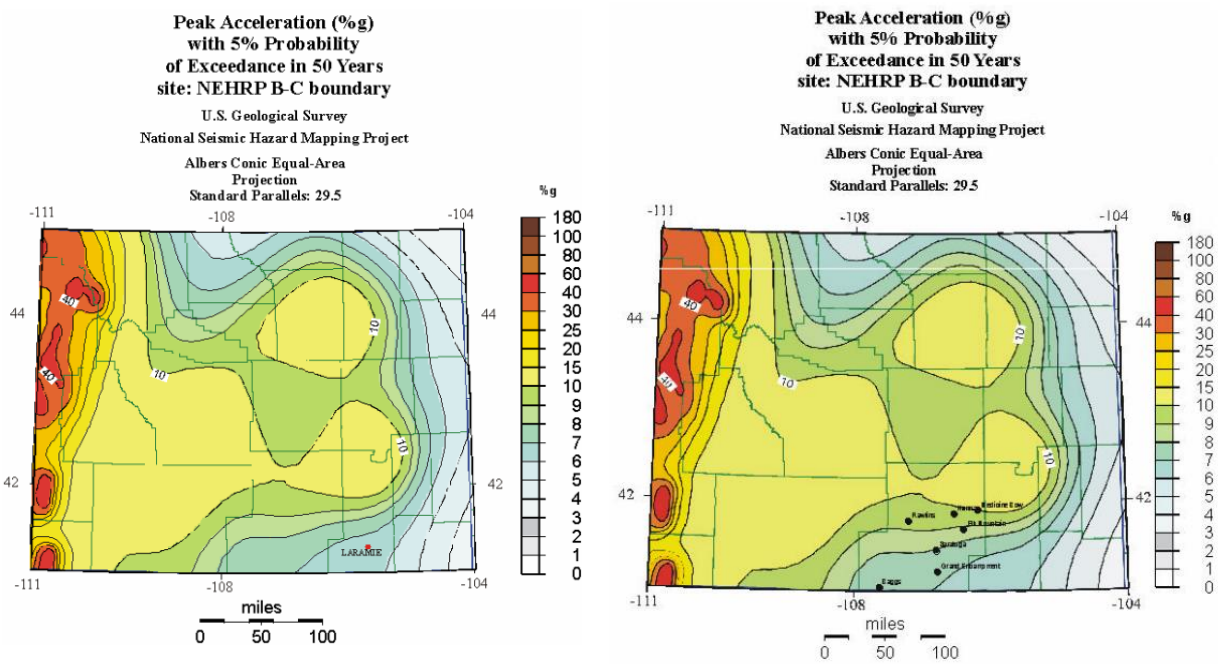
Figure 9-7 Peak Acceleration with 10% Probability of Exceedance in 50 Years for Wyoming



Based upon the 1000-year map (5% probability of exceedance in 50 years, Figure 9-8), the estimated peak horizontal acceleration in Albany County ranges from 6%g in the southeastern corner of the county to nearly 13%g in the northwestern corner of the county. Those accelerations are roughly comparable to intensity V earthquakes (3.9%g - 9.2%g) to intensity VI earthquakes (9.2%g -18.0%g). Intensity V earthquakes can result in cracked plaster and broken dishes. Intensity VI earthquakes can result in fallen plaster and damaged chimneys.

The estimated peak horizontal acceleration in Carbon County ranges from 6%g in the southeastern corner of the county to over 10%g in the northeastern and northwestern corners of the county. These accelerations are roughly comparable to intensity V earthquakes (3.9%g – 9.2%g) to intensity VI earthquakes (9.2%g – 18%g). Intensity V earthquakes can result in cracked plaster and broken dishes. Intensity VI earthquakes can result in fallen plaster and damaged chimneys.

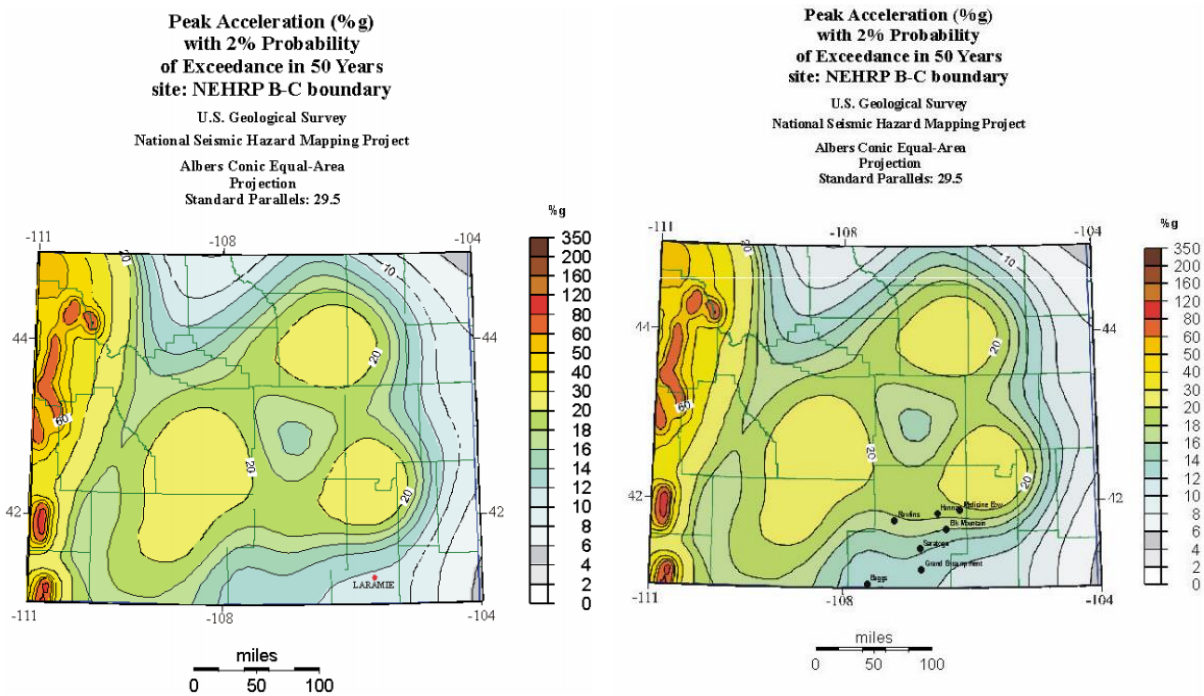
Figure 9-8 Peak Acceleration with 5% Probability of Exceedance in 50 Years for Wyoming



Based upon the 2500-year map (2% probability of exceedance in 50 years, Figure 9-9), the estimated peak horizontal acceleration in Albany County ranges from 11%g in the southeastern corner of the county to over 21%g in the entire north central part of the county. Those accelerations are roughly comparable to intensity VI earthquakes (9.2%g – 18.0%g) to intensity VII earthquakes (18%g-34%g). Intensity VI earthquakes can result in fallen plaster and damaged chimneys. Intensity VII earthquakes can result in slight to moderate damage in well-built ordinary structures, and considerable damage in poorly built or badly designed structures. Chimneys may be broken.

The estimated peak horizontal acceleration in Carbon County ranges from approximately 11%g in the southeastern corner of the county to over 20%g in the northeastern portion of the county. These accelerations are roughly comparable to intensity VI earthquakes (9.2%g – 18%g) and intensity VII earthquakes (18%g – 34%g). Intensity VI earthquakes can result in fallen plaster and damaged chimneys. Intensity VII earthquakes can result in slight to moderate damage in well-built ordinary structures, and considerable damage in poorly built or badly designed structures, such as unreinforced masonry. Chimneys may be broken.

Figure 9-9 Peak Acceleration with 2% Probability of Exceedance in 50 Years for Wyoming



As the historic record is limited, it is nearly impossible to determine when a 2,500-year event last occurred in the county. This type of event was used for loss estimation analysis because of the uncertainty involved, and based upon the fact that the new International Building Code utilizes 2,500-year events for building design. This conservative approach is in the interest of public safety.

9.3. Flood

9.3.1. Previous Occurrences

Albany County

Table 9-3 shows previous flood events in Albany County from 1905 to 2018.

Table 9-3 Past Flood Events in Albany County, 1905 to 2018

Date	Location	Death/ Injuries	Damage ($)	Flood Type	Description
5/8/1905	Spring Creek	0/0	Not reported	Flood	Overflowing of the Creek caused by thunderstorms occurring throughout the watershed during the spring and summer resulted in flood damaging property and interrupting transportation due to roads being washed out.

Date	Location	Death/ Injuries	Damage ($)	Flood Type	Description
6/12/1923	Laramie River	0/0	Not reported	Flood	Snowmelt probably combined with rainfall runoff resulted in a flood 25- to a greater than 100-year flood.
7/29/1953	Northern Albany County, Ashley, Hall, Rock Creek, Spring Creek	0/0	There were $1,800 total damages to national forest: Roads ($1000), Meadows ($500), and Springs ($300); Major thoroughfare over $30,000; loss of livestock (cows, calves, and horses).	Flash Flood	Cloudburst caused a flash flood down canyon where there was damage to roads, ranches, out buildings, fences, haystacks, corrals, and machinery. Pioneer residents remembered this as the heaviest rain ever.
7/29/1953	Laramie	0/0	Not reported	Flood	Flood caused by a cloudburst and backed up storm sewers (hardest hit area Canby, Gibbon & 9th Streets). Dirt streets were washed away and caved in from downpour. The event produced 0.88 inches of water in 45 minutes.

Date	Location	Death/ Injuries	Damage ($)	Flood Type	Description
6/9/1957	Laramie, Laramie River	0/0	Not reported	Flood	Flooding from late spring snow melt then high temperatures with falling rain; channel not kept clear because of drought years; silt deposited and debris collected. This caused quarries to be flooded; bridges, culverts washed out, flooding of homes (west Sheridan); ranch buildings damaged; families evacuated. This was a greater than 50-year flood that had a discharge of 3,800 cubic-feet-per-second (CFS) at Pioneer Dam (25 miles southwest of Laramie) according to WEMA, Laramie Boomerang, Flood Damage Inventory. Federal Emergency Management Agency (FEMA) Flood Insurance Study October 16, 1996 set the discharge amount to 3,250 CFS.
5/13/1965	Central Wyoming	0/0	Not reported	Flood	Heavy rains, especially in the central mountains, on top of the heavy snow of the 8th and 9th caused flash flooding on streams flowing out of the Laramie mountains between Wheatland and Casper. Damage to bridges, roads, crops and housing was especially heavy from Glendo through Douglas to Glenrock.
6/10/1970	Southeast Wyoming	0/0	Not reported	Flood	Heavy rains up to 6 inches in the Laramie Mountains from Casper to Wheatland caused flooding on the tributaries of the North Platte River. Some of the moisture fell as snow above 7,500 feet elevation.

Date	Location	Death/ Injuries	Damage ($)	Flood Type	Description
7/23/1984	Laramie	0/0	Damage to residences and businesses estimated to be thousands of dollars. University of Wyoming damage estimated to be $100,000. Wyoming School of Gymnastics estimated to be $12,000. Five percent of Laramie homes damaged. Flood channel damaged with erosion to bridges.	Flood/Flash Flood	Flash flooding from a late evening thunderstorm in east Laramie did thousands of dollars damage to residences and businesses (NCDC Storm Data). 100-year storm produced 1.04 inches of water in less than 24 hours. Wall of water breached dike, storm sewer overload. Planning team members noted that the water washed out existing culverts (near current Staples). The spring creek drainage areas were engineered following this event.
8/15/1984	Laramie	0/0	Not reported	Flood	Thunderstorm dumped up to 1.67 inches of rain in an hour-long deluge across Laramie in Albany County. Damage to basements of houses, cars, and a just-completed flood channel.
7/19/1985	Laramie	0/0	Not reported	Flood	Storms dumped up to 1.26 inches of rain in Laramie, causing minor urban flooding. Two unconfirmed funnel clouds were also reported. One was west, and the other southwest, of Laramie at a distance of about 10 miles.

Date	Location	Death/ Injuries	Damage ($)	Flood Type	Description
6/10/1986	35NW Laramie	0/0	Not reported	Flood	Pierce Dam failed at 1941 MST, spilling its contents into Rock Creek. This was about 35 miles northwest of Laramie along the Albany and Carbon County line. A bridge over Rock Creek along Wyoming Highway 13 was undercut. There was some flooding of buildings and ranch lands where Rock Creek runs into the Medicine Bow River.
8/20/1990	25 SW Wheatland	0/0	Not reported	Flood	A small but intense thunderstorm dumped up to 4 inches of rain and small hail just east of the Sybille Research Center. Water filled normally dry creeks, with Wyoming Highway 34 covered with up to 4 to 5 feet of water in some spots. Some bridges and corrals were washed out on ranches.
7/25/1991	Centennial	0/0	Not reported	Flood	Centennial received 0.75 inch of rain in a short period of time that caused minor flooding with little, if any damage
6/2004	Albany County	0/0	Not reported	Flood	Curtis street bridge nearly over topped. (see picture below)
6/4/2005	Laramie Valley - Laramie Range	0/0	Not reported	Flood	An unusual late season snowfall blanketed parts of southeast Wyoming at elevations generally above 7500 feet. Laramie, WY. Reported 4-6 inches of snowfall which damaged many trees. 12 inches of snow was reported over the southern Laramie Range which forced the closure of Interstate 80 for several hours.

Date	Location	Death/ Injuries	Damage ($)	Flood Type	Description
8/1/2007	Rock River	0/0	None reported	Flash Flood	Heavy rain flooded a portion of U.S. highway 30/287 near Rock River up to 8 inches deep.
6/2010	Laramie	0/0	Not reported	Flood	Greenbelt Flooding
7/20/2010	Garrett	0/0	Not reported	Flash Flood	Heavy Rain. Received 2.00 inches of rain in less than an hour. Estimated time and duration of report.
5/2011	Countywide	1/0	Not reported	Flood/Flash Flood	Heavy Rain. Precipitation from storms combined with snowmelt resulted in rising waters on the Big Laramie. The Laramie River Greenbelt Trained was closed due to potential damage of flash flooding. The river crested at 5.8 feet, 8 inches above flood stage. See picture below. Planning team member reported one drowning death on Bluegrass Creek as a result of getting too close to the bank of the swollen creeks.
7/5/2012	Fletcher Park	0/0	None reported	Flash Flood	One to two inches of rain caused flash flooding along Cottonwood Creek at the Arapaho burn site. Flash flooding north of Laramie.
7/7/2012	Laramie	0/0	None reported	Flash Flood	Heavy rainfall from a stationary thunderstorm caused flash flooding in parts of downtown Laramie. Fourth street was closed.
2012	Centennial	1/0	None reported	Flood	Planning team member reported a death in Centennial due to flooding. A person was investigating the edge of the flooding river. The banks gave way and they were washed away.

Date	Location	Death/ Injuries	Damage ($)	Flood Type	Description
8/22/2013	Bolser	0/0	None reported	Flash Flood	Thunderstorms brings 3-4 inches of rain caused flash flooding and mudslides. They occurred along Highway 34 between mile markers 19 and 27 northeast of Bosler. A mudslide was reported at mile marker 22 about three miles southwest of the Sybille Wildlife Research Center.
9/12/2013	Albany County	0/0	None reported	Flash Flood	Heavy rainfall from thunderstorms produced flash flooding across portions of the Squirrel Creek burn scar in southwest Albany County. A 90-minute period flooded Highway 311/47. A Flash Flood Watch was issued for Laramie and significant sections of Wyoming.
5/2014	Albany County	0/0	None reported	Flood	The county constructed the Sheridan Park Street berms on May 7 and May 8. Total cost was $5,485. It prevented further flooding of areas west of downtown.

Date	Location	Death/ Injuries	Damage ($)	Flood Type	Description
5/25/2014 – 6/2014	Woods Landing	0/0	None reported	Record Flood	Higher than normal snowpack, a late snow storm, high temperatures (70s), and rain precipitation resulted in record flooding. Flood waters reached record levels, higher than those reached in the 1980s. Voluntary evacuations near Woods Landing were issued, and volunteer firefighters helped build barriers with sandbags. The water veered from typical paths, breaching its channel, likely as a result of previous wildfires. This also resulted in substantial debris. Flood stage of 5.0 feet was surpassed up to 6.2+ feet. The National Weather Service warned flooding of homes along the greenway in Laramie. Flash flooding washed out Back River Road and Boswell Ranch Road near Woods Landing. Record Flood Levels. The Greenbelt remained closed until mid-June. $1,500 in county costs were reported for sand, pumps, sand bags, dump trucks, and checking pumps.
7/2014	County	0/0	None reported	Flash Flood	Resulted in closure of 3rd Street between Harney and Shields.[103] The county was under a Flash Flood Warning. The rain brought by this event also closed the Greenbelt.

[103] http://laramielive.com/tags/flooding/

Date	Location	Death/ Injuries	Damage ($)	Flood Type	Description
7/29/2014	Wilcox	0/0	None reported	Flash Flood	Slow moving thunderstorms produced very heavy rainfall with observed totals of two to four inches. Runoff on saturated grounds caused flash flooding across portions of Albany, Carbon and Platte counties.
7/12/2018	Woods Landing	0/0	None reported	Flash Flood	Locally heavy rain in less than 30 minutes over the Badger Creek burn scar led to flash flooding and mud and debris flows across Highway 230 near Woods Landing.
7/23/2018	Woods Landing	0/0	None reported	Flash Flood	Over an inch of rain in 60 minutes caused flash flooding and debris flows from the Badger Creek burn scar in southern Albany County.

The following photos demonstrate flooding in Albany County and highlight some of the events mentioned above.

Figure 9-10 June 2005 Floods, Laramie River from Curtis Street bridge, looking east. Stage 3.6'[104]

Figure 9-11 May 2011 Floods, Snowy Range Road Bridge (Greenbelt Trail Closed) [105]

[104] http://wyofloods.wrds.uwyo.edu/Albany/2005Jun04-A/2005Jun04.html
[105] http://kowb1290.com/laramie-river-substantially-higher-than-normal-photo-update/

Carbon County

Table 9-4 Previous Floods in Carbon County, 1905-2018

Date	Location	Deaths/ Injuries	Damage ($)	Flood Type	Description
4/5/1937	Carbon County			Flood	Locally heavy rains, accompanied by high temperatures, which caused rapidly melting snow on the 15th, caused considerable flood damage. In the northern portion of Carbon County Sage Creek reached the highest known stage, washing out bridges and carrying away farm buildings.
9/1/1938	Southeast, Central Wyoming			Flood	Some damage was reported from the heavy rains to highways and bridges in the southeast and central portion of the state.
4/4/1950	Rawlins			Flood	Light damage occurred at Rawlins on the 4th when storm sewers were unable to carry off water from a heavy shower, causing flooding of some basements.
5/1/1952	Baggs			Flood	Local flooding occurred in a few streams where rapidly melting snow in the mountains caused a few streams to leave their banks. The most important flooding occurred at Baggs where Savery Creek backed flood water into the business section of the town.
5/12/1984	North Platte River, Tributaries near Saratoga, tributaries near Little Snake River	0/0	$0	Flood	Rain storms combined with snowmelt runoff augmented on Little Snake River when water breached a dam. Damage to rural property in Baggs. Greater than 100-year flood

Date	Location	Deaths/ Injuries	Damage ($)	Flood Type	Description
5/14/1984	Baggs, Savery, Dixon, Little Snake River	0/0	$5,000,000	Flood	High runoff from melting snow in the mountains of southern Wyoming and northern Colorado; Burst small dam, 4-foot wall of water poured down canyon (sudden warm temps & heavy blanket of snow). $5 million of damage to area; damage to water treatment plant, land crops, fences, irrigation systems, structures, livestock, 26 homes and trailers damaged. Recovery response was from small business administration, Civil Defense, Red Cross, and Army Corps of Engineers. Runoff estimated at 500-year level.
5/16/1984	Dixon	0/0	$0	Flood	A greater than 100-year flood caused by snowmelt runoff augmented by an upstream reservoir failure had a discharge of 13,000 CFS.
6/10/1986	35NW Laramie	0/0	$225,000	Flood	Pierce Dam failed at 1941 MST, spilling its contents into Rock Creek. This was about 35 miles northwest of Laramie along the Albany and Carbon County line. A bridge over Rock Creek along Wyoming Highway 13 was undercut. There was some flooding of buildings and ranch lands where Rock Creek runs into the Medicine Bow River.
8/11/1990	Near Saratoga	0/0	$2,250	Flash Flood	Heavy thunderstorm rains of 1- to 3-inches caused flash flooding mainly in the Snowy Range 15 to 20 miles east of Saratoga. Two campgrounds in the Snowy Range had to be evacuated due to high water on creeks and streams.
5/24/1996	Rawlins	0/0	$0	Flood	Heavy rainfall in a short time caused street flooding in Rawlins. Some roads were closed for a time and some accidents occurred.
5/19/2008	Baggs			Flood	High temperatures created a rapid melt of mountain snowpack which, in turn, caused the Little Snake River to overflow its banks.
6/6/2010	Elk Mountain	0/0	$0	Flood	Excessive water from nearby snow melt caused the Medicine Bow river on the southwest side of town to flood. Houses near the river were sand bagged to prevent flood damage.

Date	Location	Deaths/ Injuries	Damage ($)	Flood Type	Description
6/7/2010	Saratoga	0/0	$0	Flood	Excessive snow melt caused the North Platte river to flood the public golf course and Veteran's Island.
7/19/2011	Ryan Park	4/2	$0	Flood	Debris carried down by runoff from heavy rainfall clogged a drainage culvert on a small section of Highway 130, resulting in the water washing away the pavement around the culvert shortly after midnight on July 19. Four fatalities occurred when one vehicle drove into the washout, with its driver escaping injury. An emergency vehicle also drove into the washout, but the driver was able to escape.
7/29/2014	Shirley Basin	0/0	$0	Flash Flood	Slow moving thunderstorms produced very heavy rainfall with observed totals of two to four inches. Runoff on saturated grounds caused flash flooding across portions of the county. One to two inches of rain in two hours caused flash flooding of low lying areas in Shirley Basin.
7/29/2014	Oil Springs	0/0	$0	Flash Flood	Slow moving thunderstorms produced very heavy rainfall. Two to three inches of rain in three hours caused flash flooding about five miles east and northeast of Battle Mountain with a few dirt roads washed out.

9.4. Geologic Hazards (Landslide/Land Subsidence/Mine Collapse)

9.4.1. Location

Carbon County

Underground Coal Mines

Arlington Quadrangle:

- Cottontail Mine – T18N R78W Section 2

Bolten Ranch 15' Quadrangle:

- McCord Prospect – T19N R85W Section 19
- Peck Mines – T19N R85W Section 19
- Unnamed mine – T19N R86W Section 13
- Unnamed mines (3) – T19N R86W Section 14
- Unnamed prospect – T19N R85W Section 19

Bradley Peak Quadrangle:

- Fieldhouse Prospect – T25N R86W Section 23
- Unnamed mine – T25N R85W Section 20
- Kronkheit Mine – T25N R85W Section 17

Bridger Pass 15' Quadrangle:

- Nebraska Mine – T20N R88W Section 6

Bull Springs Quadrangle:

- Pettingrew Mine – T25N R89W Section 30
- Unnamed mine – T25N R89W Section 29

Carbon Quadrangle:

- Carbon #1 Mine – T22N R80W Sections 26, 27
- Carbon #2 Mine – T22N R80W Sections 26, 35
- Carbon #3 Mine – T22N R80W Sections 26, 27
- Carbon #5 Mine – T22N R80W Section 14
- Carbon #6 Mine – T22N R80W Sections 26, 27
    - The Carbon mines are near a pipeline. Reclamation should be confirmed.
- New Garey Mine – T21N R80W Section 32

Como East Quadrangle:

- Carbon #4 Mine – T22N R80W Section 14
- Carbon #5 Mine – T22N R80W Section 14

Como West Quadrangle:

- Carbon #5 Mine – T22N R80W Section 14

- Sampo Mine – T22N R81W Section 2

Cottonwood Rim Quadrangle:

- Carbondale Mine – T13N R87W Section 7
- Stemp Springs Mine – T13N R88W Section 13

Dana Quadrangle:

- Dana Mine – T21N R82W Section 5; T22N R82W Section 32
    - This mine is near a railroad line. Reclamation should be confirmed.
- Vanguard No. 2 Mine – T22N R82W Section 18
    - This mine is near a road. Reclamation should be confirmed.

Difficulty Quadrangle:

- Coulter Mine – T24N R81W Section 35
    - This mine is near the Medicine Bow River. Reclamation should be confirmed.

Doty Mountain 15' Quadrangle:

- Corlett Opening – T16N R92W Section 4
- Muddy Bridge Mine – T15N R92W Section 12
- Robertson Mine – T17N R90W Sections 3-5
    - This mine is near a road and Muddy Creek. Reclamation should be confirmed.

Elk Mountain Quadrangle:

- Carbon County Mine – T21N R80W Section 32
- Elk Mountain prospect – T20N R80W Section 6
- Finch Mine – T21N R80W Section 32
- Gebhart Mine – T21N R80W Section 32
- Johnson Mine – T21N R80W Section 32
- Old Garey Mine – T21N R80W Section 32
- Unnamed mine – T20N R80W Section 4
- Unnamed mines (2) – T20N R80W Section 6
- Unnamed mines (2) – T21N R80W Section 32
- West Mine – T21N R80W Section 32
- Wilson #2 Mine – T21N R80W Section 32

Elmo Quadrangle: * All mines in this quad are near roads. Confirm reclamation.

- Elmo Peacock Mine – T22N R81W Section 16
    - This mine is near railroad line. Reclamation should be confirmed.
- Hanna No. 3 Mine – T22N R81W Section 16
- Hanna No. 4 Mine – T22N R81W Sections 17 and 18
- Hanna No. 4a Mine – T22N R81W Sections 3, 4, 9, 10, 16, 17; T23N R81W Section 33
    - This mine is near railroad lines.
- McMillen Mine – T22N R81W Section 8
- Nugget Mine – T22N R81W Section 10
- Foote Creek Lake Quadrangle:

- Burn Right Mine – T21N R78W Section 24

Grieve Reservoir Quadrangle:

- Linde Opening – T12N R88W Section 8
    - A road was built over the mine opening. Reclamation should be confirmed.

Halfway Hill Quadrangle:

- Carbon No.1 – T22N R80W Section 26
- Carbon No. 2 – T22N R80W Sections 26, 35, 36
- Carbon No. 6 – T22N R80W Section 26
- Carbon No. 7 – T21N R80W Section 1; T22N R80W Section 36
    - All mines in this quadrangle are near pipelines. Reclamation should be confirmed.

Hanna Quadrangle:

- Hanna No. 1 Mine – T22N R81W Sections 16, 19, 20, 21, 28, 29
- Hanna No. 2 Mine – T22N R81W Section 19, 30; T22N R82W Sections 24, 25
- Hanna No. 3 Mine – T22N R81W Sections 7 and 21
- Hanna No. 3 ½ Mine – T22N R81W Section 16, 17, 21
- Hanna No. 4 Mine – T22N R81W Sections 17-20
- Unnamed mine adit – T22N R81W Section 28
- *All mines in this quadrangle are near U.S. Highway 30/287, other roads, and railroad lines. Reclamation should be confirmed.

Lone Haystack Mountain Quadrangle:

- Miller prospect –T23N R85W Section 18

McFadden Quadrangle:

- Sprague Mine – T20N R78W Sections 21, 28

Muddy Gap Quadrangle:

- Old Speger Mine – T27N R89W Section 8
- Unnamed prospect – T27N R89W Section 17

Overland Crossing Quadrangle:

- Larsen Mine – T19N R85W Section 28
- Moomaw and Everist Mine – T19N R85W Section 21
- Petty Mine – T19N R85W Section 26
- Phillips Mine – T19N R85W Section 35
- Ream and Ramsey Mine – T19N R85W Section 26
- Sehorn Mine – T19N R85W Section 26
- Unnamed mines (2) – T19N R85W Section 21
- Unnamed mines (2) – T19N R85W Section 28
- Unnamed mines (2) – T19N R85W Section 35
- Unnamed mine – T19N R85W Section 36
- The mines in Sections 21 and 28 are near the North Platte River. Confirm reclamation.

Pats Bottom Quadrangle:

- Crane Mine – T23N R84W Section 26
- Prospect Mine – T22N R84W Section 2
- Unnamed mines (2) – T22N R84W Section 25
    - The Crane Mine and the unnamed mines are near the North Platte River and Seminoe Reservoir.

Pierce Reservoir Quadrangle:

- King Mine – T19N R77W Section 7
- Monarch Mine – T19N R77W Section 7
- Terry Mine – T19N R77W Section 18
    - All mines in this quadrangle are near a pipeline. Reclamation should be confirmed.

Poison Basin Quadrangle:

- Cedar Hills Mine Group – T13N R92W Section 32
- Jack Rabbit Mine Group – T12N R92W Section 5; T13N R92W Section 32
- Matt Mines – T12N R92W Section 4
- Poison Basin Mines – T12N R92W Section 4
- Teton Mine Group – T13N R92W Section 31
    - Poison Buttes Road crosses near or through Jack Rabbit Mine, Poison Buttes, and Matt Mines. Reclamation of these mines should be confirmed.

Rawlins Peak 15' Quadrangle:

- Pine Bed Mine – T21N R89W Section 26
- Unnamed mine – T21N R89W Section 21
- Unnamed mine – T21N R89W Section 24
- Unnamed mine – T21N R89W Section 25
    - The mines in Sections 24-26 are near a railroad line. Reclamation should be confirmed.

Savery Quadrangle:

- Angier Mine – T12N R89W Section 6
- Beeler Mine – T12N R89W Section 5
- Company Bank Mine – T12N R89W Section 9
- Darling Mine – T12N R89W Section 5
- Easom Mine – T12N R89W Section 8
- Pioneer Mine – T12N R89W Section 8
    - Mines listed above are near either Savery Creek or roads. Reclamation should be confirmed.
- Unnamed mine – T13N R89W Section 32

Schneider Ridge Quadrangle:

- Unnamed mine – T24N R82W Section 8
- Unnamed mine – T24N R83W Section 11

Seminoe Dam SW Quadrangle:

- Miller Mine – T25N R85W Section 35
- O'Brien Spring Mine – T24N R85W Section 9

Tenmile Spring Quadrangle:

- Vanguard No. 1 Mine – T22N R82W Section 8
- Vanguard No. 2 Mine – T22N R82W Section 18
- Vanguard No. 3 Mine – T22N R82W Section 7; T22N R83W Section 12

T L Ranch Quadrangle:

- Black Diamond No. 1 Mine – T21N R79W Section 32
- Black Diamond No. 2 Mine – T21N R79W Section 32
- Johnson Mine – T20N R79W Section 6
- Kent Mine – T20N R80W Section 2
- Unnamed mine – T20N R80W Section 2
- Unnamed mine – T21N R79W Section 34

Walcott Quadrangle:

- Buckley and Ryan Mine – T21N R84W Section 14

Wild Horse Mountain Quadrangle:

- Burlington prospect – T24N R86W Section 26
- Penn Wyoming Mine – T25N R85W Section 20

Whiskey Peak Quadrangle:

- Muddy Gap Mine – T27N R89W Section 6
- Speger prospect – T27N R89W Section 6

Underground Hard Rock Mines

Arlington Quadrangle:

- Albion Mine – T18N R78W Section 27
- Little Ella-Senator Stewart Mine – T18N R78W Sections 16 and 21
- Richmond Mine – T18N R78W Section 27
- Unnamed adit – T18N R78W Section 5
- Unnamed mine – T18N R78W Section 27

Barcus Peak Quadrangle:

- Golden Clover Mine – T14N R82W Section 26

Blackhall Mountain Quadrangle:

- Beaver group adit/shafts – T13N R83W Sections 14 and 23

Bradley Peak Quadrangle:

- Apex adit – T26N R85W Section 32
- Deserted Treasure adits – T25N R85W Section 6

- Junk Creek Mine – T26N R85W Section 20
- Penn Mine – T25N R85W Section 6
- Sunday Morning Mine – T26N R85W Section 29
- Sunday Morning prospect – T26N R85W Section 29
- The King Mine – T25N R85W Section 6

Bridger Peak Quadrangle:

- Batchelder Mine – T14N R86W Section 18
- Doane-Rambler Mine – T14N R86W Section 25
- Echo Property shaft – T14NR86W Sections 9, 15, and 16
- Ferris-Haggarty Mine – T14N R86W Section 16
- Island City Group shaft – T14N R86W Sections 3 and 10
- Leighton-Gentry/Jack Creek Mine – T14N R86W Section 5
- Meta Mine – T15N R86W Section 25
- Rex Prospect – T14N R86W Section 24
- Unnamed mine and prospects – T14N R86W Section 24
- Unnamed mine and prospects – T14N R86W Section 35

Coad Mountain Quadrangle:

- M & M's Elk Mountain Mine – T19N R82W Sections 22, 23, and 26

Divide Peak Quadrangle:

- Bridger Mine – T15N R87W Section 2
- Hub prospect – T15N R87W Section 6

Dudley Creek Quadrangle:

- Broadway Mine – T13N R83W Section 32
- Cascade Mine – T13N R84W Section 12

Encampment Quadrangle:

- Copper Schist Mine – T14N R84W Section 12
- Eureka shaft – T14N R84W Section 22
- Finley Mine – T14N R84W Section 22
- King of the Camp prospect – T14N R83W Section 36
- Kurtz-Chatterton Mine – T14N R84W Section 29
- Purgatory Gulch Mines – T13N R84W Section 1; T14N R84W Section 36
- Tennant property Mine – T14N R84W Sections 21 and 22
- Unnamed adits – T14N R84W Section 23
- Unnamed adits – T14N R84W Section 24
- Unnamed adits – T14N R84W Section 34
- Unnamed shafts – T14N R84W Section 24
- Unnamed shaft – T14N R84W Section 26
- Unnamed prospects – T14N R84W Sections 26, 35, 36

Ferris Quadrangle:

- Spanish Trails prospect #8 – T26N R86W Section 5
- Unnamed shaft – T26N R86W Section 5

Fletcher Peak:

- Anaconda Mine/North Fork Group/Homestake prospect/Three Forks Group - T12N R86W Sections 11-14
- Itmay Mine – T13N R86W Section 14
- Prospect 9999 – T13N R86W Sections 15 and 16
- Standard Mine – T13N R86W Section 12
- Unnamed mine – T13N R86W Section 11

Gunst Reservoir Quadrangle:

- Unnamed shaft – T14N R83 Section 20

Indian Rocks Quadrangle:

- Newton group – T14N R85W Sections 13 and 24

Keystone Quadrangle:

- Unnamed shafts (2) – T15N R80W Section 35

Morgan Quadrangle:

- Clare B. (Morgan) Mine – T18N R78W Section 34
- Cooper Creek adit – T17N R78W Section 3
- Copper Queen Mine – T18N R78W Section 27
- Emma G. Mine – T18N R78W Section 34
- Rip Van Winkle Mine – T18N R78W Section 27
- Silver Queen Mine – T18N R78W Section 34
- Silver King prospects – T18N R78W Section 34

Overlook Hill Quadrangle:

- Natures Mint Mine – T14N R80W Section 30
- Unnamed adit – T15N R81W Section 35

Red Mountain Quadrangle:

- Bonita prospect – T15N R85W Sections 25 and 36
- Charter Oak Mine – T15N R85W Section 24
- Continental group adit/shaft – T14N R85W Section 18
- Copper Rock group – T14N R85W Sections 27 and 28
- Gertrude Mine – T14N R85W Section 28
- Hercules Mine – T14N R85W Section 29
- Hidden Treasure Mine – T14N R85W Section 28
- Newton group – T14N R84W Sections 18 and 19
- Portland Mine – T14N R85W Section 30
- Rambler Mine – T14N R85W Section 30
- Section 8 Mine – T14N R85W Section 8

- Sun-Anchor and Sweet claims – T14N R85W Section 34
- Unnamed mine – T14N R85W Section 25
- Unnamed shaft – T14N R85W Section 25
- Unnamed mines (3) – T14N R85W Section 29

Sharp Hill Quadrangle:

- North Spring Creek prospect – T15N R86W Section 10
- Unnamed mine – T15N R86W Section 13

Singer Peak Quadrangle:

- Buckeye Lode – T14N R87W Section 11
- Syndicate Mine – T15N R87W Section 26
- Unnamed mine – T15N R87W Section 27

Solomon Creek Quadrangle:

- Century Mine – T13N R85W Sections 32 and 33
- Hinton-Verde Mine – T13N R85W Section 32
- Sun-Anchor and Sweet claims – T13N R84W Section 6
- Unnamed mine – T12N R85W Section 15
- Unnamed mine – T13N R85W Section 33

Spanish Mine Quadrangle:

- Done Moving prospect – T26N R86W Section 5
- Mathilda Jane Mine – T26N R86W Section 6
- Spanish Mine – T26N R86W Section 6
- Spanish Trails #1 prospect – T26N R86W Section 6
- Spanish Trails #4 adit – T26N R86W Section 6
- Spanish Trails #4 prospect – T26N R86W Section 6
- Unnamed shaft – T26N R86W Section 6

Seminoe Dam Quadrangle:

- Long Creek area shaft – T26N R85W Section 26

Trent Creek Quadrangle:

- Big Creek (Bonanza, Cox) Mine – T13N R81W Sections 8, 9
- Platt Mine – T13N R81W Section 9
- Unnamed mine – T12N R81W Section 7
- Unnamed shaft – T13N R82W Section 16

9.5. Thunderstorm/Hail/Lightning

9.5.1. Previous Occurrences

Albany County

Thunderstorm

Table 9-5 Damaging Thunderstorm Wind Events in Albany County, 1964-2018

Date	Location	Deaths/ Injuries	Mag. (mph)	Damages	Description
10/16/1996	Laramie	0/0	83	$20,000	A thunderstorm moved through the southern and central Laramie valley and produced strong wind gusts. The Laramie airport reported a gust to 81 MPH. The strong winds downed some trees and caused other minor damage in and near Laramie.
7/14/1998	Laramie	0/0	70	$4,000	Thunderstorms produced wind gusts up to 70 mph in Laramie, which downed two power poles on the southeast side of town.
6/21/2002	Laramie	0/0	60	$25,000	Microburst winds resulted in several downed trees, some onto homes, in Laramie.
6/27/2017	Laramie – Breese Field	0/0	90	$0	The wind sensor at the Laramie Airport measured a peak gust of 90 mph. The very strong winds uprooted and snapped trees, crushing homes and vehicles, downed utility poles, and ruptured a gas line in Laramie. Two dozen large trees were down in the parks and Greenhill cemetery. Power outages affected more than 2000 customers. No injuries were reported.
Totals		**0/0**	**Max= 90 mph**	**$49,000**	

Lightning

Table 9-6 Previous Lightning Occurrences in Albany County, 1950-2018

Date	Location	Deaths/ Injuries	Damages	Description
5/24/1950	Rock River	0/1		One Man was injured when struck by lightning near Rock River during a thunderstorm.
5/25/1956	Lookout 14 NE	0/0		A yearling heifer was killed by lightning

Date	Location	Deaths/ Injuries	Damages	Description
6/6/1961	NW of Laramie	1/0	$2,750	Lightning struck a herd of sheep, killing the herder and 89 sheep.
7/7/1971	10 miles WSW of Laramie	0/1		Lightning struck near two men injuring one of them.
6/20/1974	Hidden Valley	0/1	$275	In Hidden Valley, Pole Mountain Division, Medicine Bow National Forest, lighting struck a fiberglass sports car injuring the occupant, blowing out the tires and starting a fire.
8/30/1981	Albany County	1/1		Lightning struck and killed one person and injured another.
9/14/1981	Laramie	0/0		Repeated lightning strikes caused damage to Pacific Power equipment leading to extensive power outages.
7/8/1982	Jelm Mtn	0/0	$9,000	Lighting destroyed a $7,000 surge arrestor at UW infrared observatory on 9656 foot summit of Jelm Mountain. A second strike on July 15 knocked out $2,000 worth of peripheral equipment.
8/12/1982	NW Wheatland	0/0		Lightning caused a two acre grass fire 30 miles northwest of Wheatland on the Albany County border.
7/28/1987	Laramie	0/0		Heavy thunderstorms in the city of Laramie, several lighting strikes were reported in the city with a few trees damaged by lightning.
10/5/1988	25 W of Cheyenne	0/0		Lightning caught an unknown number of trees on fire.
6/26/1996	Laramie	0/0	$4,000	Lightning struck several trees in Laramie. A 40 foot cottonwood tree was apparently uprooted by the lightning and fell onto a house. Another tree was struck by lightning and started a small fire in a nearby house.
7/07/1996	Laramie	0/0	$2,000	Lightning struck and splintered a large tree in Laramie. A television and a VCR in a nearby house were also destroyed.
8/5/1996	25 W of Wheatland	0/0	$300,000	
7/24/1999	Centennial	2/0	-	Lightning killed two hikers on Medicine Bow peak northwest of Centennial, WY, about 150 to 200 feet below the summit at an altitude just over 12,000 feet.
9/2001	Albany County	-	-	Lightning Fire Harmony: Lightning started wildfire; 100 acres burned

Date	Location	Deaths/ Injuries	Damages	Description
2009	Albany County	-	-	The previous plan notes that 12 wildland fires occurred in 2009 that were largely ignited by lightning. They did not result in significant damage.
2012	Albany County			3 out of 4 major wildfires started by lightning
Totals		**4/4**	**$318,025**	

Hail

Events with associated damage and the largest extent are reported in Table 9-7 below.

Table 9-7 Albany County Damaging Hail Events

Date	Location	Deaths/ Injuries	Mag. (in.)	Damages	Description
9/8/1973	Albany County	0/0	4.5	None reported	Greatest magnitude event
7/16/1994	Laramie	0/0	1.75	$500	None reported
7/16/1994	Albany County	0/0	0.75	$500	None reported
7/3/2001	Laramie	0/0	1.75	$50,000	None reported
8/19/2001	Laramie	0/0	1.0	$10,000	Hail cracked windshields east of Laramie, WY.
Totals		**0/0**	**Max=4.5**	**$61,000**	

Carbon County

Thunderstorm

Events with associated damage, the highest wind speed, and reported injuries are shown in Table 9-8 below.

Table 9-8 Carbon County Damaging Thunderstorm Events

Date	Location	Deaths/ Injuries	Mag. (mph)	Damages	Description
7/25/1981	Carbon County	0/0	89	None reported	Greatest magnitude event.
8/2/1995	Hanna	0/0	-	$500	Thunderstorm winds damaged a shed and broke some windows in Hanna.
4/14/2000	Rawlins Airport	0/0	70	$100,000	A wind gust to 70 mph blew out windows in about 35 vehicles on the east side of Rawlins, WY.
4/20/2001	Rawlins	0/3	75	$50,000	Strong thunderstorm wind gust rolled a mobile home 3 times in Echo Springs, resulting in 3 injuries.

Date	Location	Deaths/ Injuries	Mag. (mph)	Damages	Description
Totals		**0/3**	**Max = 89 mph**	**$150,500**	

Lightning

Table 9-9 includes Wyoming lightning events that have caused deaths, injuries, and damage in Carbon County.

Table 9-9 Carbon County Previous Lightning Events

Date	Location	Deaths/ Injuries	Damages	Description
7/26/1956	South of Elk Mountain	1/0	$275	Lightning killed one person south of Elk Mountain in Carbon County.
6/22/1966	Baggs	0/1	$275	Lightning struck and killed a horse, injuring the rider.
5/15/1969	Medicine Bow	0/1	$275	Lightning killed a horse and injured its rider.
6/2/1976	Saratoga 33 NE	1/0	$0	Lightning killed a ranch hand on the TA Ranch on Pass Creek Road at about 1500 MST
7/30/1976	Medicine Bow 5 SE	1/0	$0	Lightning killed a 13-year-old boy while fishing at Chase Reservoir.
8/17/1986	Saratoga	0/0	$6,000	During the afternoon, a lightning-caused fire burned $6000 worth of baled hay just southeast of Saratoga.
7/11/1994		0/1	$0	Lightning struck a truck's antenna at a fire site near Saratoga. The bolt traveled from the truck to the ground and over to another truck where a sheriff's deputy was sitting slightly injuring the man.
6/14/1998	7 E Rawlins	0/1	$0	A motorcycle rider was hit by lightning as he was riding west on Interstate 80. He was struck in the back of the neck and the strike caused him to lose control of his motorcycle and crash into the median. The motorcyclist received a ruptured eardrum and burns to his eyes, chest and shoulder. The victim was taken to the hospital for treatment and released.
8/10/1998	15 S Arlington	1/1	$0	A woman was killed by a lightning bolt while hiking in the Snowy Range. A friend that was hiking with her was injured. The two were trying to get to lower levels of the mountains after spotting the storm, but the storm caught them in the open.

Date	Location	Deaths/ Injuries	Damages	Description
9/17/2002	12 S Encampment	1/0	$0	Lightning struck a tree and woman standing under it at the Pickaroon Campground in Medicine Bow National Forest. F51UT
2/16/2014	Encampment	0/0	$3,835	Loss of instrumentation at water plant due to lightning strike.
Totals		**5/5**	**$10,760**	

Hail

Table 9-10 Carbon County Previous Hail Events

Date	Location	Deaths/ Injuries	Mag. (in.)	Damages	Description
7/20/1958	Carbon Co.	0/0	0	$0	
7/20/1958	Carbon Co.	0/0	0	$0	
5/9/1972	Carbon Co.	0/0	1.25	$0	
7/26/1981	Carbon Co.	0/0	1	$0	
6/14/1982	Carbon Co.	0/0	0.75	$0	
7/19/1992	Carbon Co.	0/0	0.75	$0	
5/21/1993	Carbon Co.	0/0	0.75	$0	A report of hail to three-quarters of an inch was received from Elk Mountain.
9/17/1993	Sinclair	0/0	0.75	$0	An undersheriff reported a funnel cloud southwest of Rawlins. Near noon, hail up to 0.75 inch and 3 inches deep was noted on Interstate 80 through the town of Sinclair.
5/25/1995	Rawlins	0/0	1	$0	A thunderstorm in northern Carbon County produced a funnel cloud and hailstones up to one inch in diameter. No damage was reported as a result of the hail.
4/20/2001	Rawlins	0/0	1.5	$0	
7/22/2002	Medicine Bow	0/0	1.5	$0	Storm dropped large amounts of hail with sizes up to 1 1/2 inches. Heavy rain also occurred creating local areas of drifted hail as well as washing out a few rural roads.
8/12/2002	Rawlins	0/0	0.88	$0	
8/27/2002	Hanna	0/0	1.75	$0	
8/27/2002	Medicine Bow	0/0	1.25	$0	
6/23/2003	Seminoe Dam	0/0	0.75	$0	
7/2/2008	Rawlins	0/0	1.25	$0	Nickel to half dollar sized hail reported in the vicinity of Rawlins, WY.

5/22/2009	Shirley Basin	0/0	0.75	$0	Hail accumulated up to 2.5 inches deep.
6/6/2010	Elk Mountain	0/0	1.5	$0	
6/6/2010	Rawlins	0/0	1.25	$0	
7/4/2010	Hanna	0/0	1	$0	
7/4/2010	Elk Mountain	0/0	1	$0	Hail drifts of four to five inches deep against buildings.
7/24/2013	Shirley Basin	0/0	1	$0	Quarter size hail was observed a few miles south of Shirley Basin.
6/12/2016	Muddy Gap	0/0	1.75	$0	Golf ball size hail was reported at Muddy Gap.
7/5/2018	Seminoe Dam	0/0	1	$0	Quarter size hail was observed near Seminoe Dam.
Totals		**0/0**	**Mag=1.75**	**$0**	

9.6. Tornadoes

9.6.1. Previous Occurrences

Albany County

Table 9-11 gives a full description of previous tornado occurrences in Albany County since 1950, according to the NCEI.

Table 9-11 Albany County Previous Tornado Events

Date	Location	Mag	Death/ Injuries	Damage ($)*	Description
7/16/1953		F1	0/0	0	
7/3/1960		F1	0/1	0	Widest tornado in county history – 400 yards
6/15/1965		F0	0/0	0	
8/9/1974		F1	0/0	0	
8/9/1974		F1	0/0	0	
6/5/1977		F1	0/0	0	
7/21/1978		F0	0/0	0	
5/5/1979		F1	0/0	0	A small tornado briefly touched down in the Laramie area destroying a roof on the Regency Apts. Locals “saw a dust storm coming,” and shortly after the “twister hit the back of the building.” Also damaged were 14 vehicles, as pieces of the roof hit the parking lot area.

Date	Location	Mag	Death/ Injuries	Damage ($)*	Description
6/14/1982	Shirley Basin	F0	0/0	0	Two tornadoes touched down about 5 miles southeast of Shirley Basin between 10 and 10:15AM, moving east. ¾ inches hail reported near Wheatland Reservoir.
6/25/1982	Laramie Range	F0	0/0	0	Tornado spotted in the Laramie Range 3-3.5 miles north of Ninth Street about 1:30PM.
8/18/1983		F0	0/0	0	
8/3/1990	NE of Laramie	F0	0/0	0	A weak short-lived tornado touched down about 2 miles northeast of Laramie between 1529 and 1535 MST.
6/6/1991		F0	0/0	0	A tornado touched 2 miles north of Laramie.
6/21/1991		F0	0/0	0	Thunderstorms in southeastern Wyoming produced a tornado 4 miles west of Bosler at 1410 MST. Funnel cloud was reported 5 miles south of Cheyenne.
5/31/1994	Fox Park/Snowy Range	F0	0/0	0	National Weather Service instructors camping in the Snowy Range at mile markers six and seven near Fox Park saw a possible F0 tornado which downed 50 two- to three-foot diameter trees. One-quarter to one-half inch hail also fell and covered the ground one inch deep.
7/13/1994	Bolser	F0	0/0	0	
6/27/1995	Rock River	F0	0/0	0	A brief tornado touched down in Albany County 22 miles east of Rock River. Rock River is located 35 northwest of Laramie.
5/23/1996	Laramie	F0	0/0	50,000	A tornado briefly touched down just north of Laramie. The tornado downed a large spruce tree and a metal shed was blown up into a tree.
8/24/2002	Laramie	F0	0/0	0	
8/27/2002	Laramie/ Albany County	F0	0/0	0	Two weak tornadoes in the county – Weak tornado spotted in Pole Mountain military reservation. Second tornado (Weak) briefly touched down in open country.

Date	Location	Mag	Death/ Injuries	Damage ($)*	Description
5/22/2008	Perkins, Laramie	F0/EF2	0/1	$300,000	"A few" tornadoes reported. The most significant tornado tracked across southeastern Albany county into northern and eastern parts of the city of Laramie. Tornado skipped along its path north-northwest and moved across eastern and northeastern sections of Laramie, WY. Strong winds also overturned a tractor-trailer on Interstate 80 near Laramie and blew a boat off another trailer. Two trees blown down and minor damage to garage door. Hail 1.25 inch in diameter also fell. Event is detailed below.
5/23/2015	Bolser	EF0	0/0	0	A weak tornado touched down in open country eight miles west-northwest of Bosler and moved northwest at 15 mph. The tornado was on the ground for five minutes then dissipated. No damage was reported.
5/27/2018	Buford	Unknown	0/0	0	A tornado formed near the Whitaker exit along Interstate 25. but there was not a damage indicator to assign, so it was rated as EF-Unknown.
6/6/2018	Howell	EF2	0/0	0	A satellite tornado formed two miles to the south of the parent tornado. The tornado damaged treetops and caused significant structural damage to a well-built attached garage, which collapsed as it lifted off the foundation and shifted to the east. In addition, several nearby structures had minor damage to siding and shingles as the tornado was observed moving through the Antelope Ridge Loop subdivision, six miles north of Laramie, and into open country.

Date	Location	Mag	Death/ Injuries	Damage ($)*	Description
6/6/2018	Howell	EF3	0/0	0	An isolated supercell thunderstorm developed a tornado three to four miles west of Highway 30. The tornado continued an eastward track and intensified rapidly over the mainly open fields. Numerous wooden power poles were snapped along County Road 121, along with several galvanized steel utility poles, which were bent 90 degrees at the base. Grass was scoured out of the ground in a wide swath approximately one third of a mile in width near the intersection of County Road 121 and Cattle drive. The observed tornado continued east into the Laramie Range near King Mountain Road.
TOTAL	**26**	**EF3**	**0/2**	**350,150**	

*As reported by NCEI at time of event

2008 Laramie Tornado

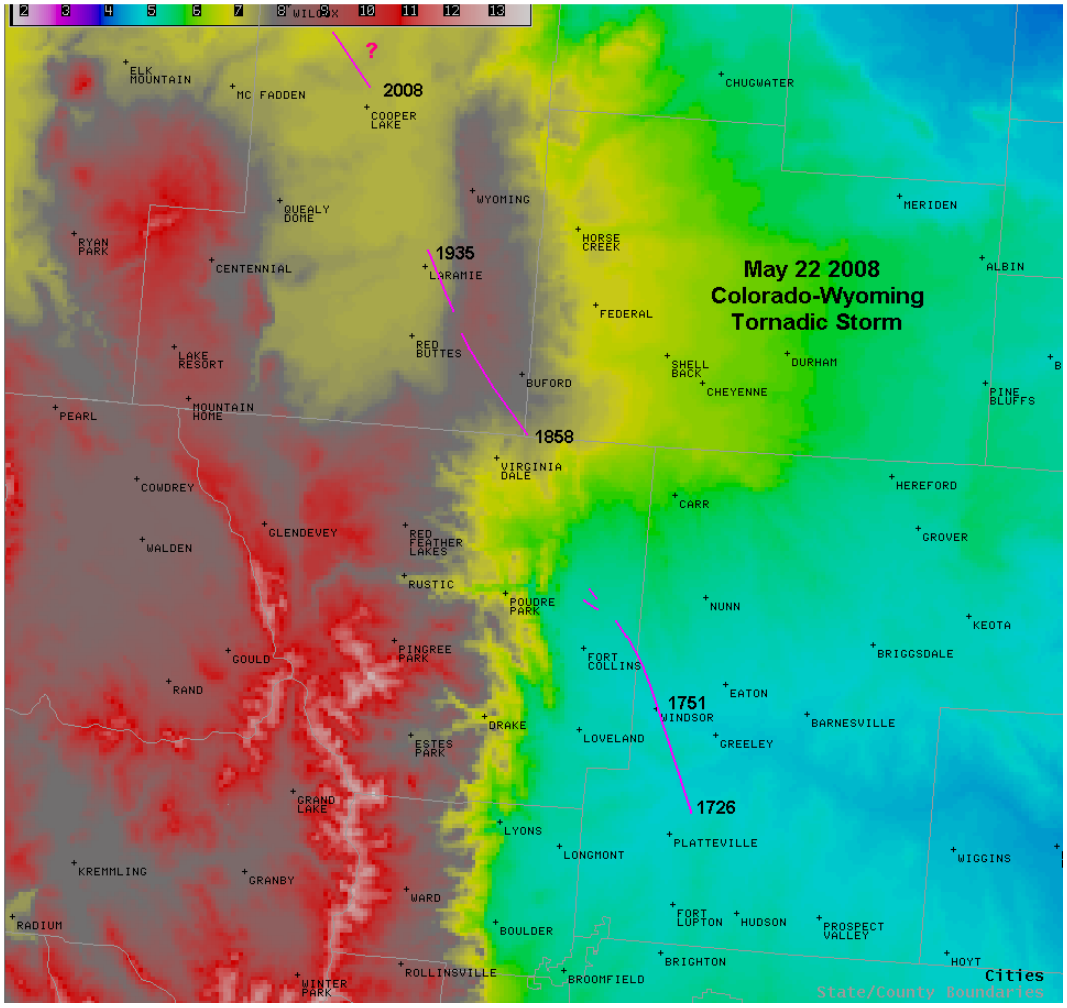
The tornadoes that impacted Albany County in late May 2008 were stronger than a typical event. They were able to maintain their intensity from northern Colorado, which speaks to its strength given the rugged terrain. While tornadoes do occur in the county, they occur infrequently and are rarely damaging. This tornado moved north-northwest (an unusual track) beginning at the county line. This tornado has the longest path and highest strength of all previous tornadoes in the county: 25.13 miles and EF2 magnitude. The Casper-Star Tribune noted widespread damage including:

- University of Wyoming Jacoby Golf Course
- Unfinished homes being built north of the junior high school
- Several power poles were knocked over in Sherman Hills east of town and on North 22nd Street
- Part of the roof and the entire porch of the Quadra Dangle Square Dance Club, an 80-year-old log building on the National Register of Historic Places
- The storm knocked down several very old, large spruce trees
- Tore the roof off the apartment building in eastern Laramie
- The roof of The Tumbleweed Express gas station was blown off in the storm, exposing insulation and electrical wiring
- The sides and roof of the football shed adjacent to the junior high football field were completely gone
- The Wal-Mart gardening area was damaged, and the store was closed Thursday afternoon.

In addition, Interstate 80 was closed due to several accidents including three overturned tractor trailers. There were several power outages in Laramie, some of which last more than 24 hours. In Rock River, the schools were put on lock down and fire trucks drove through town and altered residents over the PA.

However, the tornado lifted before reaching the town. While no deaths were reported in the county, two injuries were recorded. Figure 9-12 shows the tornado path.

Figure 9-12 2008 Laramie Tornado Path[106]



Carbon County

Table 9-12 gives a full description of previous tornado occurrences in Carbon County since 1950, according to the NCEI.

Table 9-12 Carbon County Previous Tornado Events

Date	Location	Mag	Death/ Injuries	Damage ($)*	Description
7/20/1958		F1	0/0	$30	
6/9/1960		F0	0/0	0	
5/29/1964		F1	0/0	0	

[106] http://www.bangladeshtornadoes.org/UScases/052208/052208terrainpaths.png

Date	Location	Mag	Death/ Injuries	Damage ($)*	Description
6/15/1966		F1	0/0	$25,000	
7/15/1967			0/0	$25,000	
7/2/1976		F2	0/0	$250,000	
8/14/1979		F0	0/0	0	
6/14/1982		F0	0/0	$30	
6/14/1982		F0	0/0	$30	
6/14/1982		F0	0/0	$30	
6/14/1982		F0	0/0	$30	
5/25/1995		F0	0/0	0	A slow moving tornado was reported by the public 13 miles north of Rawlins. No damage occurred and the path length and width were estimated. The Rawlins airport recorded a wind gust of 67 mph from a thunderstorm. No damage was reported at the airport.
6/6/1997	Seminoe Dam	F0	0/0	0	Brief touchdown in open country just south of Seminoe Reservoir.
6/8/1997	Ft Fred Steele	F0	0/0	0	Brief touchdown S of I-80 between Fort Steele and Saratoga in open country.
8/10/1997	Rawlins	F0	0/0	0	Touched down in open country causing no damage.
6/15/2015	Medicine Bow	EF0	0/0	0	A weak tornado touched down in open country eight miles east of Medicine Bow and slowly moved east. It dissipated five minutes later just west of County Road 610. No damage was reported.
Totals		**F2**	**0/0**	**$300,150**	

*As reported by NCEI at time of event

9.7. Wildfire

9.7.1. Previous Occurrences

Albany County

Significant previous wildfires in Albany County are described below.

2012 Wildfires

2012 was Wyoming's worst fire season on record. Thirty-five were reported in Albany County including three Class G Fires: Squirrel Creek, Arapahoe and Cow Camp. At one point, the Squirrel Creek fire, near Fox Park in southwest of Laramie, was ranked Number 3 nationally for fire assistance priority, while the

Arapaho Fire was ranked Number 1. Officials evacuated residents from both fires to the county fairgrounds.

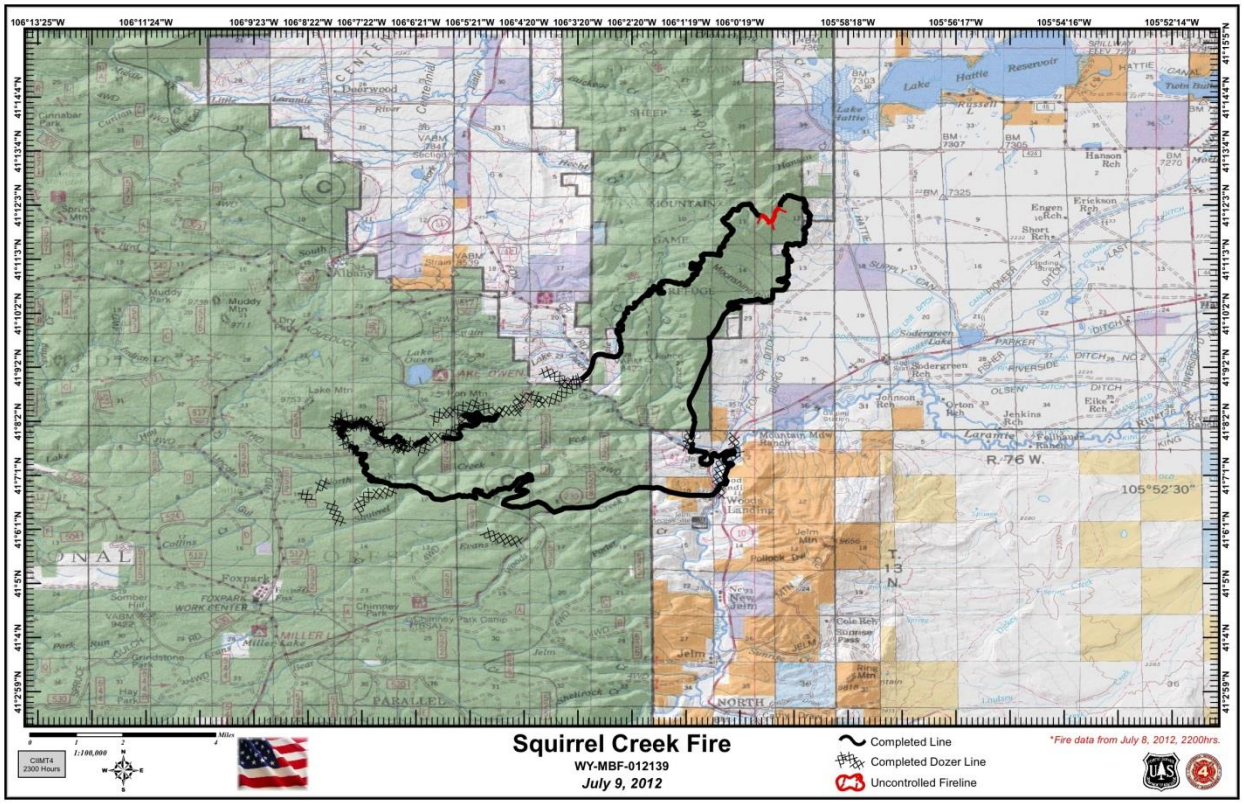
Squirrel Creek

The Squirrel Creek fire was first reported on June 30, 2012 and was declared "out," five months later in December 2012. It was approximately 17 square miles and was a human-caused fire. It was located near Fox Park. Squirrel Creek was declared controlled after 3 months but not "out" until five months later. At least three outbuildings and one residence were destroyed.[107] Hundreds were ordered to evacuate. The County set up a shelter at the fairgrounds in Laramie and held public meetings.[108] The July 4th Fireworks event was cancelled due to risk of fire. Figure 9-13 and Figure 9-14 below highlight burn areas from this fire.

Figure 9-13 Squirrel Creek Burn Area, One Year Later

[107] http://wildfiretoday.com/2012/07/05/wyoming-fires-july-5-2012/
[108] http://www.co.albany.wy.us/squirrel-creek-fire-public-meeting-2012-07-03.aspx

Figure 9-14 Squirrel Creek Fire Burn Area

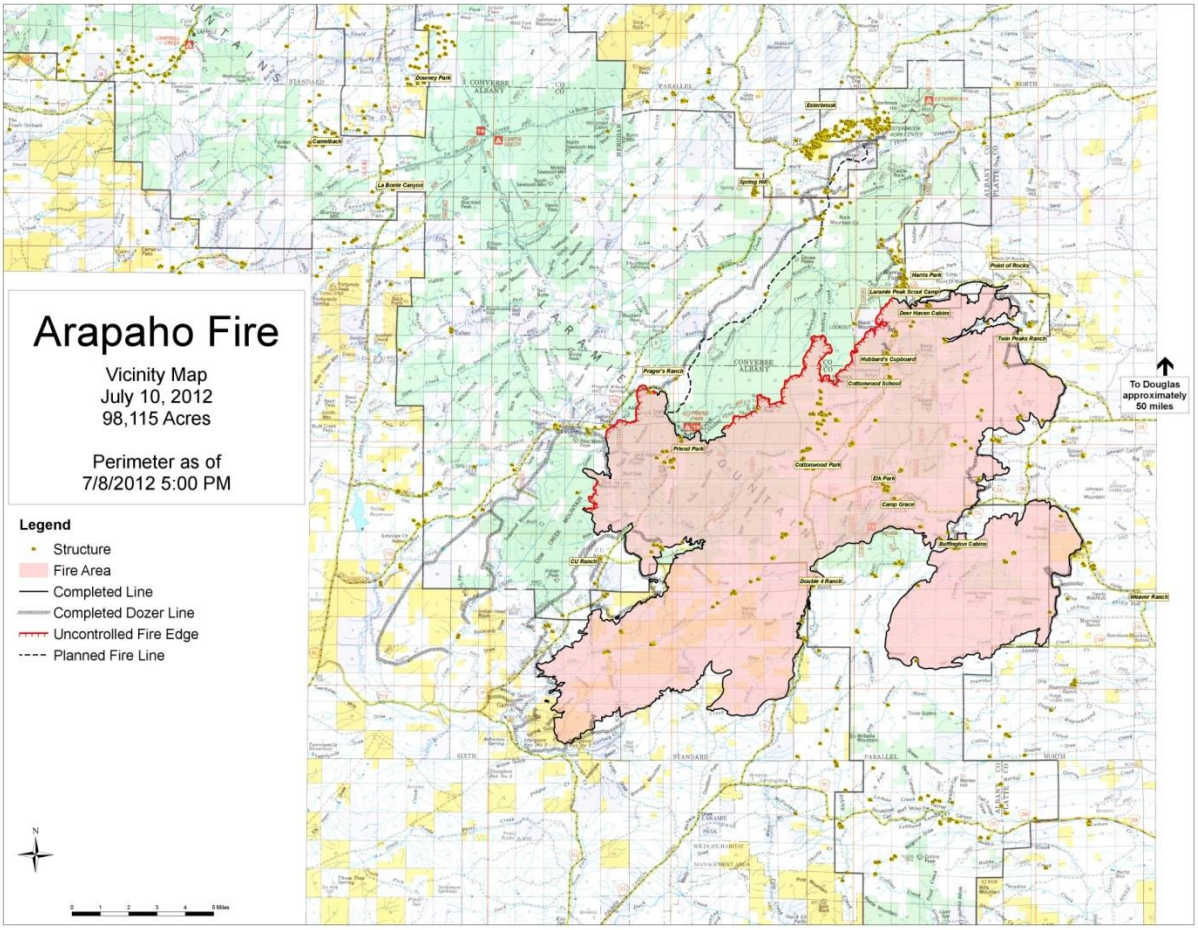


Arapaho

The Arapaho Fire started June 27, 2012 as a result of lightning near Wheatland. It was contained as of August 23, 2012. A Fire Management declaration was issued on June 29, 2012. At its peak, over 1,000 people were assigned to assist with it.[109] It burned approximately 150 square miles as shown in Figure 9-15[110]. It consumed about 90 buildings and cost more than $16 million. In Albany County, assessors looked at over 300 structures. Eight homes were damaged but not destroyed, and 54 barns and garages were destroyed. Eleven commercial buildings were also lost, including buildings at camps in the area.

[109] http://inciweb.nwcg.gov/incident/2959/
[110] http://k2radio.com/wyomings-largest-wildfire-destroys-30-homes/

Figure 9-15 Arapaho Fire Burn Area[111]



July 2017 Keystone Wildfire

A 2,527 acre lightning-caused wildfire approximately eight miles west of Albany left the communities of Moore's Gulch, Keystone, lower Keystone, and scattered homes inaccessible due to a closure by the USFS. Camping closures were also in place, affecting the Rob Roy Campground, dispersed campers near Rob Roy, Cinnabar Park, and Bobbie Thomson.

June 2018 Badger Creek Wildfire

The Badger Creek fire started on June 10, 2018 two miles northwest of Mountain Home in the Medicine Bow National Forest. The wildfire grew to 21,310 acres, and the cause is still unknown. The fire was 100% contained as of July 26, 2018. The fire resulted in several highway closures, including Highway 230 from Woods Landing to the state border with Colorado, as well as Highway 10. Additionally, a number of evacuations were in place regarding the fire, including orders for Mountain Home, Wyocolo, Beehive, Miller Lake, and the areas around the closed highways. Currently, post-fire debris flows and flooding are

[111] http://wildlandfires.files.wordpress.com/2012/07/1-1-20120712_arapaho_wy-alx-012131_briefing_land.jpg

a concern for the burn area. The U.S. Forest Service (USFS) completed Burned Area Emergency Response (BAER) mapping on the burn scar area. The following information regarding burn severity was reported by the USFS.[112]

"In the fire area, approximately 54% of the 20,302 acres analyzed by the BAER team within the Badger Creek Fire is considered unburned or low soil burn severity, while 36% sustained a moderate soil burn severity, and 10% burned at a high soil burn severity.

BAER post-fire assessment teams use the soil burn severity data to identify if there are areas of concern where increased soil erosion, accelerated surface water run-off, and debris flows have the potential to impact human life and safety, property, and critical natural and cultural resources from rain events. Forest Service BAER teams typically consist of scientists and specialists that consider emergency stabilization options for those critical resources.

BAER specialists expect erosion and run-off within the Badger Creek Fire area to increase as a result of the fire because 46% of the burned area experienced moderate or high soil burn severity. In specific areas that experienced moderate to high soil burn severity, there could be concern for run-off from steep hillslopes and resultant increases in post-fire erosion, flooding, and debris flows."

Figure 9-16 shows the burn severity map and Figure 9-17 shows debris flow probabilities, compiled by the BAER team.[113]

[112] https://www.fs.usda.gov/detail/mbr/news-events/?cid=FSEPRD588582
[113] https://inciweb.nwcg.gov/incident/maps/5928/12/

Figure 9-16 Badger Creek Fire Soil Burn Severity Map

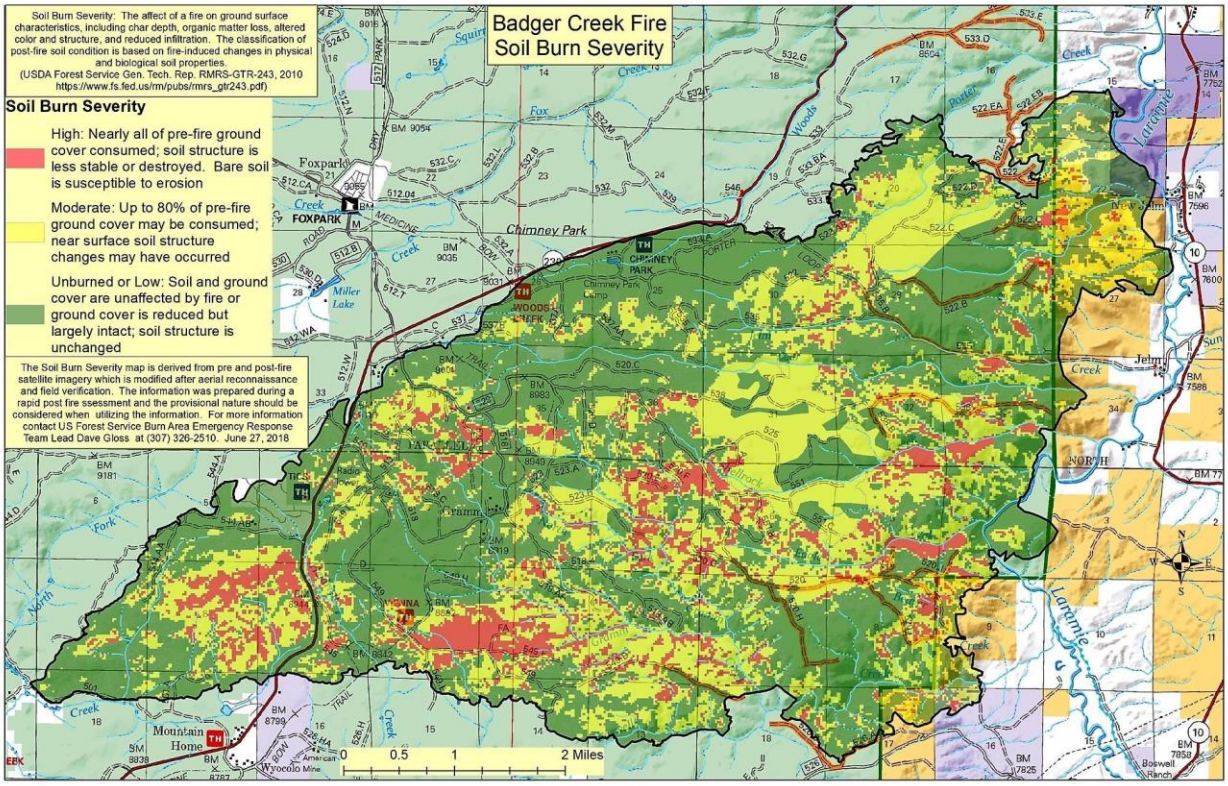
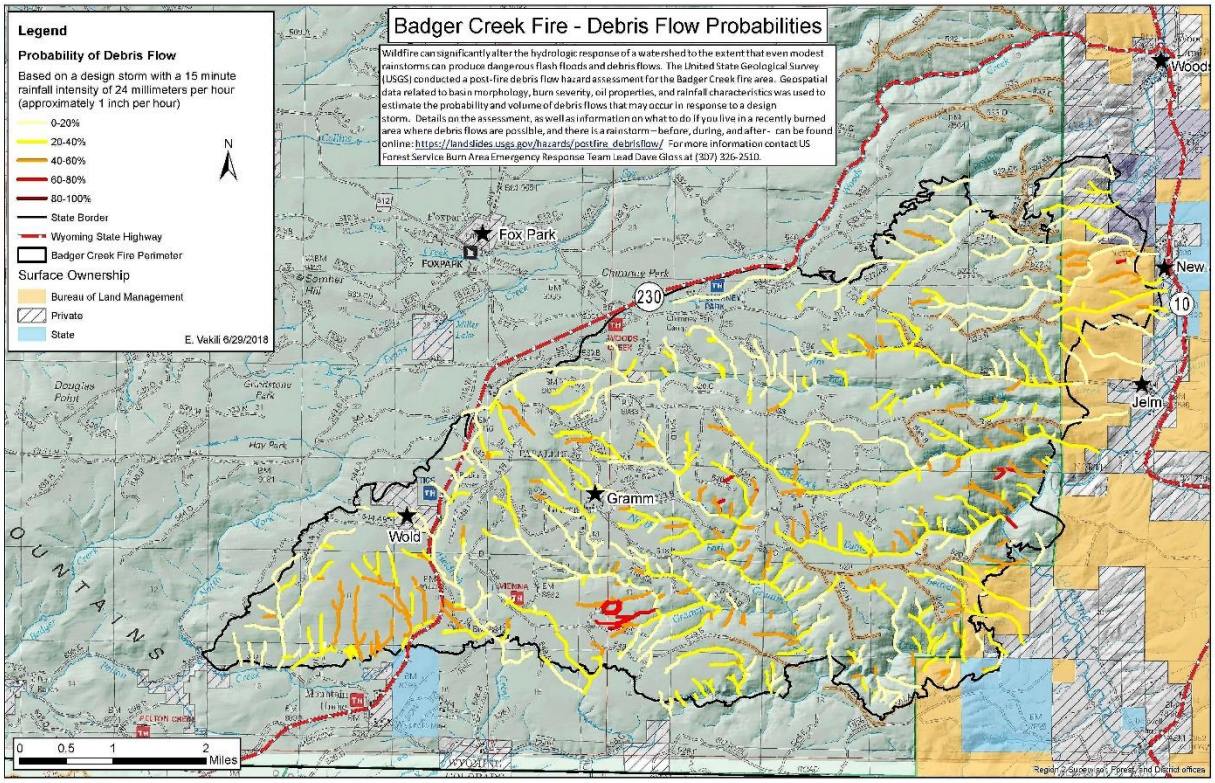


Figure 9-17 Badger Creek Fire Debris Flow Probabilities



July 2018 Beaver Creek Fire

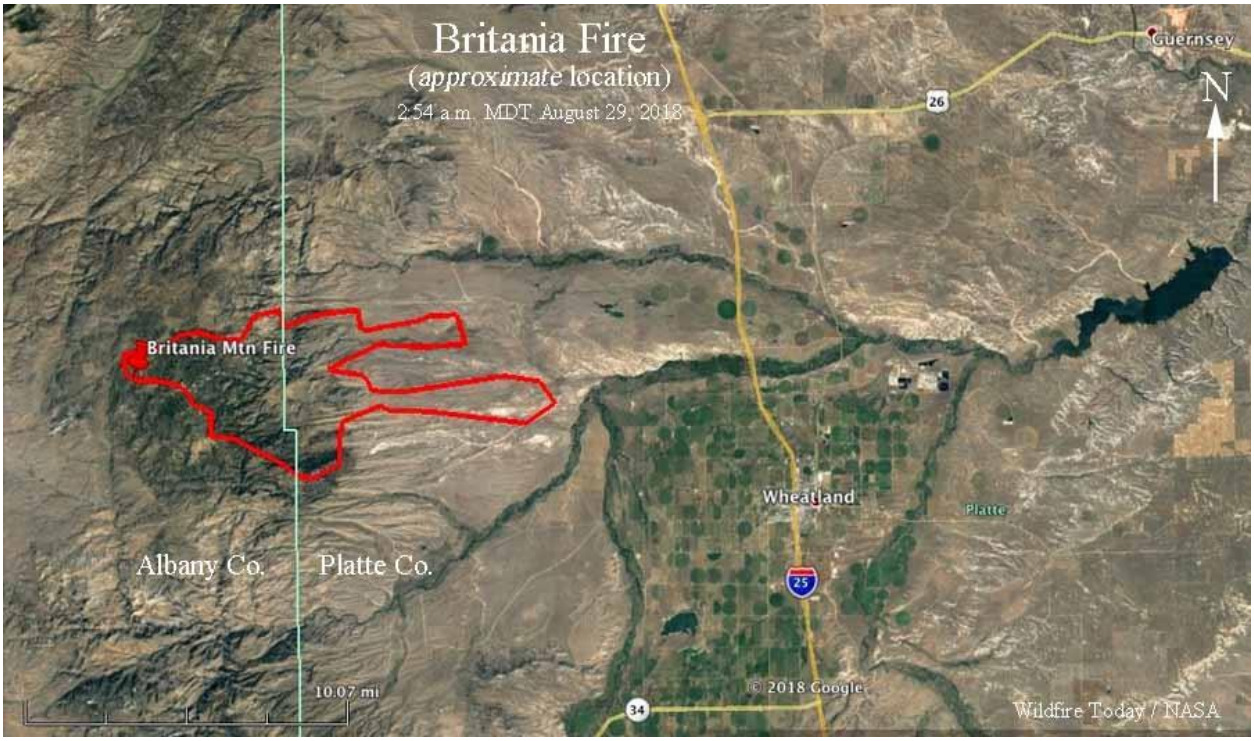
An approximately 38,000 acre wildfire started near Walden, Colorado spread into southern Albany County. The fire burned through mostly beetle-killed forests with volatile fuels, making it particularly difficult to contain. The fire was determined to be human caused

August 2018 Britania Mountain Fire

Originating approximately 8 miles northwest of Wheatland in Platte County, the >30,000 acre wildfire crossed the county line into eastern Albany County. The fire burned on both private land and the Medicine Bow National Forest. The fire burned through rugged terrain and damaged at least 19 structures, including four residences. The wildfire was lightning-caused. Evacuations were in place for Platte County residents north of Palmer Canyon Road west of Laramie River to the border of Albany County and for Albany County residents from the Platte County line to Cottonwood Road. Figure 9-18 shows the approximate location of the wildfire.[114]

[114] https://wildfiretoday.com/2018/08/28/britania-mountain-fire-burns-usfs-and-private-land-west-of-wheatland-wy/

Figure 9-18 Britania Fire Location



Carbon County

Table 9-13 Carbon County Recorded Wildfire Events (1988 through 2018)

County	Location	Fire Name	Date	Information
Carbon	Saratoga		8/17/1986	During the afternoon, a lightning-caused fire burned $6000 worth of baled hay just southeast of Saratoga.
Park, Teton, Carbon, Sweetwater, and Natrona			7/1/1988	During the month of July, at least 59 fires were started by lightning from mostly high-based thunderstorms that produced little rainfall. These included very large forest fires such as the Clover Mist Blaze in Yellowstone National Park and the Lost Fire over the Big Horn Mountains of northern Wyoming. On a week-by-week basis, the breakdown of lightning fire is as follows. Before and including the 2nd, fourteen lightning fires were started. During the 10th through the 16th, 18 such fires were reported. From the 17th through the 23rd, there were eight fires. Between the 24th and 30th, ten lightning blazes occurred. Finally, on the 31st, there were four fires. According to the BLM for Wyoming, 3,644.3 acres were torched with an estimated lost resource value of $364,430. This does not include the fires started by lightning in Yellowstone National Park because this information is not yet available.

County	Location	Fire Name	Date	Information
Park, Teton, Converse, Sweetwater, Lincoln and Carbon			8/17/1988	With the continuation of the hot, dry weather, at least 29 fires were started by lightning during the month of August. The thunderstorms that were responsible for the ignitions were generally high-based and produced little rainfall. Most of these fires were relatively small, less than 100 acres. However, the Dorn #2 fire, located in Washakie County, on August 14th, grew to 1514 acres. The largest blaze was the Fern Fire, located in Yellowstone National Park. That fire occurred on August 5th. The Fern Fire torched 2000 acres before it burned into the Clover Mist blaze (another fire ignited by lightning during the previous month of July). On a week-by-week basis, the breakdown of lightning fires is as follows. From the 1st to the 6th, there were 10 such blazes. Between the 7th and 13th, another 10 lightning fires occurred. During the 14th to the 20th, 6 fires were reported. Finally, from the 21st through the 2nd, there were 3 blazes. According to the BLM for Wyoming, 4,159 acres were torched with and estimated lost resource value of $415,900.
Carbon	NW Carbon County	Ferris Mountain Fire	October 2011	A lightning-ignited fire in an area of steep terrain and heavy timber. The fire was not threatening to any homes or outbuildings. Approximately 1,400 acres.
Carbon	NW Carbon County	Bear Mountain Complex Fire	2012	A 7,400 acre wildfire in northern Carbon County. No information on deaths, injuries, or damages reported.
Carbon	North of Seminoe Reservoir	Seminoe Dam Fire	July 2012	A 3,800 acre wildfire just north of Seminoe Reservoir. The fire burned about 5 square miles of sagebrush, juniper, ponderosa pine, and grass. Seminoe State Park remained open, but road closures in the Miracle Mile area north of Seminoe Dam occurred. No information on deaths, injuries, or damages reported.

County	Location	Fire Name	Date	Information
Carbon	Southern Carbon County	Snake Fire	September 2016	A 2,500 acre wildfire two miles north of the Wyoming/Colorado state line. Extreme fire growth resulting from single-digit humidity and wind gusts of 40 mph or more saw flames spread to the east and northeast of the fire's origin, with the blaze nearing Huston Park Wilderness. Some ranch structures as well as private and state land on the Medicine Bow National Forest were threatened. Hunters and campers in the area were evacuated. Unknown cause of fire.
Carbon	10 miles south of Encampment	Broadway Fire	August 2016	A lightning-caused wildfire exacerbated by dangerously hot and dry conditions in southeastern Wyoming spurred growth of the Broadway Fire, at 2,100 acres. The fire, located in the Medicine Bow National Forest, took place in beetle-killed forest. No information on deaths, injuries, or damages reported.
Carbon	Southeast Carbon County	Ryan Park Fire	September 2018	A 28,500 acre wildfire caused by an uncontrolled campfire in the Medicine Bow National Forest. The fire burned largely in beetle-killed forests. Firefighting personnel determined two structures and 10 outbuildings were destroyed. An area closure occurred for National Forest System lands surrounding the Ryan Fire to protect the public and fire personnel. This closure was on portions of both the Medicine Bow and Routt national forests.

Additionally, although not a wildfire, the Saratoga Forest Management lumber mill caught fire on April 16, 2018. Due to high winds gusting up to 52 mph and prevailing from the west, it was difficult for first responders to contain the fire. T fire jumped from one pile of wood chips to another before engulfing stacks of timber. By 4 p.m., as the situation was declared a "Code Red." Businesses and private residences around Saratoga Forest Management were evacuated as the danger to the east side of Saratoga increased. County and local authorities worked on prohibiting access around the lumber mill as traffic became congested with people slowing down to look at the rapidly increasing inferno. Pic Pike Road, Southeast River Street, Carbon County Road 504 and 205 and Saratoga Lake road all had access restricted to them. Smoke from the fire could be seen as far away as Walcott and flames were visible to drivers descending into the Valley. During a press conference held at 11:30 a.m. on Tuesday, April 17th at

the Saratoga Town Hall, Mayor Ed Glode declared the situation an emergency but informed the public that the fire was 100% contained and had burned 45-50 acres.[115]

9.7.2. Vulnerability Assessment

Inventory Exposed/Impacts

Albany County

Table 9-14 summarizes the community wildfire hazard ratings for Albany County based on the 2013 CWPP.

Table 9-14 Albany County 2013 CWPP Community Wildfire Hazard Ratings

Region	Community	Hazard Rating
North Albany County	Downey Park	High
North Albany County	Friend Park	Moderate
Greater Laramie Peak	Laramie Peak, including Harris Park/Laramie Peak Boy Scout Camp; Fletcher Park, Elk Park, Camp Grace; and Cottonwood Park	Moderate to very high
Greater Laramie Peak	Palmer Canyon	Moderate
	Flying X Ranch	Low
Greater Laramie Peak	Sybille	Moderate
Southeast	Roger Canyon	Low
Southeast	Sherman Hills	Moderate
Southeast	The Summit/ Rockaway Ranches	Moderate
Southeast	Boulder Ridge/ Fish Creek Ranch	High
Southwest	Rainbow Valley and North Fork	Very high
Southwest	Aspen Country	Low
Southwest	Albany	Very high
Southwest	Fox Creek	Moderate to very high
Southwest	Woods Landing/ Jelm/ Old Jelm	Very high
Southwest	Porter Ranch	High
Southwest	Mountain Home and Wyocolo	Very high
Southwest	Ox Yoke	Moderate
Southwest	Wold	Extreme
Southwest	Miller Lake/ Fox Park	Moderate
Southwest	Foxborough/ Valhalla	Extreme
Southwest	Lake Creek	Very high
Southwest	Greater Keystone area (Keystone, Moore's Gulch, Rambler)	Extreme, very high, and high

[115] https://www.saratogasun.com/story/2018/04/18/news/saratoga-fire-contained-emergency-declared/7206.html

9.8. Winter Storms/Blizzards

9.8.1. Previous Occurrences

Albany County

Table 9-15 Previous Blizzard Events in Albany County

Date	Location	Death/ Injuries	Damage ($)	Description
1886	Statewide	0/0	Loss of 50% of livestock operations	The winter of 1886-1887 was the earliest severe economic disruption. The snow that winter came early and grew. A freak thaw turned much of this snow into water. As cold weather moved back in, this froze into a crust of ice, which prevented cattle from getting through to the forage underneath. These conditions, accompanied by blizzards of unusual severity, caused a loss of over 50 percent among the State's livestock operations. The snow was six feet deep on the level between Mountain Home and Woods Landing. Trains were stalled on their tracks.
January 1888	Statewide	0/0		This blizzard covered a number of states. The combination of strong winds, snow and rapid temperature drops made it very dangerous. Loss of life was great and thousands of cattle died.
1897 Blizzard				
March 1931	Statewide	2/0 statewide		This blizzard covered several states. Temperatures dropped rapidly. Strong winds drifted snow badly, blocking highways for several days. Two people died in Wyoming.

Date	Location	Death/ Injuries	Damage ($)	Description
January 1949	Eastern and Central Wyoming	17/ Unknown (total area)		This is the most significant blizzard in Wyoming's history. Snowfall measured up to 30 inches, with drifts 20 to 30 feet high. Within 24 hours all road, bus and railroad traffic was halted. Thirty-three hundred miles of state highway lay in the storm area; there was an estimated loss of 15% of the State's cattle. Seventeen people perished, along with 55,000 head of cattle, and more than 105,000 sheep. "It is estimated from reports of field men that 4,194 people received aid through the Interior Department operations and that 104,839 cattle and 421,479 sheep were relieved. A total of 12,894 miles of roads and feed lanes were opened; 1,457 tons of food, fuel, and other supplies were hauled over opened roads." The total economic loss was estimated at over $9 million.
March 1950	Statewide	1/0		Heavy snow and strong winds covered much of several states; including Wyoming. Snowfall up to 60 inches fell in Wyoming. There was widespread damage to power lines and many cards and trains were stranded. Drifts were up to 16 feet deep.
May 1961	Statewide	0/0		Over one thousand people stranded on highways and in Laramie
February 1955	Statewide	4/0		Up to 11 inches of snow fell with winds to 65mph and temperatures below zero.
April 1968	Southern WY	3/0		Roads, UP and schools closed for three days in Albany County
March 1975	Statewide	0/0	$2,750,000	A severe blizzard with winds 40 to 50 mph and gusts to 75mph, snow and temperatures down to 0 degrees. Most damage was to livestock, especially new born.
Jan 1976	Statewide	0/0	$275,000	Heavy snow with strong winds. Livestock losses were minimal and most of the damage is attributed to loss of time, cars stuck, rescue missions, and snow removal

Date	Location	Death/ Injuries	Damage ($)	Description
October 1980	Statewide	4/0		Heavy snow and blizzard like conditions. Several vehicle accidents, one plane crash, and a freight train plowing into the back of a grain train, killing two crewmembers. Schools were closed throughout most of the state.
March 1990	Laramie	0/0		14" Shelter set up for 250 clients due to closed roads
January 1996	Albany, Carbon and Laramie Counties	0/0		Widespread blowing snow created near zero visibilities over the south central part of the state. Interstate I-80 was closed to and from Laramie
October 1996	Albany, Carbon, Platte, Niobrara and Laramie Counties	0/0	$20,000	The snow and winds closed many roads in the area. The heaviest snowfall was in the Laramie Mountains and Snowy Range, where 12 to 18 inches of snow were reported. The combination of snow and wind created many power outages across the South eastern part of Wyoming.
October 1997	Albany and Carbon Counties	1/30	$100,000	An accident near Laramie involving a bus injured at least 30 people. Icy conditions created a 20 mile long back up of traffic headed westbound on I-80 near the summit rest area between Laramie and Cheyenne. Postal delivery services were shut down in Cheyenne, the first time in fifteen years; damages in crops as well.
December 1998	Albany, Laramie and Carbon Counties	0/0	$56,250	I-80 closed with white out conditions, Buford also experiencing complete white out conditions.
December 1999	Albany County	0/0	$45,000	
September 2000	Laramie	0/0	$100,000	Roads closed and shelters were opened. I-80 closed due to numerous wrecks.
April 2001	Laramie	0/0		Roads, Businesses and Government offices closed
March 2003	Albany, Carbon, Converse, Goshen, Platte Counties	0/0	$100,000	Laramie had two feet of snow, wind gusts to 50mph with drifts

Date	Location	Death/ Injuries	Damage ($)	Description
February 2007	Rock River	0/0		National Guard called to Rock River to help with snow removal. Over 150,000 pounds of snow were removed.[116]
December 29, 2010	Laramie Range	0/0	0	51 MPH, zero visibility
December 19, 2012	Snowy Range, South Laramie, Laramie Valley	0/0	0	35-45 MPH, 1/8 mile visibility

Table 9-16 Previous Winter Storm Events in Albany County

Date	Location	Death/ Injuries	Damage ($)	Description
March 1957	Statewide	0/0	-	Heavy Snowfall, drifts were from 10 to 25 feet deep and many motorists were trapped in cars or snow bound in towns.
October 1961	Statewide	5/0	$27,500	Snow accompanied by high winds began early afternoon and continued throughout the evening. Three people were killed and four were injured in auto accidents caused by low visibility. Two hunters were lost and died in the storm. Over one thousand people stranded on highway and in Laramie.
Jan 1962	Albany County	0/0		Cold Snap: Temperatures dropped from -36 to -44
Jan 1963	Albany County	0/0		Cold Snap: Laramie reached its coldest temperature ever at 50 below
Sept 1965	Statewide	0/0	27,739	A cold wave moved over the state the evening of the 15th and caused considerable damage to crops, trees, and power and phone lines; stopped much of the transportation by closing roads; caused an estimated 5% shrinkage in marketable livestock and a few losses in livestock.

[116] http://trib.com/news/state-and-regional/snow-removal-stirs-debate/article_61727878-101b-545f-ba3f-e9966e93191a.html

Date	Location	Death/ Injuries	Damage ($)	Description
March 1973	Statewide		$275,000	The community was covered with 13.8 inches of snow. There were numerous power and communications outages as well as livestock losses. The National Guard opened roads for emergency vehicles.
December 1973	Albany County	0/0	-	11 consecutive days with temperatures below zero
November 1977	Statewide	1/0		Snow with large accumulations entered the state followed by heavy winds. Lots of people were stranded due to the closed roads.
December 1978	Statewide	0/0	$275,000	A very heavy snowstorm dumped over a foot of snow, followed by winds gusting to over 75mph, causing extensive blowing and drifting of snow. Isolated livestock and caused losses.
January 1979	Statewide	0/0	$21739.13 in 1979	Numerous heavy snow storms and extremely cold temperatures caused widespread damage across the state. Estimated loss of 2700 sheep and 2000 cattle with projected losses of calves and lambs to 35,000 head were reported. Extensive damages to water systems due to frozen water mains. Winter Storm Relief Act of $2.5 million requested.
January 1980	Statewide	4/0		Interstate 25 from Laramie to Utah was closed by winds approaching 80mph. An estimated 60 vehicles were in the ditch a long I-80 west of Rawlins. Reported 90 mph winds in Medicine Bow. Several schools closed
April 1983	Laramie	0/0		18.1 inches of snow fall
November 1983	Statewide	0/0	$2,750,000	The greatest damage occurred to homes and businesses as hundreds of water pipes froze and burst. 16.4 inches of snow fall in Laramie Wyoming.
March 1988	Laramie	0/0		The community was covered with 10 inches of snow
December 1992	Laramie	0/0		Bitter cold temperatures -20 at Laramie
February 1994	Southern WY	0/0	$714,285	Winter weather storm came through Albany County
April 1997	Albany / Carbon County	1/30	$100,000	Winter weather storm came through Albany County
December 1997	Albany County	1/18	$50,000	Winter storms caused several accidents and 18 people were injured and one death.

Date	Location	Death/ Injuries	Damage ($)	Description
March 1999	Albany County		$25,000	Winter storm came through the county creating accidents and utility shutdowns.
June 2005	Albany County	0/0	-	Late snow storm caused broken branches and downed power lines
February 2007	Albany County	0/0	-	Albany County EMA opens shelter for 90 students stranded
12/25/2009	Albany County	0/0	-	Area roads were closed due to snow and blowing snow reducing visibilities, creating hazardous driving conditions. At 25/1415 MST, a Union Pacific Railroad site at Emkay recorded a wind gust of 60 MPH.
10/25/2010	Snowy Range	0/0	-	Snow amounts in excess of 12 inches, closing portions of State Highway 130. In addition, the reported strong wind had produced hazardous travel conditions with drifts up to 4 feet.
12/18/2010	Snowy Range	0/0	-	COOP observer reported 38 inches of snow for event.
12/20/2010	Albany County	0/0	-	Law enforcement reported 12 inches of new snow in Laramie.
12/29/2010	Albany County	0/0	-	COOP observer reported 7.2 inches of snow in Shirley Basin.
1/15/2011	Snowy Range	0/0	-	SNOTEL site at North Brush Creek measured 18 inches of snow.
2/4/2011	Albany County	0/0	-	Law enforcement and truckers reported very hazardous driving conditions along Interstate 80 with strong winds producing blowing snow and near white out conditions.
4/3/2011	Snowy Range	0/0	-	The SNOTEL site at North French Creek (Elevation 10,130 ft) estimated a storm total snowfall of 18.3 inches.
4/17/2011	Snowy Range	0/0	-	SNOTEL site at North French Creek (Elev. 10,130 ft) estimated 21 inches of snowfall.
10/25/2011	Albany County	0/0	-	Five to eight inches of snow were reported.
11/1/2011	Albany County	0/0	-	Law enforcement reported heavy snow and strong winds in and around Elk Mountain. Portions of Interstate 80 closed.
11/30/2011	Albany County	0/0	-	WYDOT sensors and the public reported a combination of snow, wind gusts in excess of 50 mph creating near blizzard like conditions.

Date	Location	Death/ Injuries	Damage ($)	Description
1/20/2012	Albany County	0/0	-	Trained spotters reported that a combination of very strong winds and snow in excess of 6 inches produced by a winter storm. Considerable blowing and drifting snow was also observed.
2/19/2012	Albany County	0/0	-	Six inches of snow reported in the Arlington area. Strong winds caused considerable blowing and drifting snow.
10/13/2012	Albany County	0/0	-	Considerable blowing and drifting snow on Wyoming Highway 130 across the Snowy Range. Winds frequently gusted to 45 mph with very low visibilities.
12/17/2012	Snowy Range	0/0	-	West to southwest winds of 35 to 45 mph with gusts to 60 mph caused considerable blowing and drifting snow with low visibilities. The Sand Lake SNOTEL site (elevation 10050 ft) estimated 16 inches of snow.
1/28/2013	Albany County	0/0	-	Heaviest snowfall amounts were estimated between 3 and 5 feet over the higher peaks of the Snowy and Sierra Madre ranges. The upper North Platte River basin received four to eight inches of snow. West to northwest winds gusting to 60 mph produced near zero visibilities in blowing and drifting on open mountain passes. The Brooklyn Lake SNOTEL site (elevation 10240 ft) estimated 30 inches of snow.
2/9/2013	Albany County			Considerable blowing and drifting snow caused highway closures and poor visibilities. Storm total snowfall ranged from 6 to 10 inches for lower elevations, to as much as 18 inches for the mountains. The Sand Lake SNOTEL site (elevation 10050 ft) 30 miles west-northwest of Laramie estimated 16 inches of snow.
2/23/2013	Snowy Range			The Divide Peak SNOTEL site (elevation 8880 ft) estimated 12 inches of snow.
3/9/2013	Albany County	0/0	-	Several WYDOT sensors observed sustained winds of 35 to 45 mph with gusts to 55 mph. Visibilities were reduced to a quarter mile in falling and blowing snow. Two to three inches of snow was reported, mainly near the Interstate 80 Summit.

Date	Location	Death/ Injuries	Damage ($)	Description
3/11/2013	Albany County	0/0	-	Snowfall measured between four to ten inches, with estimates of as much as 14 inches over the Snowy Range. Interstate 80 between Cheyenne and Sinclair was closed in both directions due to moderate to heavy snow, strong winds and blowing snow. The Snowy Range ski resort measured 14 inches of snow.
4/8/2013	Albany County	0/0	-	Storm total snow accumulations up to two feet were observed across southeast Wyoming. The combination of falling snow and strong winds produced considerable drifting snow, which resulted in very low visibilities and snow packed roads. Numerous highways, including Interstate 80 from Rawlins to the Nebraska border were closed. Eleven inches of snow was reported at Elk Mountain.
4/15/2013	Albany County	0/0	-	Significant snow accumulations occurred with 6 to 18 inches over lower elevations and two to three feet over the mountains. Gusty north to northeast winds of 25 to 35 mph combined with the falling snow, which produced considerable blowing and drifting snow. Numerous highways, including Interstates 25 and 80 were closed due to very low visibilities and icy, snow-packed surfaces. The Crow Creek SNOTEL site (elevation 8330 ft) estimated 26 inches of snow.
4/22/2013	Albany County	0/0	-	Estimated snow totals of 8 to 14 inches were reported. Gusty north to northeast winds of 25 to 35 mph created areas of blowing snow and reduced visibilities. The Sand Lake SNOTEL site (elevation 10050 ft) estimated 14 inches of snow.
4/30/2013	Albany County	0/0	-	Storm total accumulations ranged from 6 to 20 inches, highest over the southern Laramie Range. An observer 15 miles west of Cheyenne measured seven inches of snow.

Date	Location	Death/ Injuries	Damage ($)	Description
10/4/2013	Albany County			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. Ten inches of snow were reported in Laramie, with 12 inches a mile south of Laramie.
11/16/2013	Snowy Range	0/0	-	Sustained west winds of 35 to 45 mph with gusts to 60 mph created considerable blowing snow and very low visibilities. Storm total snowfall was estimated from one to two feet.
12/3/2013	Albany County	0/0	-	Storm totals ranged from 6 to 18 inches, heaviest over the mountains. Westerly winds of 30 to 40 mph produced blowing snow, poor visibilities and very cold wind chill temperatures. Six to ten inches of snow were reported in and around Laramie.
1/3/2014	Snowy Range	0/0	-	Winds gusting as high as 50 mph created considerable blowing and drifting snow with low visibilities. Total snowfall amounts were estimated between 10 and 20 inches.
1/9/2014	Snowy Range	0/0	-	The Cinnabar Park SNOTEL site (elevation 9574 ft) estimated 22 inches of snow.
1/12/2014	Snowy Range	0/0	-	The Cinnabar Park SNOTEL site (elevation 9574 ft) estimated 18 inches of snow.
2/7/2014	Snowy Range	0/0	-	The Brooklyn Lake SNOTEL site (elevation 10240 ft) estimated 37.5 inches of snow.
2/12/2014	Snowy Range	0/0	-	The Medicine Bow SNOTEL site (elevation 10510 ft) estimated 16 inches of snow.
2/22/2014		0/0	-	Snow totals ranged from four to ten inches.
3/17/2014	Snowy Range	0/0	-	Snow totals ranged from 4 to 10 inches across the high plains, with 10 to 15 inches over the mountains. Near blizzard conditions combined with poor visibilities closed several major roads, including Interstates 80 and 25.
4/12/2014	Albany County	0/0	-	Periods of moderate to heavy snow and gusty northerly winds of 30 to 40 mph across portions of southeast Wyoming. Snowfall totals ranged from 6 to 12 inches. Reduced visibilities to a half mile along Interstate 80.

Date	Location	Death/ Injuries	Damage ($)	Description
4/27/2014	Snowy Range	0/0	-	A potent late season storm moved quickly across the Central Rockies and produced a brief period of moderate to heavy snow over the Snowy Range. Snow totals ranged from 10 to 13 inches. Wind gusts of 40 to 60 mph created near blizzard conditions.
12/18/2015	South Laramie Range	0/0	-	Very strong west to southwest winds with gusts of 60 to 70 mph and a fresh snowpack produced frequent whiteouts with near zero visibilities and significant drifting snow. Interstate 80 in the vicinity of the southern Laramie Range summit and between Laramie and Rawlins was closed for several hours.
3/22/2016	South Laramie Range	0/0	-	A potent Pacific low pressure system tracked northeast across Colorado and produced moderate to heavy snowfall and strong north to northeast winds. Gusts of 40 to 55 mph produced blizzard conditions with zero visibilities in falling and blowing snow. Interstates 25 and 80 were closed due to the adverse winter conditions. Snow totals ranged from six to 18 inches, heaviest over the Snowy, Sierra Madre and Laramie mountains.
12/25/2017	North Snowy Range Foothills	0/0	-	Another potent Pacific low pressure system followed on the heels of the December 23 storm system, and produced heavy snowfall over the Snowy and Sierra Madre Range mountains. Strong west to northwest winds up to 60 mph created considerable blowing snow with blizzard conditions through the Interstate 80 corridor between Laramie and Rawlins on Christmas Day. Mountain snowfall totals varied from 12 to 44 inches, heaviest over the Snowy Range. Interstate 80 was closed both directions for several hours.

Carbon County

Table 9-17 Significant Winter Storms through 2018 in Carbon County

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
12/2/1871	Cheyenne to Rock Springs to Fort Washakie				A blizzard began on the evening of December 2nd and lasted two days, affecting the entire length of the tracks across Wyoming. A train was stranded by snowdrifts blocking the tracks. Work trains were sent out from both the east and the west ends to clear the tracks. However, the winds continued to blow so severely that the tracks were blown full of snow and closed almost as fast as they were cleared. Finally, after several days of strenuous efforts, both work crews and the hungry passengers reached safety but the pattern for the next three months was set. Drifts went up to 15 feet high.
1/11/1888	Statewide	great loss of life		Thousands of cattle	This blizzard covered a number of states. The combination of strong winds, snow and rapid temperature drops made it very dangerous. Loss of life was great and thousands of cattle died.

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
2/28/1905	Statewide	Several		Loss of 50% of livestock operations	The winter of 1886-1887 was the earliest severe economic disruption. The snow that winter came early and grew very deep. Then, a freak thaw turned much of this to water. As cold weather moved back in, this froze into a crust of ice, which prevented cattle getting through to the forage underneath. These conditions, accompanied by blizzard of unusual severity, caused a loss of over 50 percent among the state's livestock operations. The snow was six feet deep on the level between Mountain Home and Woods Landing. On February 12, 1887 the storms were still raging over the state, and the snow was packed so hard that stages could drive over it. Trains were stalled on their tracks. The winter of 1886-1887 sounded the death knell of the open range cattle business as it had been during previous years. The real disaster to cattlemen had been in the winter of 1886, which has been called "The Equalizer". My father a boy of 8 at the time recalls that spring of 1887. In certain sheltered area he and companions amused themselves stepping from one carcass to another without ever setting foot to the ground.
3/25/1931	Statewide	2			This blizzard covered several states. Temperatures dropped rapidly. Strong winds drifted snow badly, blocking highways for several days. Two people died in Wyoming.

1/2/1949	Eastern and central Wyoming	17	$9,000,000	Livestock losses were great	Most significant blizzard in Wyoming's history. Snowfall measured up to 30 inches, with drifts 20 to 30 feet high. Within 24 hours of the storm initiation, all bus, rail, and air traffic was halted. There were thousands of stranded motorists and rail passengers. Thirty-three hundred miles of state highway lay in the storm area, there was an estimated loss of 15% of the state's cattle. Seventeen people perished, along with 55,000 head of cattle and more than 105,000 sheep. As the storm continued, Wyoming cities began to run out of food in the stores. Several other blizzards followed the first. "It is estimated from reports of field men that 4194 people received aid through the Interior Department operations; that 104,839 cattle and 421,479 sheep were relieved; and that help was given to 994 ranches. A total of 12,894 miles of roads and feed lanes were opened; 1457 tons of food, fuel, and other supplies were hauled over opened roads; 26,604 tons of feed was hauled over opened roads or made available; and the total number of operated machine hours, for snow moving equipment only totaled 18,310. Wind speeds were 30 to 78 mph with an average of 55 mph. Temperature was below zero. Funding: $200,000 initial relief, later an additional $500,000, federal government turned over $125,000. Out of the $700,000 appropriated, more than $450,000 was returned. Damage and cost: Highway department normally spent $265,000 for snow removal, this storm

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
					generated costs of $618,029.50; total economic loss is estimated at more than $9 million. Time spent: December through March snow removal equipment spent 139,000 hours; man-hours amounted to 201,000 hours. Cost of these operations to the government is estimated at $169,550.64, with a unit total cost of approximately $13.15 per mile of road opened and approximately $9.25 per operated hour of snow moving equipment.
3/25/1950	Statewide	1			Heavy snow and strong winds covered much of several states, including Wyoming. Snowfall up to 60 inches fell in Wyoming. There was widespread damage to power lines and many cars and trains were stranded. Drifts were up to 16 feet and one person died in the state.
2/18/1955	Statewide	4			This blizzard covered several states, including Wyoming. Up to 11 inches of snow fell with winds to 65 mph and temperatures below zero. There were 4 deaths in Wyoming.
3/22/1957	Statewide				Heavy snow fell over several states, including Wyoming. Drifts were from 10 to 25 feet deep and many motorists were trapped in cars or snow bound in towns.
10/28/1961	Statewide	5/4	$27,500	$0	Snow accompanied by high winds began early afternoon and continued through the evening. Three people were killed and four were injured in auto accidents caused by low visibility. Two hunters were lost and died in the storm.

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
9/15/1965	Statewide	0/0	$2,750,000		A cold wave moved over the state the evening of the 15th and caused considerable damage to crops, trees, power and phone lines, stopped much of the transportation by closing roads, caused an estimated 5% shrinkage in marketable livestock and a few death losses in livestock. Temperature dropped quite low for so early in the season and the heavy (18"-22") band of snow from the southwest part of the state to the northeast part was by far the heaviest so early in the season.
4/2/1968	Southern half	3/0	$275,000	$0	A blizzard started early evening over the southern half of the state and continued until late afternoon of the 3rd. Three people were killed in blizzard associated incidents. Numerous people were stranded and there were numerous outages of power and communications.
3/13/1973	Statewide	0/0	$275,000		Heavy snow and strong winds blanketed the state, with roads, streets, and farms and ranches blocked. There were numerous power and communications outages as well as livestock losses.

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
3/27/1975	Statewide	0/0	$2,750,000		A severe blizzard with winds 40 to 50 mph and gusts to 75 mph, snow and temperatures down to 0 degrees started the morning of the 27th and continued to the evening of the 28th. Highways were blocked and some people stranded for varying times but all rescued. Some damage to signs, windows, trees, etc., but most damage to livestock, especially new born, and to cows (udders frostbitten, etc.). The storm was most severe over the eastern half of the state and most of the damage was there also.
1/31/1975	Most of Wyoming	0/0	$275,000	$0	Heavy snow with strong winds began early on the 31st of December 1975 and continued through most of the State through most of the storm. Livestock losses were minimal and most of the damage is attributed to loss of time, cars stuck, rescue missions and snow removal.

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
11/16/1977	Statewide	1/0	$275,000	$0	Snow with large accumulations entered the state the afternoon on the 16th, accompanied by very cold temperatures. Some blowing and drifting caused hazardous driving conditions in many areas. The snow ended by the morning of the 18th but was quickly followed by strong gusty westerly winds which moved the large amounts of loose snow into ground blizzards with severe problems on highways, ranches, etc. One man was killed at Rawlins as he tried to walk into town along the interstate from the west. Numerous people were stranded along the highways and in towns and ranches until the roads were opened.
12/5/1978	Statewide	0/0	$275,000	$0	This very heavy snowstorm dumped over a foot of snow across much of the state causing road and airport closures in many areas throughout the state. Winds gusting to 75 mph caused extensive blowing and drifting snow, stopping both local and interstate travel. This storm isolated livestock from ranchers, contributing to subsequent substantial losses of cattle and sheep in Wyoming.

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
1/1/1979	Statewide	0/0	$2,500,000		Numerous heavy snows combined with prolonged extremely cold temperatures have caused widespread damage across much of Wyoming during the month of January. Estimated loss of 2700 sheep and 2000 cattle with projected losses of calves and lambs to 35,000 head are reported. Also, numerous towns and communities across the state have extensive damages to their water systems due to frozen water mains and sewer systems. Emergency Winter Storm Relief Aid of $2.5 million is currently being asked for by the state.
1/10/1980	Statewide	0/0	?		Much of the state was paralyzed. Freak thunderstorms occurred in Casper, Riverton, and Lander areas. Roads were closed and some motorists stranded. Interstate 25 from Laramie to the Utah state line was closed by winds approaching 80mph in south-central Wyoming. An estimated 60 vehicles were in the ditch along I-80 west of Rawlins. Reported 90 mph winds in Medicine Bow blew out car and truck windows and a large window in a cafe. Many schools were closed.

1/25/1980	Statewide	4/0	?		Snow and blowing snow from the morning of the 25th to the evening of the 27th swept across Wyoming dumping a record 11 inches of snow on Cheyenne in a 12-hour period. Heavy snow and slick road surfaces due to bitter cold temperatures closed many highways and interstates, including I-80 from the Nebraska state line to Rock Springs. Near Bitter Creek Hill, 38 miles east of Rock Springs, 21 cars and trucks were involved in a pile-up on the afternoon of the 25th. Two men were killed at 7 p.m. on the 26th, 9 miles east of Powell when the driver lost control, ejecting both men. One fatality occurred on the 27th at 11:30 a.m. on I-80 near Rock Springs when a car slowed down because of poor visibility and slick roads and the truck driver, trailing the vehicle, failed to slow down in time and crushed the back end of the car in which the victim was riding. A man died about 12:45 p.m. on the 27th when the flatbed truck he was driving 95 miles south of Gillette jack-knifed on a left-hand curve and rolled on its top. Schools in Cheyenne were closed at noon on Friday and did not reopen until Wednesday. Most churches in Cheyenne remained closed on Sunday. Casper thermometers dipped to record lows of -27 degrees on Saturday, -28 degrees on Sunday night, and -32 degrees Monday morning. Cheyenne reported temperatures at 0 or below zero for a period of 79 hours. Weather-related problems may have caused the derailment of 12 empty freight cars at Point of Rocks at 6:45 a.m. on the 25th.

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
10/14/1980	Statewide	4/5	?	$0	Snow beginning on the evening of the 14th moved across the state leaving 13 inches in Laramie and 11 inches in Rawlins. Most other areas received from 1-3 inches. Some highways were closed on the 16th, including Interstate 80 between Cheyenne and Walcott Junction (100 miles). One person was killed and three others injured in a storm-related two-vehicle accident southwest of Cody on the 15th. The storm apparently contributed to a light plane crash that killed one man near the airport at Rock Springs at 9:10 p.m. on the 15th. Blizzard-like conditions were contributing factors when a freight train plowed into the caboose of a grain train 13 miles southeast of Laramie about 4 p.m. on October 16, killing two crewmembers and injuring two others. Schools in Laramie, including the University of Wyoming, were closed on the 16th. Many hunters were stranded. Tree limbs snapped causing power outages in Rawlins and Sinclair.

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
12/1/1982		1/0	?	$0	A major winter storm dumped heavy snow in the state Wednesday and Thursday morning. Casper was hit the hardest with 24 inches of snow, breaking the previous 24-hour total. The Wind River Canyon between Shoshoni and Thermopolis also reported 24 inches. Elsewhere in the basins and plains, amounts varied from 5 to 11 inches. Winds to 40 mph caused blizzard conditions in the central and northeast areas causing drifts of 5 to 8 feet deep. One death was attributed to this storm.
3/25/1983		0/0	$2,750	$0	Several hundred miles of state and federal highways were closed as a strong spring snowstorm moved east. Snow, with accumulations up to 8 inches in the southwest, was blown about by 20 to 30 mph winds causing ground blizzard conditions.

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
12/20/1983	Statewide	0/?	$2,750,000	$0	The worst arctic outbreak ever in December hit WY full force with almost all of the state remaining below zero for five days. Overnight lows in the 20 to 40 below range were common, with quite a few towns setting record Dec lows. Most WY residents fared much better in the cold than mechanical items. A malfunctioning transformer left the town of Lander without power for 12 hrs., and the extreme temperatures damaged numerous vehicles. The greatest damage, however, occurred to homes and businesses as hundreds of water pipes froze and burst. The State Capitol Building in Cheyenne, for example, suffered almost a quarter of a million dollars damage due to burst water pipes.
11/26/1984		1/1	$27,500	$0	Eight inches of snow was reported on Beaver Creek, 10 miles south of Encampment in Carbon County; 5.5 inches snow was logged at nearby Saratoga. One man was killed and one injured when the fatality's car slid broadside into oncoming traffic south of Laramie.

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
5/6/1988	Northern and west-central Wyoming, South-central mountains	0/0	$0	$0	The strong low pressure system both at the surface and aloft moved slowly northeastward to extreme southeast Montana by the 7th. This storm unleashed very heavy snow over most areas with elevations above 6000 feet MSL in the north and west sections of Wyoming. Since this storm had begun the morning of the 6th more than 20 inches of new snow had fallen in the Big Horn Mountains of northern Wyoming, while there was 6 to 10 inches of snow at Yellowstone National Park. Additionally, more than 10 inches of new snow was on the ground near Pinedale, located in west-central Wyoming, and the Snowy Range to the west of Laramie. More snow fell at these locations during the 7th. By 1335 MST on the 7th, Arrowhead Lodge in the Big Horn Mountains had a total of 3 feet of new snow on the ground. Bear Lodge, located in the Wyoming Black Hills, had 24 to 30 inches of new snow by the afternoon of the 7th. Numerous trees and power lines were downed by very wet snow, with several communities without electricity through much of the 7th.

2/2/1989	Statewide	0/0	$0	$0	Record cold temperatures gripped the cowboy state from the 2nd through the morning of the 6th, the coldest in at least 5 years. Many locations had at least 80 to 100 consecutive hours of subzero readings. Wind chills from 50 to 90 degrees below zero accompanied the cold. Most overnight lows were between minus 20 and minus 40 degrees with maximum temperatures struggling above 15 or 20 degrees below zero. On the morning of the 3rd, Sheridan set a record low of minus 32, eclipsing the old record of 24 degrees below zero, set in 1985. Casper had a record low 27 degrees below zero. The minimum at Cheyenne was minus 24, one degree shy of the record low for the 3rd, dating back to 1883. Additionally, Weston, located over far northern Wyoming, dropped to 47 degrees below zero while locations in Yellowstone Park dipped lower than minus 40 degrees. These low temperatures, including several records, were typical through the 6th. The maximum temperature for Cheyenne on the 3rd was 18 degrees below zero. Not only was that a record low maximum, but the second coldest such reading since weather records have been kept at Cheyenne, back more than 100 years. During the morning of the 6th, the temperature at the capitol city finally rose above zero. The record is 120 hours, set in December 1983. Due to this Arctic episode, February was the coldest February ever for Casper.

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
					It was also the worst cold spell for Gillette in a decade.
12/21/1989	Statewide	0/0	$0	$0	As a result of the combination of calm winds, a bitterly cold arctic air mass and deep snow cover, extremely low minimum temperatures occurred across the cowboy state during the morning of the 22nd. Many of these temperatures were not only record lows for the date, but also the coldest ever for December. The lowest temperatures were generally over the Eastern two-thirds of Wyoming. Recluse, in the far Northeast corner, had a low of 50 degrees below zero. Other lows included 47 below in Redbird, 40 below at Douglas, 35 degrees below at both Sheridan and Gillette, 34 degrees below zero in Laramie, 28 below at both Casper and Cheyenne, 23 below in Cody, 14 below at Farson and 13 degrees below zero in Lander.
2/11/1994	Southern Wyoming	0/?	?	$0	Snow fell heavily at times across southern Wyoming. Eleven inches of new snow fell at Rock Springs closing I-80 for a time. Cheyenne observed near blizzard conditions that evening. Seven inches of snow combined with 35 mph gusts caused 40 automobile accidents in and near Cheyenne.

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
10/21/1995	All except the Southwest Corner	0/0	$1,000,000	$0	Heavy snow and strong winds caused blizzard conditions over much of Wyoming. Snowfall amounts ranged from four inches at Rock Springs and Gillette to seventeen inches at Casper Mountain. Generally, six to ten inches of snowfall was common. Winds gusted to 55 mph and caused blizzard conditions with drifts up to five feet deep. Reported drifts of two to four feet were common. Many roads were closed from the 22nd to the afternoon of the 23rd due to drifting and near zero visibilities. Many travelers were stranded across the state until the 23rd and a number of hunters had to be rescued. Power was out for a time in various places, due to downed power lines from the heavy snow and strong winds.
11/1/1995	In and near most mountains	0/0	$0	$0	Snow fell over most of Wyoming, with areas in and near the mountains receiving significant snowfall. Most of these areas had between 6 and 10 inches of snow, with the largest amount being 11 inches at Story (Sheridan County). Due to the snow, Highway 70 between Baggs and Encampment (Carbon County) was closed during the afternoon.

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
12/18/1990	Statewide	0/0	$27,500	$0	A major winter storm followed by a bitterly cold Arctic outbreak, plagued most of Wyoming for about 2 to 4 days. Heavy snows with strong winds occurred on the 18th over the far western part of the state, with up to a foot in the mountains. Light snows of 2 to 6 inches generally occurred over the rest of the state, except in the far southwest where storm totals approached 15 to 20 inches by 1800 MST on the 19th. Bitterly cold Arctic air started spilling into the state after 1200 MST on the 18th on brisk northern winds. On the 19th and 20th, wind chills dropped to -40 to -75 degrees at times in many areas. The coldest temperatures occurred on the 21st and 22nd, with most areas from -25 to -45 degrees. Minus 50 degree readings were reported at Worland and near Jackson. Casper set an all-time record-low of -41 degrees on the 21st. Major roads affected by the snow and winds were confined to the far west and southwest. The worst conditions occurred along Interstate 80 from Rock Springs to Rawlins on the night of the 19th and 20th where snow and strong winds closed the road, stranding many people. The bitter cold caused power outages in some places, most notably in Jackson. Schools and other events were widely canceled due to the cold weather.

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
1/20/1996	Green Mountains, Natrona, Rock Springs/Green River, Red Desert, Flaming Gorge, Southeast Sweetwater, Southwest Carbon, North Carbon, Snowy Range, North Laramie Mountains, Laramie Valley, Laramie Mountains, Platte	0/0			Winds were sustained between 40 and 50 mph from Jeffrey City and Casper, southeast to just east of the Laramie Mountains. Wind gusts were between 55 and 65 mph, with the strongest gust being 71 mph, 10 miles south of Wheatland between 1753 and 1909 MST. Highway 191, south of Rock Springs was closed due to blowing snow from 2300 to 0600 MST.
1/23/1996	Southwest Carbon, North Carbon, Snowy Range, Laramie Valley, Laramie Mountains	0/0			Widespread blowing snow created near zero visibilities over the south central part of the state. Interstate 80 was closed during that time from Walcott Junction to Laramie.

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
1/24/1996	Kemmerer, Uinta, Rock Springs/Green River, Red Desert, Flaming Gorge, Southeast Sweetwater, Southwest Carbon, North Carbon	0/0			Strong winds and heavy snowfall created blizzard conditions in southwest and south central Wyoming. Winds gusted to around 50 mph over the area. Snowfall was from 12 to 18 inches in Evanston, with 3 to 6 inches over the rest of the area. Many roads, including I-80 in the southwest corner, were closed due to the snow and blowing and drifting snow. A number of travelers were stranded in the southwest corner. Some snowplows in the area even became stuck and stranded due to the poor conditions.
1/27/1996	Yellowstone National Park MT, and ID; north and south Absarokas, Teton Range, Jackson Valley, Wind River Mountains, Star Valley, Salt River Range, Snowy Range	0/0			Heavy snow and strong winds were over the western mountains and the Snowy Range. Fifteen to 40 inches of snow fell, with the greatest amount being 40 inches in some of the west facing mountains. Jackson saw 24 inches of snow in 24 hours, which was the largest 24-hour snowfall ever recorded for that city. Some roads in the area were closed on the 28th. In addition, winds were from 55 to 70 mph with gusts more than 100 mph over the open, higher areas. The strong winds caused considerable blowing and drifting snow.

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
10/25/1996	Converse, Niobrara, southwest Carbon, north Carbon, Snowy Range, north Laramie Mountains, Laramie Valley, Laramie Mountains, Platte, Cheyenne Foothills	0/0			Heavy snow and strong winds created blizzard conditions in much of south central and eastern Wyoming. The snow and winds closed many roads in that area, especially in and near the southeast mountains. The heaviest snowfall was in the Laramie Mountains and Snowy Range, where 12 to 18 inches of snow was reported. Other snowfall amounts in the area were 7 inches in Laramie, 8 inches in Douglas and 5 inches in Lusk. Only 1 to 4 inches fell in parts of the southeast plains. Winds gusted to near 50 mph and produced near zero visibilities. Drifts as high as 5 feet were observed in the Laramie Mountains between Cheyenne and Laramie. The strong winds and snow caused power outages to many rural areas in south central and southeast Wyoming.

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
1/9/1997	Southwest Carbon, north Carbon, Snowy Range, Laramie Valley, Laramie Mountains, Cheyenne Foothills, Pine Bluffs	0/0			Heavy snow that began on the 9th and ended on the 10th combined with strong winds to create whiteout conditions in southeast and south central Wyoming and the Nebraska panhandle. I-80 was closed between Cheyenne and Big Springs, NE due to blowing and drifting snow on the 10th from 0100 to 0645 MST, and Nebraska Highway 71 was closed between Scottsbluff and Kimball from 0100 until 0830 MST. Some snowfall totals include 3 inches in Scottsbluff, NE; 4 inches at Kimball, NE; 7 inches at Sidney, NE; 5 inches at Potter, NE; 6 inches at LaGrange; 4 inches at Cheyenne; and 8 inches at Snowy Range Ski Area. Additionally, I-80 was closed January 11 for a few hours at night between Rawlins and Laramie, and for almost 24 hours between Laramie and Cheyenne.
1/25/1997	Southwest Carbon	0/0			Strong winds combined with snow to create whiteout conditions in south central Wyoming. Highway 287 was closed north of Rawlins by 1900 MST due to blowing and drifting snow. Sustained winds were 40 to 45 mph with a gust to 63 mph at Rawlins at 2150 MST.

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
4/4/1997	Converse, Niobrara, southwest Carbon, north Carbon, Snowy Range, north Laramie Mountains, Laramie Valley, Laramie Mountains, Platte, Goshen, Cheyenne Foothills, Pine Bluffs	0/0			Strong winds combined with snow amounts of generally 8 to 12 inches to create widespread blizzard conditions in southeast Wyoming and the Nebraska panhandle. By 2045 MST on the 4th, all roads had been closed in and out of Cheyenne except for I-25. Closed and impassable roads became the norm from the evening of April 4 through April 6 due to blowing and drifting snow. Many automobile accidents occurred as a result of the treacherous conditions, and many power lines were downed due to the weight of snow. Many livestock were killed by the snow and accompanying cold temperatures because the storm occurred in the calving season. The highest snow amount was 12 inches at Albin and Lusk, and sustained winds were generally 40 to 50 mph through the event.
10/12/1997	North Carbon, Laramie Valley, Laramie Mountains	1/30	$25,000	$0	A Utah man died of head injuries after his pickup truck slid on black ice on a bridge and rolled. The accident occurred on I-80 at the Arlington interchange. An accident near Laramie involving a bus injured at least 30 people. Icy conditions created a 20-mile long traffic backup on westbound I-80 near the summit rest area between Laramie and Cheyenne.

10/24/1997	Converse, Niobrara, southwest Carbon, north Carbon, Snowy Range, north Laramie Mountains, Laramie Valley, Laramie Mountains, Platte, Goshen, Cheyenne Foothills, Pine Bluffs	0/0	$100,000	$10,000	An early season blizzard dumped up to 20 inches of snow in areas of southeastern Wyoming, downing power poles and power lines as well as making many roads impassable. Wet, wind-driven snow damaged trees in addition to unharvested milo, corn, and sunflower fields. Many motorists were stranded on impassable roads or when vehicles slid off roads. High School athletic events were postponed, and high school bands and athletic teams were stranded when their buses could continue no further. The following occurrences were documented as occurring on the 24th. Semi-tractor trucks with trailers tipped over after jackknifing on I-80 near Sinclair and at milepost 340; no damage estimates were available. The Wyoming Highway Patrol received 198 accident reports by 1645 MST, compared to the normal of 30 to 50. I-25 was closed from the Colorado border to Wheatland at approximately 1600 MST. I-80 was closed the entire length of Wyoming, from border to border, by late evening. The following occurrences were documented as occurring on the 25th. I-80 remained closed from the Nebraska border to Rock Springs. A Wyoming Department of Transportation employee received minor injuries when the snow plow he was operating flipped over east of Cheyenne. Postal delivery service from Cheyenne was shut down for the first time in at least 15 years. Two hunters were rescued in the Snowy Range near Arlington

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
					after spending the previous night in the Medicine Bow National Forest; they had entered the Snowy Range north of Centennial the morning of the 24th, and became lost after the onset of the blizzard. The Wyoming Highway Patrol received 252 accident reports since 0800 MST on the 24th, several times the normal figure.
11/9/1997	Southwest Carbon	1/0	$8,000	$0	An 81-year-old Rawlins man died when his car slid off an icy Rawlins street, crashing through a small fence and tumbled over a 17-foot retaining wall, landing on its roof. Several inches of snow fell on November 9, making roads slick. M81VE
3/6/1998	Converse, Niobrara, southwest Carbon, north Carbon, Snowy Range, Platte	0/19	$65,000	$0	A winter storm affected parts of southeast Wyoming, with a total of 11 inches of snowfall reported in Rawlins, 10 inches at Lusk and Hanna, and 8 inches of snowfall was reported across Platte County. The Wyoming Highway Patrol received 19 reports of automobile accidents involving injuries due to snow packed roads, and another 90 accidents without injuries between midnight and 1917 MST.
6/17/1998	Snowy Range	0/0	$0	$0	Heavy snow up to 8 inches fell over the higher elevations of the Snowy Range. The snow stranded travelers on the Snowy Range Pass. Two snowplows slid off of curves and into ditches as they tried to plow the Pass.

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
10/5/1998	North Carbon, Laramie Mountains	0/0	$0	$0	Law enforcement officials reported that the summit of I-80 and Highway 210 were closed due to whiteout conditions at the higher elevations of these roads. The Town of Buford also had whiteout conditions.
12/18/1998	Southwest Carbon, north Carbon, Snowy Range, Laramie Mountains, Cheyenne Foothills, Pine Bluffs	0/0	$0	$0	A winter storm dumped 12 to 18 inches of snow on the southwest mountains, and 8 to 10 inches of snow on parts of the adjacent plains. Interstates 80 and 25 in southeast Wyoming were closed due to icy conditions and poor visibilities.
2/11/1999	Southwest Carbon	0/0	$30,000	$0	A winter storm dumped 8 to 12 inches of snow across southwest Carbon County. In addition, strong winds overturned 10 semi-trailers along I-80 in Carbon County.
3/27/1999	Southwest Carbon	0/0	$37,000	$0	Ice on U.S. Highway 287 caused a collision between two pickup trucks. The driver of one of the pickup trucks was seriously injured and was extricated from the vehicle. The accident occurred 6 miles south of Muddy Gap at 0730 MST. Another accident occurred 30 miles north of Rawlins, in which a person lost control of their vehicles on the ice. The vehicle slid into the ditch and rolled 3 times. The driver sustained a broken arm. The accident occurred at 0715 MST.

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
9/28/1999	Southwest Carbon, Snowy Range, Laramie Mountains	1/1			Snow fell over parts of south central and southeast Wyoming, with snowfall of 8 inches reported at Elk Mountain, and 6 inches at Buford. Icy bridges resulted in an accident on I-80, 15 miles east of Rawlins, which killed one person and injured another. F68VE
2/16/2000	Converse, Niobrara, southwest Carbon, Snowy Range, Platte	0/12	$100,000		Heavy snow fell over parts of south-central and eastern Wyoming, resulting in icy roads and numerous accidents. I-80 was closed for a while between Laramie and Rawlins. Around 8 inches of snow accumulated in Rawlins, with 6 inches reported in Douglas, Wheatland, and Lusk.
9/22/2000	Southwest Carbon, north Carbon, Snowy Range, north Laramie Mountains, Laramie Valley, Laramie Mountains, Platte, Cheyenne Foothills	0/0	$100,000		Heavy snow fell over south central and southeast Wyoming over a two-day period, with 5 to 9 inches common. Elk Mountain, reported 12 to 14 inches of snow while Cheyenne, recorded a record 10.5 inches. I-80 between Laramie and Rock Springs, as closed during much of the storm, stranding up to 1200 travelers, mostly in Rawlins.
12/16/2000	North Carbon, Laramie Mountains, Platte, Cheyenne Foothills	0/0			Strong winds were reported over the mountains and foothill areas of southeast Wyoming, with gusts as high as 83 mph recorded near Chugwater, and gusts up to 73 mph at Arlington. I-80 was closed for a few hours for localized conditions due to blowing snow.

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
2/7/2001	Converse, southwest Carbon, north Carbon	0/0			Heavy snow fell in a swath from south central into east central Wyoming, with as much as 11 to 13 inches of snow reported in Rawlins and 6 to 7 inches in Douglas. A 250-mile stretch of I-80 was closed for much of the day between Laramie and Rock Springs, with many secondary roads also closed.
4/21/2001	Converse, Niobrara, north Carbon, Laramie Valley, Laramie Mountains, Platte, Goshen, Cheyenne Foothills, Pine Bluffs	0/0	$100,000		The second major winter storm in 10 days produced heavy snow over much of southeast Wyoming, with blizzard conditions in some spots. Twelve to 16 inches recorded in Wheatland and Cheyenne. All roads out of Cheyenne, were closed again, as was much of I-80. Power outages were also reported in parts of Laramie County as winds gusted to around 40 mph.
3/13/2002	Converse, Niobrara, southwest Carbon, north Carbon	0/0	$10,000		Heavy snow fell across a swath of southeast Wyoming from near Rawlins to Lusk. Lusk was buried under 24 to 26 inches of snow, which caused a drive-in canopy to collapse. Douglas reported around 18 inches of snowfall while Rawlins and Shirley Basin recorded 12 to 15 inches. Many roads in the area were closed for more than 24 hours.

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
3/17/2003	Converse, north Carbon, north Laramie Mountains, Laramie Valley, Laramie Mountains, Platte, Goshen, Cheyenne Foothills	0/0	$100,000		A powerful winter storm produced heavy snow and blizzard conditions over much of southeastern Wyoming over a 2.5-day period, closing most roads and isolating many areas. Snowfall amounts of 2 to 3 feet were reported over the Laramie Mountains west of Cheyenne. Snowfall amounts from 12 to 20 inches were common over the adjacent plains from Douglas to Cheyenne, with Cheyenne recording just over 18 inches. In addition, gusty winds from 30 to 45 mph combined with the snow to produce drifts from 6 to 10 feet in some areas.
5/11/2014	Encampment	0/0	$0	$0	This event did not result in any monetary damages, but many area trees were damaged causing power outages and private property damages. The event impeded travel and stranded vulnerable populations such as seniors.
2/3/2016	North Snowy Range Foothills	0/0	$0	$0	Westerly winds as high as 70 mph produced considerable blowing snow which resulted in ground blizzard conditions for the wind prone areas of southeast Wyoming. Visibilities were frequently reduced to near zero at the Interstate 80 summit and Arlington area, and Interstate 25 between Chugwater and Wheatland. These adverse conditions closed both interstate highways for several hours.

Date	Location	Deaths/ Injuries	Estimated Damage - Property	Estimated Damage - Crops	Description
2/23/2017	Central Carbon County	0/0	$0	$0	An intense Pacific low pressure system produced heavy snowfall and strong winds up to 50 mph across east central, south central and southeast Wyoming. The strong winds caused blizzard conditions over western Carbon County in south central Wyoming. A narrow swath of 20 to 25 inches of snow fell from Wheatland to Torrington in southeast Wyoming. Elsewhere, snow accumulations ranged from 3 to 10 inches, with 10 to 20 inches over the mountains. This storm resulted in major impacts to transportation, resulting in numerous road and interstate highway closures.

9.9. Dam Failure

9.9.1. Location

Albany County

Table 9-18 Dam Locations in Albany County

Dam Name	Hazard potential	Owner Type	NID Height (Ft.)	NID Storage	Primary Purpose	Dam Type	River	City	Distance
WHEATLAND NO. 2	Significant	Private	37	144877	Irrigation	Earth	LARAMIE RIVER	FORT LARAMIE	-
WHEATLAND NO. 3	Low	Private	28	100271	Irrigation	Earth	LARAMIE RIVER OFFSTREAM	FORT LARAMIE	30
LAKE HATTIE	Significant	Private	43	130182	Irrigation	Earth	LARAMIE RIVER OFFSTREAM	LARAMIE	14
GILLESPIE	Low	Private	8	384	Irrigation	Earth	TRIB OF LAKE IONE	TORRINGTON	90
GRANT CREEK	Low	Private	25	104	Irrigation	Earth	GRANT CREEK	TORRINGTON	50
BURNS M. G.	Low	Private	14	225	Irrigation	Earth	DUCK CREEK, TRIB LARAMIE RIVER	TORRINGTON	72
LONE TREE NO. 2	Low	Private	7	179	Irrigation	Earth	SAND CREEK	LARAMIE	17
IRON MOUNTAIN	Low	Private	35	242	Irrigation	Earth	SOUTH SYBILLE CREEK	TORRINGTON	90
HUNDRED SPRINGS	Low	Private	14	213	Fish and Wildlife Pond	Earth	SPRINGS, TRIB. OF HARNEY CREEK	LARAMIE	9
PATRICK RYAN NO. 3	Low	Private	27	40	Fire Protection, Stock, Or Small Fish Pond	Earth	GOAT CREEK	TORRINGTON	-
BELL & SCRANTON NO. 1	Significant	Private	35	1051	Irrigation	Earth	SOLDIER CREEK	TORRINGTON	82
NEWELL	Low	Private	31	220	Irrigation	Earth	COTTONWOOD CREEK	TORRINGTON	77
WILLIAMS NO. 3	Low	Private	28	205	Irrigation	Earth	DALE CREEK	FT COLLINS, COLORADO	-
ROB ROY	High	Local Governme nt	150	42264	Irrigation	Earth	DOUGLAS CREEK	KEYSTONE	2
WEAVER	Low	Private	29	145	Irrigation	Earth	HARNEY CREEK	LARAMIE	-
SUNDBY NO. 2	Low	Private	26	45	Irrigation	Earth	BARKLEY CREEK	LARAMIE	-
TWIN BUTTES	Low	State	8	6250	Fish and Wildlife Pond	Earth	MORTENSEN DRAW	LARAMIE	12
DUCK CREEK NO. 1	Low	Private	36	93	Irrigation	Earth	DUCK CREEK	TORRINGTON	66

Dam Name	Hazard potential	Owner Type	NID Height (Ft.)	NID Storage	Primary Purpose	Dam Type	River	City	Distance
SUNDBY	Low	Private	21	119	Irrigation	Earth	HECHT CREEK	LARAMIE	31
BELL	Low	Private	38	479	Irrigation	Earth	MIDDLE CHUGWATER CREEK	CHUGWATER	35
STRONG NO. 4	Low	Private	28	89	Irrigation	Earth	STRONG CREEK	CHUGWATER	-
WILLIAMS & BLUNK NO. 1	Low	Private	27	27	Fish and Wildlife Pond	Earth	WEST FORK TEXAS CREEK	UPRR	2
SID NO. 1	Low	Private	18	205	Irrigation	Earth	NORK FORK DUCK CREEK	TORRINGTON	68
WHISKEY NO. 1	Low	Private	25	57	Fire Protection, Stock, Or Small Fish Pond	Earth	WHISKEY DRAW	MEDICINE BOW	45
LAKE OWEN	Significant	Local Governme nt	30	1401	Irrigation	Earth	LAKE OWEN CREEK	LARAMIE	30
CANON NO. 2	Low	Private	37	35	Irrigation	Earth	TIMBER CANON CREEK	TORRINGTON	-
BLISS NO. 1	Low	Private	27	63	Irrigation	Earth	MIDDLE CHUGWATER CREEK	CHUGWATER	38
PHILLIPS NO. 1	Low	Private	28	122	Irrigation	Earth	PHILLIPS DRAW	TORRINGTON	80
WELLBAUM	Low	Private	30	74	Fire Protection, Stock, Or Small Fish Pond	Earth	WELLBAUM DRAW, TRIB. SHEEP CRK	ALCOVA	-
IRON MOUNTAIN NO. 1	Low	Private	32	51	Irrigation	Earth	W FORK IRON MOUNTAIN CREEK	TORRINGTON	0
KENNEDY NO. 1	Low	Private	40	105	Irrigation	Earth	DODGE CREEK	TORRINGTON	-
CANON NO. 3	Low	Private	28	28	Irrigation	Earth	TIMBER CANON CREEK	TORRINGTON	92
STRONG NO. 1	Low	Private	24	80	Irrigation	Earth	STRONG CREEK	CHUGWATER	32
CANON NO. 5	Low	Private	45	102	Irrigation	Earth	TIMBER CANON CREEK	TORRINGTON	-
STURGEON NO. 3	Low	Private	30	86	Irrigation	Earth	ANTELOPE CREEK	TORRINGTON	78

Dam Name	Hazard potential	Owner Type	NID Height (Ft.)	NID Storage	Primary Purpose	Dam Type	River	City	Distance
CANON NO. 4	Low	Private	34	77	Irrigation	Earth	TIMBER CANON CREEK	TORRINGTON	97
JOHNSON	Low	State	35	132	Other	Earth	LITTLE CREEK	TORRINGTON	71
OLD SMUGGLER	Low	Private	22	92	Irrigation	Earth	SHIRLEY DRAW	TORRINGTON	140
BELL & SCRANTON NO. 2	Low	Private	25	168	Irrigation	Earth	EGGLESTON CREEK	TORRINGTON	76
SPORTSMAN LAKE	Low	Private	13	1681	Irrigation	Earth	OFFSTREAM-FIVE MILE CREEK	LARAMIE	12
ENL. WILLOW CREEK NO. 2	Low	Private	42	1505	Irrigation	Earth	WILLOW CREEK	LARAMIE	12
ELLA	Low	Private	24	108	Irrigation	Earth	MIDDLE SYBILLE CREEK	TORRINGTON	-
CANON NO. 1	Low	Private	33	35	Irrigation	Earth	TIMBER CANON CREEK	TORRINGTON	-
BAR M NO. 1	Low	Private	34	137	Irrigation	Earth	NORTH BRANCH BAR M CREEK	TORRINGTON	67
LONE TREE	Low	Private	35	728	Irrigation	Earth	LONE TREE CREEK	LARAMIE	15
SODA LAKE DRAW NO. 1	Low	Federal	11	299	Irrigation	Earth	MEEBOER DRAW	LARAMIE	12
HARMAN	Low	Federal	10	307	Irrigation	Earth	RICHARD DRAW	LARAMIE	20
GLADE	Low	Private	14	160	Irrigation	Earth	GLADE CREEK	TORRINGTON	74
STURGEON NO. 1	Low	Private	21	91	Irrigation	Earth	DAVIDSON CREEK	TORRINGTON	74
KAFKA NO. 1	Low	Private	22	432	Irrigation	Earth	N LARAMIE RIVER	TORRINGTON	88
TWENTY MILE NO. 1	Low	Private	16	178	Irrigation	Earth	TWENTY MILE CREEK	TORRINGTON	90
PINTO	Low	Private	25	124	Irrigation	Earth	PINTO CREEK	TORRINGTON	-
WILLIAMS NO. 2	Low	Private	33	285	Irrigation	Earth	DALE CREEK	FT. COLLINS, COLORADO	-
BAR M NO. 3	Low	Private	30	82	Irrigation	Earth	NORTH FORK BAR M CREEK	TORRINGTON	80
BAR M NO. 2	Low	Private	43	661	Irrigation	Earth	BAR M CREEK	TORRINGTON	62
BROWN NO. 1	Low	Private	39	120	Irrigation	Earth	TWENTY FIVE CREEK	HWY. 211	-

Dam Name	Hazard potential	Owner Type	NID Height (Ft.)	NID Storage	Primary Purpose	Dam Type	River	City	Distance
CAVENDER	Low	Private	12	618	Irrigation	Earth	COOPER CREEK	-	0
KING NO. 1	Low	Private	24	2449	Irrigation	Earth	SEEPAGE CREEK	SEE REMARKS	0
LITTLE PIERCE	Low	Private	24	62	Other	Earth	DRY CREEK	COMO BLUFFS FISH HATCHER	30
COAL BANK	Low	Private	19	140	Irrigation	Earth	COAL BANK CREEK	COMO BLUFFS FISH HACHERY	18
LACE	Low	Private	15	260	Fire Protection, Stock, Or Small Fish Pond	Earth	COAL BANK CREEK	COMO BLUFFS FISH HATCHERY	34
MULE CREEK	Low	Private	17	167	Irrigation	Earth	MULE CREEK	ALCOVA	64
THREE MILE	Low	Private	20	130	Irrigation	Earth	THREE MILE CREEK	ALCOVA	90
DUTTON CREEK	Low	Private	31	2645	Irrigation	Earth	DUTTON CRK., TRIB. COOPER CRK.	-	0
BEERY	Low	Private	13	159	Irrigation	Earth	BERRY SPRINGS	SEE REMARKS	0
CAVENDER	Low	Private	15	1147	Irrigation	Earth	DUTTON CREEK	-	0
CASH'S HOME	Low	Private	29	94	Flood Control	Earth	NORTH FORK HORSE CREEK	HWY 211	13
SHELLHART FISH & STOCK	Low	Private	27	35	Flood Control	Earth	HOUSE CREEK TR. DUCK CREEK	UVA SEE REMARKS	-
TWO BAR NO. 1	Low	Private	36	45	Fish and Wildlife Pond	Earth	TWO BAR CREEK	WHEATLAND	-
ALVIE NO. 1	Low	Private	38	16	Flood Control	Earth	ALVIE NO. 1 DRAW, TRIB KING DR	LAMBERT	17
GRAZING NO. 1 STOCK	Low	Private	30	112	Fire Protection, Stock, Or Small Fish Pond	Earth	SOUTH FORK ROGERS CREEK	OIL SPRINGS SEE REMARKS	31
LARAMIE WASTEWATER TREATMENT(CELL 1)	Low	Local Governme nt	19	455	Other	Earth	DRAINAGE OF LARAMIE RIVER	LARAMIE	0

Dam Name	Hazard potential	Owner Type	NID Height (Ft.)	NID Storage	Primary Purpose	Dam Type	River	City	Distance
FREEMETH SPRINGS STOCK	Low	Private	21	83	Flood Control	Earth	FREEMETH DRAW TR. GEASEWOOD CR	COUNTY ROAD 610	12
BERDINE STOCK	Low	Private	27	73	Fish and Wildlife Pond	Earth	SOUTH BLUE GRASS CREEK	WHEATLAND	30
ENL. HALLECK CREEK NO. 3	Low	Private	29	54	Fish and Wildlife Pond	Earth	HALLECK CREEK	TORRINGTON	62
HOME	Low	Private	20	151	Irrigation	Earth	BOSWELL SPRING CREEK	-	0
JAMES LAKE	Low	Private	40	41100	Irrigation	-	SEVEN MILE CR, LIT. LARAMIE R.	BOSLER	18
POINT OF ROCKS	Low	Private	28	62	Flood Control	Earth	SO. BRANCH OF SOUTH CHUGWATER	CHUGWATER	42
SEEPAGE LAKE	Low	Federal	7	603	Irrigation	Earth	MEEBOER OR SODA LAKE DRAW	-	0
STURGEON NO. 2	Low	Private	25	107	Irrigation	Earth	WILLOW CREEK	UNNAMED RANCH	40
TOLTEC	Low	Private	60	4541	Irrigation	Earth	NORTH LARAMIE	GARRETT	-
HANCHETT	Low	Private	29	102	Fish and Wildlife Pond	Earth	SOUTH BLUE GRASS CREEK	WHEATLAND	30
DOBY NO. 3	Low	Private	41	44	Flood Control	Earth	DUCK CREEK	TORRINGTON	70
COOK NO. 2	Low	Private	34	57	Fish and Wildlife Pond	Earth	WALL ROCK CREEK	HWY 34	5
COOK STOCK	Low	Private	27	40	Fire Protection, Stock, Or Small Fish Pond	Earth	MIDDLE CREEK	UNNAMED RANCH	2.1
RAINEY	Low	Private	10	537	Irrigation	Other	DUTTON CREEK OFFSTREAM	-	0

Carbon County

Table 9-19 Dam Locations in Carbon County

Dam Name	Hazard Potential	Owner Type	NID Height (Ft.)	NID Storage	Primary Purpose	Dam Type	River	City	Distance
WATER VALLEY FISH & RECREATION	Significant	Private	15	110	Recreation	Earth	SOLDIER CREEK	RIVERSIDE	6
ANDERSON	Low	Private	28	361	Irrigation	Earth	OTTO CREEK, TRIB COW CREEK	SARATOGA	13
SILVER LAKE	Low	Private	23	393	Irrigation	Earth	COW CREEK OFFSTREAM	SARATOGA	22
COW CREEK LAKE	High	Private	28	887	Irrigation	Earth	COW CREEK	SARATOGA	-
CHACE NO. 1	Low	Private	21	134	Irrigation	Earth	CARBON DRY CREEK	ALCOVA	100
IRENE	Low	Private	25	25	Fire Protection, Stock, Or Small Fish Pond	Earth	SOUTH FORK FIRST SAND CREEK	ALCOVA	100
SEAVERSON	Low	Private	14	810	Fire Protection, Stock, Or Small Fish Pond	Earth	FILLMORE CREEK	SEE REMARKS	0
GREYHOUND	Low	Private	11	204	Irrigation	Earth	RATTLESNAKE CR OFFSTREAM	FT FRED STEELE	21
LAKE GEORGE	Low	Private	19	325	Fish and Wildlife Pond	Earth	CADWELL SLOUGH, TR N PLATTE RI	SARATOGA	1
SARATOGA LAKE	Low	State	13	3177	Recreation	Earth	NORTH PLATTE RIVER	FT FRED STEELE	23
VER PLANCKE	Significant	Private	37	339	Irrigation	Earth	ANTELOPE CREEK	VX RANCH	1
CHEROKEE TRAIL	Low	Private	20	100	Irrigation	Earth	INDIAN CREEK	SARATOGA	21
TOOTHAKER	Low	Private	35	343	Irrigation	Earth	BEAVER CREEK	SARATOGA	-
SUMMIT	Low	Private	25	237	Irrigation	Earth	LITTLE BEAVER CREEK	SARATOGA	24
DANA MEADOWS	Low	Private	34	69	Fire Protection, Stock, Or Small Fish Pond	Earth	HANNA CREEK	ALCOVA	52
GUNST	Significant	Private	24	593	Irrigation	Earth	BEAVER CREEK	UNNAMED RANCH	1

Dam Name	Hazard Potential	Owner Type	NID Height (Ft.)	NID Storage	Primary Purpose	Dam Type	River	City	Distance
THOMPSON	Low	Private	22	104	Irrigation	Earth	RYE GULCH	SARATOGA	19
STEPHENSON	Low	Private	9	112	Irrigation	Earth	BIG DITCH CREEK	ALCOVA	55
SPRING LAKE	Low	Private	21	416	Other	Earth	SPRING CREEK	SARATOGA	31
ROUSE	Low	Private	20	288	Fire Protection, Stock, Or Small Fish Pond	Earth	BEAVER CREEK	SARATOGA	18
GOLDEN CLOVER NO. 1	Low	Private	27	49	Water Supply	Earth	LITTLE BEAVER CREEK	SARATOGA	-
KINNEY	Low	Private	20	691	Irrigation	Earth	DANA SPRINGS CREEK	ALCOVA	60
RAWLINS PEAKING	Low	Local Governme nt	38	426	Other	Earth	SAGE CREEK	ALCOVA	67
GRINNELL	Low	Private	8	310	Irrigation	Earth	GRINNELL CREEK	ALCOVA	90
WILLOW SPRINGS	Low	Private	19	193	Water Supply	Earth	WILLOW SPRING CREEK	ALCOVA	98
SAND LAKE	Significant	Private	22	1660	Irrigation	Earth	DEEP CREEK	ARLINGTON	12
BOSLER	Low	Private	18	1819	Fish and Wildlife Pond	Earth	BOSLER SLOUGH OFFSTREAM	MCFADDEN	4
ANTELOPE	Low	Private	18	74	Water Supply	Earth	ANTELOPE DRAW	ALCOVA	87
CORPENING	Low	Private	14	176	Irrigation	Earth	NORTH BRUSH CREEK	SARATOGA	32
ENL. TURPIN PARK	High	Private	30	2180	Irrigation	Earth	TURPIN CREEK	ELK MOUNTAIN	-
SEEPAGE	Low	Private	18	146	Irrigation	Earth	SEEPAGE CREEK	SEE REMARKS	0
KEYSTONE	Low	Private	10	343	Irrigation	Earth	SOUTH BRUSH CREEK	SARATOGA	-
ARASTER	Low	Private	11	120	Irrigation	Earth	ARASTER CREEK	SARATOGA	30
SUCKER LAKE	Low	Private	13	140	Irrigation	Earth	NORTH FRENCH CREEK	SARATOGA	30
FINLEY	Low	Private	30	310	Fish and Wildlife Pond	Earth	SPRING CREEK GULCH	SARATOGA	10

Dam Name	Hazard Potential	Owner Type	NID Height (Ft.)	NID Storage	Primary Purpose	Dam Type	River	City	Distance
PIERCE	Significant	State	30	3711	Irrigation	Earth	ROCK CREEK OFFSTREAM	COMO BLUFFS FISH HATCHERY	8
BUCK DRAW	Low	Private	32	539	Irrigation	Earth	SIDE DRAW	FT FRED STEELE	25
MEER	Low	Private	22	271	Irrigation	Earth	DRY CREEK	ALCOVA	62
HORN & MEASON	Low	Private	18	291	Irrigation	Earth	CEDAR CREEK	SARATOGA	5
BUCKLIN NO. 2	Low	Private	9	429	Irrigation	Earth	WHISKEY CREEK	ALCOVA	39
RYAN BROTHERS LAKE	Low	Private	12	284	Irrigation	Earth	NORTH TWIN LAKE CREEK	SARATOGA	40
HANNAH MAHONEY NO. 2	Low	Private	22	107	Irrigation	Earth	MUDDY CREEK	MUDDY GAP	10
RAWLINS	Low	Local Governme nt	47	792	Water Supply	Earth	SAGE CREEK	FT FRED STEELE	34
HOG PARK MAIN DAM	High	Local Governme nt	118	24987	Fish and Wildlife Pond	Earth	HOG PARK CREEK	ENCAMPMEN T	14
J. O.	Low	Private	30	165	Irrigation	Earth	COW CREEK	BAGGS	34
POINT OF ROCKS	Low	Private	8	227	Irrigation	Earth	COTTONWOOD CREEK	ALCOVA	95
INDIAN CREEK	Low	Private	28	110	Irrigation	Earth	INDIAN CREEK	ALCOVA	51
IRENE NO. 2	Low	Private	30	130	Irrigation	Earth	INDIAN CREEK	ALCOVA	39
IRENE	Low	Private	35	388	Irrigation	Earth	DRY CREEK	ALCOVA	-
SEDERLIN	Low	Private	7	173	Fish and Wildlife Pond	Earth	FISH CREEK	ALCOVA	62
JACK CREEK	Low	Private	24	196	Irrigation	Earth	SOUTH JACK CREEK OFFSTREAM	FT FRED STEELE	24
ANTELOPE	Low	Private	16	187	Irrigation	Earth	NORTH SPRING CREEK	SARATOGA	16
SOUTH SPRING CREEK LAKE	High	Private	33	856	Irrigation	Earth	SOUTH SPRING CREEK	SARATOGA	24

Dam Name	Hazard Potential	Owner Type	NID Height (Ft.)	NID Storage	Primary Purpose	Dam Type	River	City	Distance
SAGE CREEK	Low	Private	13	684	Irrigation	Earth	SAGE CREEK OFFSTREAM	FT FRED STEELE	19
SEPARATION	Low	Private	13	759	Irrigation	Earth	SEPARATION CREEK	-	0
NORTH SPRING CREEK	High	Private	31	922	Irrigation	Earth	NORTH SPRING CREEK	SARATOGA	-
LOW	Low	Private	20	272	Irrigation	Earth	LOW CR, TR WILLOW CR, TR JACK	FORT FRED STEELE	22
SEAVERSON	Low	Private	33	125	Irrigation	Earth	MCPHAIL CREEK	FT FRED STEELE	26
LONG POND	Low	Private	19	130	Fish and Wildlife Pond	Earth	BEAVER CREEK	FT. FRED STEELE	63
CHEROKEE	Low	Private	26	97	Irrigation	Earth	CHEROKEE CREEK	RAWLINS	7
BEAVERS	Low	Private	17	151	Irrigation	Earth	TIN CAN DRAW	SAVERY	29
BUCKLIN NO. 3	Low	Private	12	130	Irrigation	Earth	WHISKEY CREEK OFFSTREAM	ALCOVA	41
WHITE	Low	Private	31	798	Recreation	Earth	WATKINS CREEK	COMO BLUFF FISH HATCHERY	28
CARDWELL	Low	Private	35	161	Irrigation	Earth	LITTLE CANYON CREEK	ALCOVA	17
HIGHLINE	Low	Private	34	1719	Irrigation	Earth	SWEETWATER CREEK	SLATER, COLORADO	22
SHEEP MOUNTAIN	Low	Private	42	438	Irrigation	Earth	SPRING CREEK	SLATER, COLORADO	20
WIANT DAM NO. 1	Low	Private	19	383	Irrigation	Earth	SOUTH BRUSH CREEK	SARATOGA	-
HAINES	Low	Private	20	564	Irrigation	Earth	NORTH SPRING CREEK OFFSTREAM	SARATOGA	4
PINE CONE NO. 1	Low	Private	30	585	Irrigation	Earth	PINE CREEK	ROCK RIVER	12
GOOD NO. 1	Low	Private	20	230	Fish and Wildlife Pond	Earth	BEAVER CREEK	FT. FRED STEELE	65

Dam Name	Hazard Potential	Owner Type	NID Height (Ft.)	NID Storage	Primary Purpose	Dam Type	River	City	Distance
PINE CONE NO. 2	Low	Private	39	186	Irrigation	Earth	JACK DANIELS DRAW	ROCK RIVER	12
KORTES	High	Federal	244	4739	Hydroelectric	-	NORTH PLATTE RIVER	NONE	0
SEMINOE	High	Federal	295	1017279	Hydroelectric	-	NORTH PLATTE RIVER	RED BUTTES	64
WIANT DAM NO. 2	Low	Private	10	383	Irrigation	Earth	SOUTH BRUSH CREEK	SARATOGA	38
G. H. RESERVOIR	Low	Private	17	165	Flood Control	Earth	MIDDLE DITCH DRAW	-	0
GOVERNMENT NO. 1	Low	Federal	17	99	Other	Earth	CLOSED BASIN	WAMSUTTER OFF STREAM	10
DETENTION DAM 1593 NO. 2	Low	Federal	26	84	Flood Control	Earth	TRIBUTARY OF PAINTED DRAW	BAGGS	34
DETENTION DAM 1492 NO. 3	Low	Federal	21.3	74	Debris Control	Gravity	RATTLE DRAW	BAGGS, WY	12
DETENTION 1492 #8 DAM	Low	Federal	24.5	193.2	Debris Control	Gravity	ROBBERS GULCH	BAGGS, WY	17
DETENTION 1592 #1 DAM	Low	Federal	35.8	270	Debris Control	Gravity	ROBBERS GULCH	-	0
RED GULCH DETENTION 1592 #5 DAM	Low	Federal	27.95	102.7	Debris Control	Gravity	-	-	0
LITTLE ROBBER DET. DAM	High	Federal	48.12	402	Debris Control	Gravity	LITTLE ROBBERS GULCH	BAGGS WYO.	15
SHIRLEY BASIN RESERVOIR	Low	Federal	25.45	70.4	Flood Control	Gravity	MUDDY CREEK OFFSTREAM TRIB	-	0
TETON RESERVOIR	Low	Federal	33.36	603.5	Recreation	Gravity	LITTLE SAGE CREEK	-	0
LITTLE SAGE CREEK RESERVOIR	Low	Federal	25.96	272	Debris Control	Gravity	LITTLE SAGE CREEK	-	0
ATLANTIC RIM	Low	Local Governme nt	32	645	Water Supply	Earth	SAGE CREEK	-	7
BOB'S SPORT FISHING	Low	State	24	126	Fish and Wildlife Pond	Earth	LOW CREEK	FT. STEELE	40

Dam Name	Hazard Potential	Owner Type	NID Height (Ft.)	NID Storage	Primary Purpose	Dam Type	River	City	Distance
BROWNLEE	Low	Private	15	91	Irrigation	Earth	W FORK CHEROKEE & COTTON CREEK	HWY 230	1.5
PINE CREEK	Low	Private	30	17	Irrigation	Earth	PINE CREEK	-	0
HANNA	Low	Local Government	25	62	Other	Concrete	RATTLESNAKE CREEK	-	0
HANNA LAGOON (CELL 1 & 2)	Low	Local Government	10	61	Other	Earth	DRAINAGE OF BIG DITCH CREEK	-	0
HOG PARK SADDLE DAM NO. 1	High	Local Government	26	24987	Irrigation	Earth	HOG PARK CREEK	ENCAMPMENT	14
HOG PARK SADDLE DAM NO. 2	High	Local Government	34	24987	Irrigation	Earth	HOG PARK CREEK	ENCAMPMENT	14
JOHN L. CAMPBELL NO. 1	Low	Private	18	56	Irrigation	Earth	INDIAN CREEK	-	0
MARSH AND COMPANY NO. 7	Low	Private	25	182	Irrigation	Earth	MUDDY CREEK	HWY 220	10
RAWLINS WASTEWATER TREATMENT PLANT (A 1)	Significant	Local Government	17	59	Other	Earth	SUGAR CREEK, TRIB NORTH PLATTE	-	0
SPRING CREEK (ENLARGEMENT)	High	Private	35	432	Irrigation	Earth	SPRING CREEK	LEO	7
HANSEN	Low	Federal	16	351	Irrigation	Earth	FILLMORE CREEK	I-80	24
BUCKLIN	Low	Private	35	920	Irrigation	Earth	WHISKEY CREEK OFFSTREAM	ALCOVA	0
MARY NO. 1	Low	Private	38	140	Irrigation	Earth	NORTH FORK WATKINS CREEK	-	0
GOETZ	Low	Private	12	112	Fire Protection, Stock, Or Small Fish Pond	Earth	MUDDY CREEK	-	0
ANNE MARIE #1	Low	Private	28	65	Fish and Wildlife Pond	Earth	TROUBLESOME CREEK	CORPENING RANCH	2.6

Dam Name	Hazard Potential	Owner Type	NID Height (Ft.)	NID Storage	Primary Purpose	Dam Type	River	City	Distance
RED WASH #2	Low	Private	8	332	Fish and Wildlife Pond	Earth	MUDDY CREEK	HWY 789	2
TIM WHITE WETLANDS	Low	Private	11	129	Fish and Wildlife Pond	Earth	LAKE CREEK OUTLET DRAW	FORT STELLE	30
RAWLINS WASTEWATER TREATMENT PLANT (A 2)	Significant	Local Governme nt	17	59	Other	Earth	SUGAR CREEK, TRIB NORTH PLATTE	-	0
RAWLINS WASTEWATER TREATMENT PLANT (A 3)	Significant	Local Governme nt	17	59	Other	Earth	SUGAR CREEK, TRIB NORTH PLATTE	-	0
RAWLINS WASTEWATER TREATMENT PLANT (ST1)	Significant	Local Governme nt	17	152	Other	Earth	SUGAR CREEK, TRIB NORTH PLATTE	-	0
RAWLINS WASTEWATER TREATMENT PLANT (ST2)	Significant	Local Governme nt	17	148	Other	Earth	SUGAR CREEK, TRIB NORTH PLATTE	-	0
RAWLINS WASTEWATER TREATMENT PLANT (S 1)	Significant	Local Governme nt	17	178	Other	Earth	SUGAR CREEK, TRIB NORTH PLATTE	-	0
RAWLINS WASTEWATER TREATMENT PLANT (S 2)	Significant	Local Governme nt	17	174	Other	Earth	SUGAR CREEK, TRIB NORTH PLATTE	-	0
HANNA PILOT RESERVOIR	Low	Private	27	755	Other	Earth	HANNA DRAW	LOCAL ROAD	0
CANARY GROVE LIVESTOCK RESERVOIR	Low	Private	32	51	Fire Protection, Stock, Or Small Fish Pond	Earth	CANARY GROVE DRAW	UNNAMED BLDGS.	2
SMILEY RESERVOIR	Low	Private	47	132	Fire Protection, Stock, Or Small Fish Pond	Earth	CHEROKEE CREEK	COUNTY ROAD	4.2
RED WASH NO. 5 WETLAND	Low	Private	15	284	Fish and Wildlife Pond	Earth	RED WASH CREEK (OFF CHANNEL)	HWY 789	2
HIGH SAVERY	High	State	165	30387	Irrigation	Earth	SAVERY CREEK	SAVERY	21
DUCK POND NO. 5	Low	Private	13	159	Fish and Wildlife Pond	Earth	MUDDY CREEK (OFF CHANNEL)	POLO RANCH	0.7

Dam Name	Hazard Potential	Owner Type	NID Height (Ft.)	NID Storage	Primary Purpose	Dam Type	River	City	Distance
LOCO CREEK	Low	Private	48	44	Fish and Wildlife Pond	Earth	LOCO CREEK	UNNAMED RANCH	8.5
KETCHUM BUTTE	Low	Private	35	148	Fire Protection, Stock, Or Small Fish Pond	Earth	WILD COW CREEK	COUNTY ROAD	11
DEEP GULCH	Low	Private	45	253	Fish and Wildlife Pond	Earth	DEEP GULCH	COUNTY ROAD	5.5
LSRCD SECTION 13	Low	Private	25	113	Fish and Wildlife Pond	Earth	BLUE EAGLE CREEK	COUNTY ROAD	0.1
CHAPMAN	Low	Private	26	102	Fish and Wildlife Pond	Earth	WILLOW DELL	BOLTEN RANCH	18
ENLARGEMENT OF THE 29-35-4	Low	Private	30	24	Debris Control	Earth	MED 11 DRAW	SEMINOE RES	0.25
COAL GULCH	Low	Private	30	45	Irrigation	Earth	COAL GULCH	DIXON	-

11. Appendix D: Jurisdictional Plan Adoptions